



MJPBM
Official Journal of Malaysian
Public Health Physicians' Association

**The 12th National Public Health Conference
in conjunction with
26th NIH Scientific Conference**

Embracing the New Era: Advancing Public Health Through AI and Digitalisation

**8th - 10th July 2025
The Everly Putrajaya**

EDITORIAL BOARD

Chairman

Dr. Noor Ani Ahmad

Institute for Public Health, National Institute of Health

Members:

Dr. Muhammad Fadhli MohdYusoff
Dr. Kishwen Kanna Yoga Ratnam
Dr. Wan Nur Syamimi Wan Mohamad Darani
Dr. Nornabiha Izzati Ahmad Noorzali
Ms. Nur Nadiah binti Zainal Abidin
Ms. Khairunnisa Anuar
Mr. Amir Arsyad Azmi

Institute for Public Health, NIH
Institute for Public Health, NIH
Institute for Public Health, NIH
Kuala Lumpur State Health Department
Secretariat PPPKAM
Secretariat 12NPHC
Secretariat 12NPHC

TABLE OF CONTENTS

ORAL PRESENTATION: EPIDEMIOLOGY (COMMUNICABLE/NON- COMMUNICABLE DISEASE)

PRESENTATION ID	TITLE	PAGE
EPIDOP01 / 251	Development, Validation and Usability Testing of “Wabak X” Card Game: A Serious Game on Disease X and Outbreak Preparedness for the Orang Asli in Selangor <i>Ameerah Su’ad Abdul Shakor, Mariam Mohamad, Khalid Ibrahim, Izandis Mohamad Sayed</i>	33
EPIDOP02 / 270	A Comparative Study of XGBoost, SVM, and Random Forest for Hypertension Risk Prediction Among Malaysian Adults <i>Ridwan Sanaudi, Muhd Zulfadli Hafiz Ismail, Zamtira Seman, Evi Diana Omar, Hasnah Mat, Asyraf Syahmi Mohd Noor, Yusrina Mohd Yusoff, Anis Syakira Jailani, Munerah Mohamad Zaman, Ainil Zafirah Abd Karim, Nabilah Hanis Zainuddin, Najjah Tohar, Zurina Razalee, Nik Noor Syamimi Ismail, Mohd Azahadi Omar</i>	37
EPIDOP03 / 292	Factors Associated with Tuberculosis Recurrence in Besut, Terengganu - A Case Control Study <i>Mardhiyyah Azmi, Hafizuddin Awang, Mohd Anuar Abd Rahman, Kasemani Embong</i>	41
EPIDOP04 / 299	Depression among Tuberculosis Patients in Sarawak <i>Zulkifli Mohd Nor Faizal, Sahak Noorzilawati, Saimon Rosalia</i>	44
EPIDOP05 / 318	A Competing Risk Analysis of Cardiovascular Events among People Living with HIV - Early Findings from CardHIV Study <i>Hoon Shien Teh, Kim Heng Tay, Yvonne Mei Fong Lim, Su Lan Yang, Wen Yea Hwang</i>	49
EPIDOP06 / 324	Epidemiology of Measles and Factors Associated with Laboratory-Confirmed Measles in Johor Bahru from 2020 until 2024 <i>Md Faizul Abd Razak, Haidar Rizal Toha, Muhammad Saffuan Azli</i>	52
EPIDOP07 / 325	Prevalence and Risk Factors of Cataract Formation in Diabetic Patients in Johor Bahru: A Population-Based Analysis <i>Loganathan Salvaraji, Haidar Rizal Bin Toha, Ng Wei Meng</i>	56
EPIDOP08 / 334	Leading Causes of Death among Children Aged 0-14 Years in Malaysia: A Comparison between 2019 & 2023	61

Tham Sin Wan, Khaw Wan-Fei, Nazirah Alias, Nur Hamizah Nasaruddin, Nur Diyana Rosnan, Wan Kim Sui, Mohd Azmi Suliman, Shubash Shander Ganapathy, Mohd Azahadi Omar

EPIDOP09 / 342	Modelling Dengue Incidence and Its Association with Temperature in Johor Bahru, Malaysia <u>Nur Sujaihah Hanafi, Akashah Abdullah, Luqmanul Hakim Junaidden, Haidar Rizal Toha</u>	64
EPIDOP10 / 347	Assessing the of accuracy of Artificial Intelligence Diagnostic in Tuberculosis screening: Sensitivity and Specificity in Rural Sarawak <u>Melvin Chung Hsien Liang, Teo Jia Chi, Nurul Amirah Masani, Lai Kah Sheng, Ooi Mann Chek</u>	67
EPIDOP11 / 363	Towards a Mentally Healthier Nation: Expert Consensus on a Depression Intervention for Patients in Primary Care <u>Asma' Khalil, Zahir Izuan Azhar, Chen Xin Wee, Norley Shuib</u>	70
EPIDOP12 / 389	Understanding the Home Tobacco Environment among Non-Tobacco Users in Malaysia: Insights from the National Health and Morbidity Survey 2023 <u>Mohd Ruhaizie Riyadzi, Hamizatul Akmal Abd Hamid, Halizah Mat Rifin, Thamil Arasu Saminathan, Tania Gayle Robert Lourdes, Hasimah Ismail, Wan Kim Sui, Kishwen Kanna Yoga Ratnam, Joan Sonny Limbowoi Saimin, Norhafizah Sahril, Muhammad Fadhli Mohd Yusoff</u>	74
EPIDOP13 / 390	When a Permanent Solution is Taken for a Temporary Problem: Exploring the Demographics of Suicide Mortality <u>Shubash Shander Ganapathy, Wan Kim Sui</u>	78
EPIDOP14 / 391	Antimicrobial Resistance Trends of Gram-Negative Infections in Malaysia: 2018 - 2022. <u>Audrey Huili Lim, Norazida Ab Rahman, Hana Farizah Zamri, Murnihayati Hassan, Rohaidah Hashim, Sheamini Sivasampu, Peter Seah Keng Tok</u>	81
EPIDOP15 / 396	Prevalence of Albuminuria in Malaysia: Early Signs of Kidney Damage in Diabetic and Non-Diabetic Populations <u>Tania Gayle Robert Lourdes, Thamil Arasu Saminathan, Mohd Azmi Suliman</u>	86
EPIDOP16 / 403	Delay In Diagnosis Among Dengue Cases In Perak: A Seven Year Retrospective Analysis <u>Nur Intan Kartiniwatie Kamaruddin, Mohd Fadhli Samsuri</u>	89

EPIDOP17 / 408	Prevalence of Chronic Kidney Disease in Malaysia: Findings from the MyCKD 2024 Study <i>Thamil Arasu Saminathan, Sunita Bavanandan, Loh Chek Loong, Muhammad Fadhli, Mohd Azmi bin Suliman, Tania Gayle Robert Lourdes, Halizah Mat Riffin, Hasimah Ismail, Esther Tan Zhao Zhi, Irene Wong, Hamizatul Akmal Abd Hamid, Noor Ani Ahmad</i>	92
EPIDOP18 / 411	Invisible Exposure: Epidemiologic Clues from a Mucormycosis Outbreak in a Maternal and Child Centre in East Coast of Peninsular Malaysia <i>Noorfariza Nordin, Hasniza Abdullah, Azmani Wahab, Suhaiza Sulaiman, Nor Zubaidah Kadir, Radhiah Abu Bakar</i>	94
EPIDOP19 / 439	Advancing Community-Based Diabetes Self-Screening: A Hypothetical AI-Driven Risk Prediction Model Using National Health Surveillance Data <i>Che Muhammad Nur Hidayat Che Naw</i>	98

ORAL PRESENTATION:

FAMILY HEALTH / HEALTH MANAGEMENT

FHHMOP01 / 174	Exploring Digitalisation Challenges in Implementing Integrated Care in Langkawi's Healthcare System <i>Devi Shantini A/P Rata Mohan, Nur Azmiah Zainuddin, Tengku Mohamad Iskandar Tengku Mohamad Rosman, Sri Devi A/P Sukumaran, Mohd Suhaili Muhamed Shueib, Adlan Zafrulan Ismail</i>	101
FHHMOP02 / 178	Geographic Information Systems (GIS) Mapping of Primary Care Services: Do Older Adults in Malaysia Have Equitable Access? <i>Suhana Jawahir, Jabrullah Ab Hamid, Nur Elina Abdul Mutalib, Awatef Amer Nordin, Devi Shantini Rata Mohan, Adilius Manual, Iqbal Ab Rahim, Sarah Nurain Mohd Noh</i>	104
FHHMOP03 / 189	Optimising Colorectal Cancer Screening in Malaysia: Are Screening Efforts Aligned with Disease Burden? (2014-2021) <i>Diane Woei-Quan Chong, Vivek Jason Jayaraj, Fathullah Iqbal Ab Rahim, Nurul Athirah Naserrudin, Sharifah Saffinas Syed Soffian, Muhammad Fikri Azmi, Eliana Ahmad, Mohd Yusaini Mohd Yusri, Ahmad Shanwani Mohamed Sidek, Norfarizan Azmi, Rosaida Md Said, Muhammad Firdaus Md Salleh, Norasiah Abu Bakar, Hamiza Shahar, Rima Marhayu Abdul Rashid, Shazimah Abdul Samad, Zanita Ahmad, Mohd Safiee Ismail, Adilah A. Bakar, Nor Mashitah Hj Jobli, Sukumaran Raman, Nurulaisyah Hamzah, Mohd Yasin Raja Abdullah, Sondi Sararaks</i>	108
FHHMOP04 / 229	Gender Disparities in Adolescent Health Risks: A Cross-Sectional Study in Tumpat, Kelantan	111

Mohamad Hafiz Harun, Lailatul Nur Noor Azmi, Nabila Balqish Azahar, Aimi Fadilah Shariffuddin, Ahmad Firdaus Mohamed, Hasneezah Hassan

FHHMOP05 / 231	Development of an Image-based Health Promotion Material to Cultivate Healthy Child Media Habits among Malaysian Toddlers <u>Catherine Thamarai Arumugam, Nik Daliana Nik Farid, Mas Ayu Said</u>	115
FHHMOP06 / 247	Title: Rheumatic Heart Disease Screening Among School Children at Primary Care Level in Tuaran: Task-Shifting Strategy using Hand-held Echocardiography and Risk Factor Analysis <u>Hazeqa Salleh, Nasieha Saquenah binti Ribin</u>	117
FHHMOP07 / 268	Kiambang Merah: Innovating Menstrual Care through AI and Digitalisation in Social Entrepreneurship for Public Health <u>Nor Faiza Mohd. Tohit, Siti Athirah Zafirah Abd Rashid, Wan Farizatul Shima binti Wan Ahmad Fakuradzi, Nur Adnin Ahmad Zaidi</u>	121
FHHMOP08 / 277	Establishing a Cardiac Arrest Registry to Improve Out-of-Hospital Cardiac Arrest (OHCA) Outcomes in Malaysia: A Step Towards Data-Driven Emergency Care <u>Mohd Shahri Bahari, Leong Yuen Chin, Farhana Aminuddin, Sivaraj Raman, Mohd Shaiful Jefri Nor Sham Kunusagaran, Nur Amalina Zaimi, Tan Yui Ping, Ee Vien Low, Marhaini Mostapha, Nor Zam Azihan Mohd Hassan</u>	124
FHHMOP09 / 289	Living in an Obesogenic Environment: Voices of Women of Reproductive Age - A Qualitative Exploration <u>Nurul Farehah Shahrir, Noor Aman Hamid, Nur Nabila Abd Rahim, Zaiton Daud, Siti Harirotul Hamrok Asis, Rohana Abdul Jalil</u>	127
FHHMOP10 / 295	From Policy to Delivery Rooms: Cascade of High-Risk Pregnancy Dynamics and Maternal Outcomes in Ningxia, Northwestern China <u>Yang Xiali, Ning Yanhua, Tian Xiaojuan, He Ying, Nadzratulaiman Wan Nordin, Xin Wee Chen</u>	130
FHHMOP11 / 310	Intimate Partner Violence and Child Maltreatment in Sarawak: Predictive Factors Among Men <u>Siti Romahani Rahman, Md Mizanur Rahman</u>	133
FHHMOP12 / 313	Patients' Perspectives on Good Quality of Care for Managing Diabetes, Hypertension and Dyslipidaemia: A Nominal Group Technique Approach <u>Mohamad Zulfikrie Abas, Norshahiratul Atiqah Mohd Zaidi, Lee Pei Jia, Wan Kim Sui, Azah Abdul Samad, Chan Huan Keat, Sheamini Sivasampu, Ang Swee Hung</u>	136

FHHMOP13 / 319	Development of Public Health Law in Malaysia <i>Justen Han Wei Wong, Tahir Aris, Ismuni Bohari, Mohd Zamre Mohd Zahir</i>	139
FHHMOP14 / 329	Use of Generative Artificial Intelligence among Medical Doctors in Sarawak: An Application of the <i>Theory of Planned Behaviour</i> <i>Wong Siaw Hui, Noorzilawati binti Sahak, Md Mizanur Rahman</i>	142
FHHMOP15 / 362	From <i>Buku Rekod</i> to Mobile: Hajj Health Reimagined <i>Iesza Raihan Ali, Sarah Idayu Mohd Abd Latiff, Vivek Jason Jayaraj, Salmiah Baharudin, Muhammad Shafiq Samsudin, Khairulaizat Mahdin, Maheshwara Rao Appannan</i>	146
FHHMOP16 / 354	The Historical Launch of Virtual Clinic Services at Health Clinics in Ministry of Health Malaysia <i>Kawselyah Juval, Nazrila Hairizan Nasir, Isabel Chung Yin Hooi</i>	149
FHHMOP17 / 412	Unpacking EMR Experiences in Primary Care: A Qualitative Study <i>Ariff Azfarahim Ibrahim, Mohd Rizal Abdul Manaf, Aniza Ismail, Rosnah Ismail, Ahmad Husni Ariffin</i>	153
FHHMOP18 / 326	An Integrated Internal Audit on The Key Benefits of Digital X-Ray Services in Primary Healthcare Clinic <i>Dr. Kisheaan Devarajan, Dr. Amirul Ameer bin Rashidan, Dr. Thava Viknaraj Sivabalan, Ms. Renugah Thevi Murugayah, Ms. Rachael Sharmini Rajendran</i>	156
FHHMOP19 / 425	Advancing Public Health Disaster Management through AI and Digitalisation: Lessons from the Putra Heights Disaster <i>Ahmad Faizul Abd Rahman Sazli, Nur Suhada Ramli, Sharifah Fazlinda Syed Nor, Norain Mansor, Anis Salwa Kamaruddin, Muhammad Fikri Azmi, Mohd Fathulzhafran Mohamed Hanan, Humadevi Sivasamy, Lalitha Malar Maniam, Mas Ahmad Sherzkawee Md Yusoff, Jamiatul Aida Md Sani, Mohd Shahrol Abd Wahil</i>	159

ORAL PRESENTATION:

OCCUPATIONAL HEALTH/ ENVIRONMENTAL HEALTH/ SOCIAL & HEALTH BEHAVIOUR/ OTHERS

OESHOP01 / 180	QHub 1.0: The Development of a Centralised Learning Hub for Quality Improvement in Malaysia <i>Nur Ezdiani Mohamed, Samsiah Awang, Muhammad Maziz Shamsuddin, Muhammad Nur Aiman Abdul Rauf, Izzahtul Afiah Kamarullail, Kelly Ngit Khang, Muhammad Izzuddin Abdul Khalid, Fadzlina A. Rahim, Kavitha Vijayan, Zulqarnain Baharau, Asnida Abu Bakar</i>	162
----------------	--	-----

OESHOP02 / 181	The Manifestation of Work-related Fatigue among Scaffolders as Indicated by Physical and Cognitive Dimension: Objective Fatigue Assessment from a One Group Pre-Post Experimental Study <i>Heng Pei Pei, Hanizah Mohd Yusoff, Mohamad Ridza Hj Illias, Saravanan Karrupayah, Muhammad Fadhli Mohd Yusoff, Norizzati binti Amsah, Rozita Hod</i>	165
OESHOP03 / 204	Body Weight Perception and Weight Control Behaviours among School-going Adolescents in Malaysia <i>Chan Ying Ying, Norhafizah Shahril, Hamizatul Akmal Abd Hamid, Mohamad Aznuddin Abd Razak, Lim Kuang Kuay, Azli Baharudin, Kee Chee Cheong, Zamtira Seman, Mohd Azahadi Omar, Noor Ani Ahmad</i>	172
OESHOP04 / 215	Spatial Distribution of Dietary Patterns and Its Association with Obesity Among Adults in Malaysia <i>Kimberly Yuin Y'ng Wong, Sanjay Rampal, Foong Ming Moy</i>	177
OESHOP05 / 216	Reimagining Environmental Health in the Digital Age: A Data-Driven Heat Health Warning System (HHWS) for Malaysia <i>Hadita binti Sapari</i>	181
OESHOP06 / 252	Discovering the Health Risks among Healthcare Workers: Prevalence and Its Associated Factors for Obesity in a Major Government Research Institute in Klang Valley, Malaysia <i>Mona Lisa Md Rasi, Mohd Nizam Misran, Azra Abdul Aziz, Wan Afiqah Wan Sabri, Thanuja Narayanan, Rozilawati Jafri, Siti Haslina Othman, S Maria Awaluddin</i>	184
OESHOP07 / 255	Sequential Food Poisoning Outbreaks in a Boarding School: Risk Factors and the Cloud Kitchen Risks <i>Diana Raj, Chew Cheng Hoon, Shakirah binti Jamaludin, Anussa a/p Krishnan, Engku Norma binti Engku Aziz, Mohd Imran bin Mohammed Abdul Wahab, Noriah binti Ismail</i>	190
OESHOP08 / 256	Machine Learning Identifies Autoantibody-defined Systemic Lupus Erythematosus Subgroups and Their Association with Clinical Manifestations <i>Lay-Kim Tan, Ch'ng-Suyin Shereen, Norliza Zainudin, Ravathy Nasadurai, Habibah Mohd-Yusoof, Mollyza Mohd-Zain, Malek Faris Riza Feisal-Jeffrizal, Say-Lee Pok, and Fariz Yahya</i>	193
OESHOP09 / 276	Development and Validation of an Educational Model for Adult with Allergic Rhinitis <i>Chii-Chii Chew, Xin-Jie Lim, Pathma Letchumanan, Maithrea Suresh Narayanan, Philip Rajan, Chee Ping Chong</i>	196

OESHOP10 / 290	Spatio-temporal Analysis of Leptospirosis Hotspot Areas and its Association with Hydroclimatic Factors in Selangor (2011-2019) and Developing a Predictive Model <u>Muhammad Akram Ab Kadir</u> , Rosliza Abdul Manaf, Siti Aisah Mokhtar, Luthffi Idzhar Ismail	199
OESHOP11 / 296	Enhancing Ergonomic Risk Prediction: Modifying The National Institute for Occupational Safety and Health (NIOSH) Lifting Equation with Individualised Data Inputs <u>Noor Adillah Dawad</u> , Siti Munira Yasin, Azlan Darus, Ahmad Taufik Jamil, Nyi Nyi Naing	202
OESHOP12 / 303	Validation of the Integrated Palliative Care Outcome Scale (IPOS) - Malay Version <u>Diana Katiman</u> , <u>Wen Jun Wong</u> , Hadhinah Ahmad Puaad, Wen Yea Hwong, Teoh Cy Oun	206
OESHOP13 / 306	Low Back Pain Among Medical Laboratory Technologists: Associating Factors and Ergonomic Risk Assessment <u>Imanul Hassan Abdul Shukor</u> , Mohd Faiz Ibrahim, Siew Wei Fern, Kamal Haikal Mat Rabi, Nurul Farehah Shahrir, Rohaida Ismail	209
OESHOP14 / 322	Modifying Effects of Temperature on PM _{2.5} -Related Hospital Admissions in Klang Valley, Malaysia <u>Mohd Faiz Ibrahim</u> , Rohaida Ismail, Nik Muhammad Nizam Nik Hassan, Nor Zam Azihan Mohd Hassan, Farhana Aminuddin, Sarah Saizan, Fawzi Zaidan Ali, Halmy Sirat	213
OESHOP15 / 330	Translation and Validation of the Motivation Thought Frequency Scales for Alcohol (MTF-A) into an Indigenous Language (Jakun Version) <u>Rifhan Rasuli</u> , Aimi Nadira Mat Ruzlin, Mariam Mohamad	217
OESHOP16 / 338	Exploring Barriers in Anticipatory Guidance Practices on Oral Health for Toddlers Among Dental Therapists <u>Susan Shalani Gnanapragasam</u> , Aznilawati Abdul Aziz, Wan Nadzirah W Pauzi, Nurul Adila Mat Dait, Farhani Md Azizan	221
OESHOP17 / 359	Understanding Service Uptake and Eye Health Inequities in Machang's B40 Community <u>Noor Halilah Buari</u> , Nur Izzah Afifah Shahrir, Nur Suhailah Alias, Sabrina Subri	225
OESHOP18 / 419	Vision impairment among Urban School Children: Socioeconomic Barriers to Eye Health in Kuala Lumpur <u>Naufal Nordin</u> , Mohd Helmi Abu Yahya, Noor Haziq Saliman	227
OESHOP19 / 429	Awareness and Knowledge of Childhood Eye Problems among Special School Teachers in Selangor <u>Sabrina Subri</u> , Nur Suhailah Alias, Noor Halilah Buari	232

E-POSTER PRESENTATION: EPIDEMIOLOGY (COMMUNICABLE/ NON-COMMUNICABLE DISEASE)

EPIDPP01 / 179	Insights for COVID-19 Booster Dose Acceptance in Kolkata, India: A Regional Cross-sectional Study <i>Abhishek Lachyan, Min Fui Wong, Indranil Saha, Vivek Jason Jayaraj</i>	237
EPIDPP02 / 197	Unmasking Susceptibility: HBV in Malaysia's Vaccinated Population, A Cross-Sectional Study from National Health & Morbidity Survey 2020 <i>Filza Noor Asari, Eida Nurhadzira Muhammad, Nurfatehar Ramly, Mohd Hatta Abdul Mutalip, Muhammad Faiz Mohd Hisham, Chong Zhuo Lin</i>	241
EPIDPP03 / 205	Association between cardiovascular disease and cataract: A meta-analysis <i>Jun Fai Yap, Pei Pei Heng, Wan Nur Syamimi Wan Mohamad Darani, Halizah Mat Rifin, Nor Asiah Muhamad, Muhammad Fadhli Mohd Yusoff</i>	246
EPIDPP04 / 209	Multimorbidity among Reproductive-Aged Women: A Nationwide Cross-Sectional Study in Malaysia <i>Siti Hafizah Zulkipli</i>	250
EPIDPP05 / 218	Effectiveness of WhatsApp Messaging Health Education on Uncontrolled Type 2 Diabetes Mellitus Patients - A Cluster Randomized Controlled Trial <i>Alif Ramli, Freddie Robinson, Carol Lim Kai Joo, Nirmal Kaur, Balachandar S. Sayapathi, Anisah Jantim, Ismail Lasa, Norimah Yusof, Mohd Hafizuddin Ahmad, Noriah Mahmud, Mohd Anuar Abd Rahman</i>	259
EPIDPP06 / 219	Depression Among Malaysian Adults: A Sociodemographic Comparison Between NHMS 2019 and NHMS 2023 <i>Mohamad Aznuddin Abd Razak, S Maria Awaluddin, Norlaila Hamid, Wan Sarifah Ainin Wan Jusoh</i>	263
EPIDPP07 / 220	Prevalence and Determinants of Anxiety in Individuals with Type 2 Diabetes Mellitus: Evidence from a Cross-Sectional Study in Southern Malaysia <i>Norizzati Amsah, Zaleha Md Isa, Norfazilah Ahmad, Zaid Kassim</i>	267
EPIDPP08 / 223	Prevalence and Associated Factors of Metabolic Syndrome Among Teachers in Peninsular Malaysia: The CLUSTER Cohort Study <i>Chong Chean Tat, Moy Foong Ming</i>	270
EPIDPP09 / 224	Epidemiology and Predicting Mortality in Melioidosis Patients in Sandakan, Malaysia <i>Mohamad Hafiz Mohamad Nasir, Mohd Faiz Gahamat, Nafsah Dulajis, Aima Bungsu, Saint Alvendy Daraim, Rowena Jamilus, Hafiez Syam Basrin, Muhammad Jikal</i>	274

EPIDPP10 / 232	A case study of the implication of World Health Organization (WHO) position on TAK-003 dengue vaccine to Malaysia <i>Chong Zhuo Lin</i>	277
EPIDPP11 / 235	Prevalence And Associated Factors Among Overweight and Obese Adults with Hypertension in Malaysia <i>Nor Azian Mohd Zaki, Khairul Hasnan Amali, Syafinaz Sallehuddin, Kishwen Kanna Yoga Ratnam</i>	281
EPIDPP12 / 237	Assessing Cardiovascular Diseases Mortality in Malaysia, 2023 <i>Nazirah Alias, Nur Hamizah Nasaruddin, Khaw Wan-Fei, Tham Sin Wan, Wan Kim Sui, Shubash Shander Ganapathy, Mohd Azahadi Omar</i>	285
EPIDPP13 / 240	Prevalence and Determinants of Obesity Among Individuals with Diabetes in Malaysia: Findings from the National Health and Morbidity Survey 2023 <i>Hasimah Ismail, Thamil Arasu Saminathan, Zamtira Seman, Halizah Mat Rifin, Tania Gayle Robert Lourdes, Hamizatul Akmal Abd Hamid, Mohd Ruhaizie Riyadzi, Azli Baharudin, Muhammad Fadhli Mohd Yusoff</i>	288
EPIDPP14 / 242	Prevalence of Abdominal Obesity and Its Associated Factors Among Malaysian Adults: Insight from the National Health and Morbidity Survey (NHMS) 2023 <i>Azli Baharudin, Khairul Hasnan Amali, Hamizatul Akmal Abd Hamid, Nor Azian Mohd Zaki, Muhammad Fadhli Mohd Yusoff, Thamil Arasu Saminathan, Hasimah Ismail, Syafinaz Mohd Sallehuddin, Lalitha Palaniveloo</i>	292
EPIDPP15 / 243	Ethnic Disparities and Intervention Gaps in Glycemic Control: A Cross-Sectional Study of Known Diabetes Cases <i>Nurul Huda Ibrahim, Halizah Mat Rifin, Wan Kim Sui, Hamizatul Akmal Abd Hamid, Hasimah Ismail, Thamil Arasu Saminathan, Muhammad Fadhli Mohd Yusoff</i>	295
EPIDPP16 / 244	Delayed Dengue Diagnosis in Batang Padang District, Perak: A 2024 Study <i>Muhamad Isa Abdul Aziz, S Maria Awaluddin, Chong Zhuo Lin, Mohd Hatta Abdul Motalip, Tuan Mohd Amin Tuan Lah, V C Anuratha, Nur Fatihah Shaharuddin</i>	299
EPIDPP17 / 250	Depression and Its Links to Physical Activity, Sedentary Behaviour, and Weight Status in Malaysian Adolescents: A Cross-Sectional Study <i>Norhafizah Sahril, Norliza Shamsuddin, Wan Sarifah Ainin Wan Jusoh, Norlaila Hamid, Ahmad Ali Zainuddin, Noor Ani Ahmad</i>	303

EPIDPP18 / 258	How Age and Employment Status Influence on E-Cigarette Use in Malaysia? <i>Mohd Hazrin Hasim @ Hashim, Mohd Ruhaizie Riyadzi, Tuan Mohd Amin Tuan Lah, Thamil Arasu Saminathan, Muhammad Fadhli Mohd Yusoff, Norliana Ismail, Mohd Hairul Nizam Abd Hamid, Ummi Nadiah Yusoff, Noraryana Hassan, Nizam Baharom</i>	307
EPIDPP19 / 261	User acceptance of the DMOSS Dengue Forecast Model in Malaysia <i>Sarbhan Singh, Lim Mei Cheng, Nuur Hafizah Md. Iderus, Sumarni Mohd Ghazali, Mohd Nadzmi Md Nadzri, Asrul Anuar, Mohd Kamarulariffin Kamarudin, Nur Ar Rabiah Binti Ahmad, Chew Cheng Hoon, Balvinder Singh Gill, Chong Zhuo Lin, Wan Ming Keong, Kok Keng Tee, Lokman Hakim Sulaiman, Teh Chien Huey</i>	311
EPIDPP20 / 264	The Prevalence of Hypertension and Its Associated Risk Factors among Indigenous Adults in Malaysia: Findings from the National Health Survey 2022. <i>Kishwen Kanna Yoga Ratnam, Mohd Azmi Suliman, Hamizatul Akmal, Mohammad Aznuddin Abd Razak, Wan Kim Sui, Khairul Hasnan Amali, Thamil Arasu, Tania Gayle, Halizah Mat Riffin</i>	314
EPIDPP21 / 266	Implementation Of Community - Base Rheumatic Heart Disease Screening At Primary Care Facilities in Penampang District : Pilot Project From Sabah, Malaysia <i>Pee Nai Eng, Sam Froze Jiee, Lim Kai Joo, Aini Simon Sumeh, Anisah Jantim, Siva Rao Muniandy, Elron Alpero</i>	317
EPIDPP22 / 278	Predicting Multimorbidity Using Machine Learning: Insights from NHMS 2019 <i>Ainil Zafirah Abd Karim, Ridwan Sanaudi, Muhd Zulfadli Hafiz Ismail, Zamtira Seman, Evi Diana Omar, Hasnah Mat, Munerah Mohamad Zaman, Asyraf Syahmi Mohd Noor, Anis Syakira Jailani, Nabilah Hanis Zainuddin, Mohd Azahadi Omar</i>	320
EPIDPP23 / 280	Mental Health Predictors Among Public Sector Workers at the National Institutes of Health, Selangor <i>Puteri Sofia Nadira Megat Kamaruddin, Mona Lisa Md Rasip, Mohd Nizam Misran, Azra Abdul Aziz, Wan Afiqah Wan Sabri, Thanuja Narayanan, Rozilawati Jafri, Siti Haslina Othman, Mohd Safwan Ibrahim, Shazana Rifham bt Abdullah</i>	323
EPIDPP24 / 304	Multiagency Responses in Managing Leptospirosis Outbreak at A Recreational Site in Perak <i>Abdulloh Mazalan, Hairunnisa Hashami, Husna Maizura Ahmad Mahir, Raja Muhammad Raja Omar, Noor Hidayah Mohd Yasin, Nurul Syariah Shafiin, Ahmad Fahmi Rashid Redza</i>	327
EPIDPP25 / 308	Prevalence and Factors Associated with Pre-Hypertension among Adults in Malaysia <i>Hamizatul Akmal Abd Hamid, Halizah Mat Riffin, Lim Kuang Kuay, Tania Gayle Robert Lourdes, Mohd Ruhaizie Riyadzi, Azli Baharudin, Muhammad Fadhli Mohd Yusoff</i>	329

EPIDPP26 / 311	A Wake-Up Call on Adolescent E-Cigarette Use in Malaysia <i>Muhammad Fadhli Mohd Yusoff, Mohd Ruhaizie Riyadzi, Tania Gayle Robert Lourdes, Hamizatul Akmal Abd Hamid, Thamil Arasu Saminathan</i>	333
EPIDPP27 / 320	Sex Differences in Years of Life Lost in Malaysia, 2023: A Burden of Premature Mortality <i>Khaw Wan-Fei, Nazirah Alias, Tham Sin Wan, Nur Hamizah Nasaruddin, Nur Diyana Rosnan, Wan Kim Sui, Mohd Azmi Suliman, Shubash Shander Ganapathy, Mohd Azahadi Omar</i>	338
EPIDPP28 / 323	Epidemiological Characteristics of Hepatitis B Notifications in Kinta District, Perak, Malaysia, 2024 <i>Lai Yeng Chow, Pathma Reddy, Gregory Xavier</i>	341
EPIDPP29 / 331	Influenza B Outbreak Report at The Hostel of Sekolah Menengah Kebangsaan Tinggi Setapak, Kuala Lumpur <i>Puteri Sofia Nadira Meqat Kamaruddin, Shazana Rifham Abdullah, Mohd Safwan Ibrahim</i>	344
EPIDPP30 / 333	Urban-Rural Disparities in Overall Disability among Malaysian Adults: Findings from the National Health and Morbidity Survey 2023 <i>Norliza Shamsuddin, S Maria Awaluddin, Siti Hafizah Zulkipli, Nor'Ain Ab Wahab, Norzawati Yeop, Hashimah Ismail, Halizah Mat Ripin, Muhammad Fadhli Mohd Yusoff</i>	347
EPIDPP31 / 339	The Impact of TB Anatomy on the Duration of Treatment: An ANCOVA Approach Controlling for Age <i>Siti Romaino Mohd Nor, Nyi Nyi Naing, Mat Zuki Mat Jaeb</i>	350
EPIDPP32 / 340	Impact of Diagnostic Delay on Melioidosis Mortality in Sandakan: A Call for Early Detection Strategies <i>Nafsah Dulajis, Mohamad Hafiz Mohamad Nasir, Aizuddin Hidrus, Mohamad Faiz Gahamat</i>	353
EPIDPP33 / 341	Prevalence of Dual Tobacco Users and Sources of Access among Adolescents in Malaysia: Findings from the National Health and Morbidity Survey 2022 <i>Mohd Firdaus Razali, Mohd Ruhaizie Riyadzi, Hamizatul Akmal Abd Hamid, Khaw Wan-Fei, Lim Kuang Kuay</i>	356
EPIDPP35 / 344	Thalassaemia in Sabah: Insights from the Malaysian Thalassaemia Registry <i>Hadhinah Ahmad Puaad, Wen Jun Wong, Gek Bee Ong, Yee Leng Lee, Su Lan Yang, Wen Yea Hwong</i>	360
EPIDPP36 / 346	Systematic Review on Predictors of Smoking Cessation Success Among Adults in Malaysia	364

Nur Fadzlyanah Khusaini, Chin Ri Wei Andrew, Mohammad Azri Bantalani, Muhammad Aklil Abd Rahim

EPIDPP37 / 352	Urban-Rural Variation in Predicting Depression Among Elderly Using Naïve Bayes Classifier <i>Nabilah Hanis Zainuddin, Ridwan Sanaudi, Ainil Zafirah Abd Karim, Zamtira Seman</i>	368
EPIDPP38 / 353	The Proportion and Determinants of Incomplete Treatment Among Latent Tuberculosis Infection in Tumpat District, Kelantan, Malaysia <i>Hasneezah Hassan, Ahmad Firdaus Mohamed, Mohamad Hafiz Harun</i>	371
EPIDPP39 / 356	Exploration of Klang's Health District Office Dengue Case Investigations in Relation to Hospital Tengku Ampuan Rahimah Serological Results <i>Hazwa Harith, Nur Nabila Abd Rahim, Gurpreet Kaur Karpal Singh, Suvarna Mohan</i>	375
EPIDPP40 / 358	Tuberculosis Among Orang Asli in Perak: A Cross Sectional Study from 2019-2023 <i>Lau Kin Mun, Afzaninawati Suria Yusof, Adam Prakash Gunaselan, Suntharavalli Vadivalu, Husna Maizura Ahmad Mahir</i>	380
EPIDPP41 / 364	Hypertensive Drug Utilisation and Polypharmacy Among Older Adults in Malaysian Public Primary Care <i>Mohd Shaiful Jefri, Marhaini Mostapha, Rima Marhayu Abdul Rashid, Noor Haslinda Ismail, Sivaraj Raman, Farhana Aminuddin, Mohd Shahri Bahari, Nur Amalina Zaimi, Tan Yui Ping, Ee Vien Low¹, Nor Zam Azihan Bin Hassan</i>	384
EPIDPP42 / 368	Overweight And Obesity Among Orang Asli Proto Malay Adults In Malaysia <i>Khairul Hasnan Amali, Azli Baharuddin, Ahmad Ali Zainuddin, Muhamad Khairul Nazrin Khalil</i>	388
EPIDPP43 / 370	Determinants of Known Asthma Among Adults in Malaysia: Findings from the National Health and Morbidity Survey (NHMS) 2023 <i>Joan Sonny Limbowoi Saimin, Shubash Shander Ganapathy, Halizah Mat Rifin, Wan Kim Sui, Kishwen Kanna Yoga Ratnam, Lim Kuang Kuay, Mohd Ruhaizie Riyadzi, Mohamad Aznuddin Abd Raza¹, Khairul Hasnan Amali, Muhammad Hanafi Bakri, Nurul Haniyah Roslan, Nur Faraeein Zainal Abidin</i>	394
EPIDPP44 / 375	An Appraisal Of Urban Malaria In Johor Bahru: Gametocyte Cases In 2024 <i>Noor Adillah Dawad, Luqmanul Hakim Junaiden, Akashah Abdullah, Haidar Rizal Toha</i>	398

EPIDPP45 / 379	Factors Associated with Tuberculosis (TB) Treatment Success among TB Patients in Kelantan; 3 Years Record Review 2021-2023 <i>Siti Romaino Mohd Nor</i>	402
EPIDPP46 / 381	Population-Based Thalassaemia Carrier Mapping in Malaysia: Insights from a Half a Decade of School-Based Screening <i>Don Ismail Mohamad, Radziah Mohamad, Saidatul Norbaya B., Alisahkhairun Rahmat, Mohd Shahriel Mat Daud, Nurul Kausar Izzati Mohd Ghazali, Mardiana Omar</i>	406
EPIDPP47 / 383	The Forgotten Pill? Lipid-Lowering Therapy Adherence at One Year After Acute Myocardial Infarction <i>Hui Li Lim, Wen Jun Wong, Swee Hung Ang, Alan Yean Yip Fong, Gurudevan Mahadevan, Yvonne Mei Fong Lim</i>	409
EPIDPP48 / 384	Concomitant Lymphatic Filariasis in Humans and Animals in Sabah: Findings from the SABAH-VI Baseline Study <i>Mohd Hatta Abdul Mutalip, Khairiah Ibrahim, Rahmah Noordin, Nor Azlin Abdul Aziz, Sajidah Khadijah Meor Azlan, Eida Nurhadzira Muhammad, Faizul Akmal Abdul Rahim, Amierul Fikri Mahmud, Mohammad Ridhuan bin Mohd Ali, Emelia Osman</i>	413
EPIDPP49 / 385	Persistence of Symptoms at 6 months Post COVID-19: A Cohort Study <i>Peter Seah Keng Tok, Norazida Ab Rahman, Sheamini Sivasampu</i>	417
EPIDPP50 / 388	Five-Year Comparative Analysis of Immunochemical Faecal Occult Blood Test Uptake and Its Predictors among Malaysian Average-Risk Population (2019-2023) <i>Wan Nur Syamimi Wan Mohamad Darani, Thamil Arasu Saminathan, Halizah Mat Rifin, Muhammad Fadhli Mohd Yusoff</i>	421
EPIDPP51 / 392	From Therapy to Threat: Legionellosis Outbreak at a Recreational Hot Spring in Melaka <i>Nur Aishah Buang, Khairul Anuar Abdullah, Hafiz Idlan Radzali, Mohd Ridzuan bin Janudin, Siti Nadiyah Mohamad Mohsin, Raziah Nordi, Ainur Nafisya Kamarolzaman, Adibah Ibrahim</i>	425
EPIDPP52 / 405	Sociodemographic factors associated with multiple cardiovascular risk factors among adults in Malaysia: A gender-stratified analysis of the National Health and Morbidity Survey (NHMS) 2023 <i>Halizah Mat Rifin, Wan Kim Sui, Hamizatul Akmal Abd Hamid, Tania Gayle Robert Lourdes, Mohd Firdaus Razali, Nurzaime Zulaily, Mohd Hatta Mutalip, Kimberly Wong Yui Y'ng, Khairul Hasnan Amali</i>	430
EPIDPP53 / 406	Pinpointing Locations And Time For Dengue Preventive Activities In Perak By Exploring Connections Between	434

	Populations Movements And Previous Dengue Trend Data. <i>Shaffik S, Mohd Fadhli S, Thiruchelvam M, Husna Maizura AM</i>	
EPIDPP54 / 421	Incidence and Factors Associated with Hospital Admission for Hand, Foot, and Mouth Disease (HFMD) in Segamat, Johor <i>Mohamad Fazreen Mohamad Anuar, Mohd Ridzuan Mohd Lutpi, Mohammad Nafis Sahiran, Mohd Khairul Anwar Kamdi, Choo Teck Min, Norjanah binti Johari</i>	436
EPIDPP55 / 427	Tuberculosis Outbreak Investigation at a Workplace in Cheras, Kuala Lumpur, 2024 <i>Mohamad Fazreen Mohamad Anuar, Mohd Ridzuan bin Mohd Lutpi, Mohammad Nafis bin Sahiran, Mohd Khairul Anwar bin Kamdi, Choo Teck Min, Norjanah binti Johari</i>	440
EPIDPP56 / 428	Smokers' Knowledge and Perception of Smoking <i>Norzawati Yoep, Muhammad Faiz Mohd Hisham, Wan Kim Sui</i>	443
EPIDPP57 / 430	The Hidden Epidemic: Leptospirosis Risk and Spread in Kinta District (2022-2024) <i>Zulaikha Abdul Razak, Gregory Joseph Xavier, Mohd Zamri Md Ali, Pathma Sree R, Vinothkumarthevar R</i>	447
EPIDPP58 / 435	Are Men Who Have Sex with Men (MSM) Driving the Shift in HIV Transmission Patterns in Larut, Matang and Selama District, Perak? - A Decade of Insights (2015-2024) <i>Muhammad Naim Ibrahim, Mohd Najimi Ahmad, 'Ammar Amsyar Abdul Haddi, Syahrizal Abdul Halim, Husna Maizura Ahmad Mahir</i>	451
EPIDPP59 / 436	Young, Bold and at Risk: A 10-Year Trend Analysis of Gonorrhoea and Acquired Syphilis in Larut, Matang and Selama District, Perak <i>Muhammad Naim Ibrahim, Mohd Najimi Ahmad, Ammar Amsyar Abdul Haddi, Syahrizal Abdul Halim, Husna Maizura Ahmad Mahir</i>	455
EPIDPP60 / 437	Unseen Chains of Transmission: A Pertussis Outbreak Among Schoolchildren Affecting a High-Risk Infant in Melaka <i>Abdul Ahmad Syafiq Hussein, Ayuzeity Bistari Md Bukhori, Siti Nurbaya Abdul Aziz, Mohd Ridzuan Janudin, Nazirah A Hamid</i>	459
EPIDPP61 / 446	Suppressing Dengue Through Wolbachia-Infected <i>Aedes aegypti</i> : Progress and Impact from a Community-Based Intervention in Melaka Tengah <i>Adibah Ibrahim, Mohd Ridzuan Janudin, Sharifah Nur Shahirah Syed Abdul Halim, Noor Hazmi Noor Hassim, Rabizah Hamzah</i>	463

EPIDPP62 / 365	Beyond the Virus: Did COVID-19 Spark a Rise in Autoimmune and Inflammatory Conditions? <i>Masliyana Husin, Swee Hung Ang, Yvonne Mei Fong Lim, Xin Rou Teh, Vivek Jason Jayaraj, Shahanizan Mohd Zin, Santhi Subramaniam, Maheshwara Rao Appanan, Sheamini Sivasampu, Fahd Adeeb, Peter Seah Keng Tok</i>	467
EPIDPP63 / 301	Incidence of Leptospirosis in Segamat District, Johor 2024 and Its Associated Risk Factors <i>Choo Teck Min, Mohd Ridzuan Mohd Lutpi, Mohd Khairul Anwar Kamdi, Mohammad Nafis Sahiran, Nor Alia Nadhirah Ramli, Mohd Serajuddin Mohd Salleh, Ruhaizan Ruwandi</i>	470
EPIDPP64 / 395	Overweight, Obesity, and Hypercholesterolemia Among Adults in Malaysia: Findings from the National Health and Morbidity Survey (NHMS) 2023 (Non-Communicable Disease) <i>Syafinaz Mohd Sallehuddin, Khairul Hasnan Amali, Nor Azian Mohd Zaki, Ruhaya Salleh, Halizah Mat Rifin</i>	473
EPIDPP65 / 401	Improving Diabetes Mellitus Care in Primary Health Clinics in Kuala Lumpur Through Clinical Audit of Diabetes Mellitus <i>Waramlah Ramlan, Jaysina Ayu Jaafar Siddek, Haliza Abd Manaf</i>	476
EPIDPP67 / 424	Dengue Trends in Petaling District, Malaysia: A 2023-2024 Analysis <i>Nor Izyani Bahari, Mas Ahmad Sherzkawee Mohd Yusoff, Jamiatul Aida Md Sani, Junisha Hani Baharudin</i>	480
EPIDPP68 / 433	Dysentery Under the Microscope: A Study from Kuala Krai <i>Sarah Saizan, Siti Salimah Yusoff, Hazura Mat Zubir</i>	484
EPIDPP69 / 434	An episode of food poisoning outbreak: Salmonella, are you the culprit? <i>Mohd Adlan Md Kamal, Anis Nadirah Mohamad Zainudin, Zakiah Othman, Khairul Anwar Jabir, Renuga Devi Kanabalan, Rohaya Ramli</i>	488
EPIDPP70 / 442	Harnessing Artificial Intelligence for Improved Diagnosis and Surveillance of Leptospirosis <i>Murnihayati Hassan, Siti Nur Zawani Rosli, Meruwan Amin Shoib, Mohd Nadzuan Yahaya, Mohammad Ridhuan Mohd Ali</i>	492
EPIDPP71 / 443	Community-Based Weight Management Among KOSPEN community in Malaysia: A Public Health Approach <i>Maizatul Azlina Chee Din, Mohd Tariq Mhd Noor, Ahmad Izzuddin Anuar</i>	495

E-POSTER PRESENTATION: FAMILY HEALTH/ HEALTH MANAGEMENT

FHHMPP01 / 175	Digitalisation in Action: Solutions for Limited-Resource Settings <i>Nur Azmiah Zainuddin, Devi Shantini A/P Rata Mohan, Tengku Mohamad Iskandar Tengku Mohamad Rosman, Sri Devi A/P Sukumaran, Muhammad Suhaili Muhammad Shueib, Adlan Zafrulan Ismail</i>	498
FHHMPP02 / 177	From Concept To Reality: Expert Insights in Content Validation of The Malaysian Diabetic Foot Self-Care Instrument <i>Divya Nair Narayanan, Normaizira Hamidi, Izzatur Rahmi Mohd Ujang, Nurhayati Shaharuddin, Roslina Supadi Samsiah Awang, Nora Hamid, Suhanahani Bastani, Mohammad Luqman Abd Rani, Tengku Mohd Asri Tengku Makhtar, Nurasmilla Md Noor</i>	501
FHHMPP03 / 188	Chronic Ambulatory Care-Sensitive Conditions: A Snapshot of Potentially Preventable Hospitalisations in Ministry of Health Facilities <i>Shakirah Md.Sharif, Hazwa Harith, Ang Zen Yang Melody Soong Yin Yin, Fun Weng Hong</i>	504
FHHMPP04 / 190	Developing Malaysia's Men's Health Report Card: A Tool for Assessing Health Trends <i>Wilfred Mok Kok Hoe, Ang Zen Yang, Chew Cheng Hoon, Mohd Yasin Raja bin Abdullah, Diane Chong Woei Quan, Fun Weng Hong, Wan Mohd Shariffuddin Zainuddin, Zakiah Mohd Said, Sondi Sararaks</i>	508
FHHMPP05 / 192	Do Mental Health Issues Relate to Risky Sexual Behaviour in Adolescents? Findings from the Adolescent Health Survey 2022, Malaysia <i>Noor Aliza Lodz, Mohd Aznuddin Abd Razak</i>	511
FHHMPP06 / 195	Maternal Morbidities (Obesity, Hypertension and Diabetes Mellitus) Influencing Caesarean Delivery Decisions in Malaysia <i>Norlaila Hamid, S Maria Awaluddin, Wan Sarifah Ainin Wan Jusoh, Norliza Shamsuddin, Norhafizah Sahril, Chan Yee Mang, Noor Ani Ahmad</i>	515
FHHMPP07 / 198	Anxiety Symptoms Among Family Caregivers of Persons with Dementia in West Malaysia: Prevalence, Associated Factors and Its Effect on Quality of Life <i>Hashima E Nasreen, Syarifah Amirah binti Syed Ahmad</i>	519
FHHMPP08 / 203	Urban-Rural Disparities in Contraceptive Use Among Women of Reproductive Age in Malaysia: A Cross-Sectional Analysis	523

Wan Sarifah Ainin Wan Jusoh, S Maria Awaluddin

FHHMPP09 / 207	Protecting the Future: Vaccine Hesitancy Among Malaysian Mothers of Children Under Two Years Old <i>Norain Ab Wahab, S Maria Awaluddin, Eida Nurhadzira Muhammad, Chong Zhuo Lin, Norliza Shamsuddin, Nazirah Alias, Foong Ming Moy, Noor Ani Ahmad.</i>	526
FHHMPP10 / 210	Streamlining Excellence: A Protocol for Standardising Healthcare Quality Professionals' Roles and Functions in the Ministry of Health Malaysia <i>Normaizira Hamidi, Nurhayati Shahrudin, Divya Nair Narayanan, Samsiah Awang, Khalidah Maruan, Izzatur Rahmi Mohd Ujang, Nur Ezdiani Mohamed, Roslina Supadi, Mariyah Mohamad</i>	529
FHHMPP11 / 212	The Risk of Health Status of 2024 Pre-Hajj Medical Examination in Malaysia Hajj Pilgrim (MyVAS Outcomes) <i>Khairulaizat Mahdin, Mohd Azmi Suliman, Iesza Raihan Ali, Azah Abdul Samad, Muhammad Shafiq Samsudin, Maheshwara Rao Appannan, Salmiah Baharudin</i>	532
FHHMPP12 / 217	Prevalence and Determinants of Parental Monitoring Among Malaysian Adolescents <i>Noor Syaqlah Shawaluddin, Tuan Mohd Amin Tuan Lah, Maznieda Mahjom, Nur Hamizah Nasaruddin, Nazirah Alias, Mohd Ruhaizie Riyadhzi, Thamil Arasu Saminathan, Nur Faraeen Zainal Abidin, Lim Kuang Kuay, S Maria Awaluddin</i>	535
FHHMPP13 / 225	Prevalence of Pre-Pregnancy Comorbidities among Mothers in Malaysia and the Association with Hypertensive Disorder in Pregnancy <i>Maznieda Mahjom, Mohd Shaiful Azlan Kassim, Kishwen Kanna Yoga Ratnam, S Maria Awaluddin, Lim Kuang Kuay, Noor Syaqlah Shawaluddin, Tuan Mohd Amin Tuan Lah, Farah Nabilah Ahmad Zainuddin, Dzarifah Hanis Md Sairi</i>	538
FHHMPP14 / 226	Gross Motor Developmental Delay Among Children Aged 6 To 59 Months in Malaysia, 2022 <i>Nur Hamizah Nasaruddin, S Maria Awaluddin, Noor Syaqlah Shawaluddin, Khaw Wan-Fei, Nazirah Alias, Tham Sin Wan, Sharifah Nazeera Syed Anera, Wan Shakira Rodzlan Hasani, Sulhariza Husni Zain</i>	541
FHHMPP15 / 228	Potentially Preventable Hospitalisations Among Older Adults: Analysis of Hospitalisations in The Ministry of Health Facilities Between 2015 and 2020 <i>Melody Soong Yin Yin, Ang Zen Yang, Tang Kar Foong, Shakirah Md. Sharif, Lim Wern Han, Fun Weng Hong, Alif Haikal Md Razman, Nur Aleeya Syakila Muhamad Subian, Sondi Sararaks</i>	544

FHHMPP16 / 230	Reasons and factors associated with contraceptive non-use among married Orang Asli women: Findings from the Orang Asli Health Survey 2022 <i>Muhamad Khairul Nazrin Khalil, Nurhafizah Sahril, Filza Noor Asari, Noor Syaqlah Shawaluddin, Muhammad Faiz Mohd Hisham</i>	547
FHHMPP17 / 234	Prevalence and Factors Associated with Anaemia among Women of Reproductive Age among Orang Asli in Malaysia <i>Muhammad Azri Adam Adnan, Norizzati Amsah, Norlaila Hamid, Mohd Khairul Nadzrin Khalil</i>	551
FHHMPP18 / 236	Outpatient Healthcare Utilisation Inequalities Among Older Adults in Malaysia - A Multi-Dimensional Analysis <i>Awatef Amer Nordin, Suhana Jawahir, Iqbal Ab Rahim, Adilius Manual, Jabrullah Ab Hamid, Nur Elina Abdul Mutalib, Devi Shantini Rata Mohan, Sarah Nurain Mohd Noh</i>	555
FHHMPP19 / 239	Trends In Glycaemic Control: Evaluating Medical Nutrition Therapy Outcomes Over Time In Public Healthcare Clinics <i>Murnizar Mokhtar, Nurul Huda Ibrahim, Norasima Kassim, Mohammad Zulkarnain Mohammad Ikham, Rozlinizam Kudori, Aisyah Muhamad, John Kong Jian Pei, Mohd Fauzee Mohd Zaki, Siah Woan Yie</i>	559
FHHMPP20 / 253	Uncovering Gaps in Colorectal Cancer Screening Uptake Among Urban Community-Dwelling Elderly <i>Aidalina Mahmud, Mohd Erfan Edros</i>	562
FHHMPP21 / 257	Incidence and Types of Medication Transcription Errors in Healthcare Facilities in Malaysia <i>Norazida Ab Rahman, Ee Vien Low, Fateha Kamaruddin, Asilah Che Ayub, Sue Chin Chong, Noridayu Tumiran, Norafidah Idris</i>	565
FHHMPP22 / 259	Global Research Trends on Paediatric Obesity: A Bibliometric Analysis from 1994 to 2023 <i>Mohd Azmi Suliman, Tham Sin Wan, Thamir Arasu Saminathan</i>	569
FHHMPP23 / 260	Three Decades of Malnutrition Research Among Older Persons: A Bibliometric Analysis of Contributors and Research Themes <i>Mohd Azmi Suliman, Tham Sin Wan</i>	573
FHHMPP24 / 265	Top-down Costing of Primary Healthcare Services in Malaysian Public Health Clinics <i>Marhaini Mostapha, Mohd Shaiful Jefri, Rima Marhayu Abdul Rashid, Noor Haslinda Ismail, Tan Yui Ping, Mohd Shahri Bahari, Farhana Aminuddin, Sivaraj Raman, Nur Amalina Zaimi, Ee Vien Low, Nor Zam Azihan Mohd Hassan</i>	577

FHHMPP25 / 272	Trends in Equality of Inpatient Care Utilisation for Middle-aged and Older Adults in Malaysia: Findings from the 2011, 2015, and 2019 National Health and Morbidity Surveys <i>Suhana Jawahir, Awatef Amer Nordin, Devi Shantini Rata Mohan, Nur Elina Abdul Mutalib, Iqbal Ab Rahim, Jabrullah Ab Hamid, Adilius Manual, Sarah Nurain Mohd Noh</i>	580
FHHMPP26 / 282	Utilisation of Medical Check-ups Among Older Adults in Malaysia: Findings from the National Health and Morbidity Survey (NHMS) 2023 <i>Nur Hidayati Abdul Halim, Ang Zen Yang</i>	584
FHHMPP27 / 284	Maternal Mortality in Perak: A Decadal Epidemiological Review (2015-2024) <i>Raja Muhammad Raja Omar, Che Wan Ilmiyah, Masliza Mustafa, Khoo Yi Yi, Prem Kumar, Husna Maizura Ahmad Mahir</i>	588
FHHMPP28 / 285	Productivity Impact of Premature Death from Cardiac Arrest Outside Hospitals in Penang <i>Nor Zam Azihan Mohd Hassan, Mohd Shahri Bahari, Leong Yuen Chin, Farhana Aminuddin, Sivaraj Raman, Mohd Shaiful Jefri Nur Sham Kunusegaran, Nur Amalina Zaimi, Tan Yui Ping, Ee Vien Low, Marhaini Mostapha</i>	591
FHHMPP29 / 287	A Review of Antimicrobial Stewardship Program in Primary Healthcare clinics in Perak, Malaysia <i>Hairul Izwan Abdul Rahman, Nur Afiini Rozana Mohd Sani, Husna Maizura Ahmad Mahir</i>	595
FHHMPP30 / 288	Association Between Depression and Health Seeking Behaviour Among Women in Malaysia <i>Sharifah Zawani Syed Ahmad Yunus, Mohamad Fuad Mohamad Anuar, Kasturi Manoharan</i>	597
FHHMPP31 / 293	Cost-Minimization Analysis of Kramer's Rule Combined with Transcutaneous Bilirubin Screening versus Kramer's Rule Alone for Neonatal Jaundice in Primary Healthcare Clinics <i>Xin-Jie Lim, Subashini Ambigapathy, E-Li Leong, Nicholas Yee-Liang Hing, Nurul Idayu Mior Azmi, Mary Stella, Sheela Mithra, Ling-Yuin Lee, Mohammad Zawawi Abu Bakar, Paream Kaur, Philip Rajan Devesahayam, Jeyaseelan P. Nachiappan</i>	600
FHHMPP32 / 294	Evaluating the Effect of Equipment Age on Radiographic Service Downtime in Government Primary Healthcare Clinics, Malaysia <i>Huzaifah Hussin, Rajini Sooryanarayana, Asnida Anjang Ab Rahman, Anisah Sariman</i>	604

FHHMPP33 / 298	Strategies Addressing Early Unscheduled Return Visits to Emergency Departments Among Adults in Asia: A Scoping Review <i>Diana Yeo Ing Tieng, Tg Mohamad Iskandar Tg Mohamad Rosman, Nur Khairah Badaruddin, Kavita Jetly Jagjit Kumar Jetly, Fairuz Nadiah Nordin, Nor Asma Musa</i>	608
FHHMPP34 / 307	Cost-Effectiveness Analysis of Nirmatrelvir/Ritonavir Versus Usual Care to Prevent COVID-19 Hospitalization Among Elderly Patients in Malaysia <i>EV Low, NYL Hing, HS Teh, MD Pathmanathan, SK Chidambaram, SMZin, F M. Zin, SB M. Ami, MR Appannan, WR Kim, ZW Teh, WJ Lee, MH Ismail, AA Samad, KM Peariasamy</i>	611
FHHMPP36 / 315	Mapping the Research Landscape on Malnutrition in Older Adults: A Bibliometric Analysis of Trends and Thematic Networks <i>Sin Wan Tham, Mohd Azmi Suliman</i>	614
FHHMPP37 / 316	Analysis of Malaysia's Traditional and Complementary Medicine (T&CM) Policy and Strategies from a Practice Perspective: A Study Protocol <i>Kavita Jetly a/p Jagjit Kumar Jetly, Terence Tan Yew Chin, Tay Yea Lu, Siti Hajar Muhammad Rosli, Teh Li Yin, Teoh Sheh Ki, Gong Jia Ying, Rumana Akhter Saifi, Wong Min Fui @ Esther Wong</i>	617
FHHMPP38 / 327	Improving Maternal Outcomes through Annual Clinical Audit of Pre-pregnancy Care (PPC) in Malaysian Health Clinics <i>Sarah Awang Dahlan, Majdah Mohamed</i>	620
FHHMPP39 / 328	Mapping Patient and Provider Perspectives on Diabetes Control to the Chronic Care Model: Insights from a Review of Qualitative Studies in Malaysia <i>Lee Pei Jia, Norshahiratul Atiqah Mohd Zaidi, Mohamad Zulfikrie Abas, Tan Jie Ne, Wan Kim Sui, Azah Abdul Samad³ Chan Huan Keat, Sheamini Sivasampu, Ang Swee Hung</i>	623
FHHMPP40 / 345	Patient Safety and Medication Errors in Telemedicine: Protocol for a Scoping Review <i>Nor Asma Musa, Mohd Amirul Hariz Aminuddin, Fairuz Nadiah Nordin, Syarifah Nortasya Sayed Muhammad Kamarudin, Zawariah Brukan Ali</i>	626
FHHMPP41 / 348	Designing a Sustainable Premium Economy Health Service Model in Malaysia Public Hospitals : Insight from Healthcare User <i>Wafaak.E, Natrah.M.S, J.H.W.Wong, W.A.Yap</i>	630

- FHHMPP42 / 357 Determinants of Period Poverty Among Women in a 633
Malaysian Low-Income Housing Community
S A Zafirah, Nor Faiza Mohd Tohit, Wan Farizatul Shima Wan Ahmad Fakurazi, Badrul Hisham Abdul Samad, Nur Adnin binti Ahmad Zaidi
- FHHMPP43 / 360 Primary Healthcare Utilization and Cost Among Older 636
Adults with Diabetes Mellitus: Insights from TPC-OHCIS 2022
Hazwa Harith, Weng Hong Fun, Zen Yang Ang, Shakirah Md.Sharif, Su Fen Chia, Wern Han Lim, Alif Haikal Md Razman, Kar Foong Tang, Noraliza Noordin Merican, Sheleaswani Inche Zainal Abidin, Siti Raidah Mohamad Azman, Muhammad Amiruldin Bin Harun
- FHHMPP44 / 374 Knowledge and Attitudes on Contraception Among an 640
Underprivileged Community in Sungai Besi
Nur Adnin Ahmad Zaidi, Siti Athirah Zafirah Abdul Rashid, Nor Faiza Mohd Tohit, Wan Farizatul Shima Wan Ahmad Fakuradzi, Badrul Hisham Abd Samad
- FHHMPP45 / 382 Evolution Of HPV Vaccination Strategies Over 15 Years In 643
Malaysia
Mardiana Omar, Radziah Mohamad, Saidatul Norbaya B., Noorhaire Sumarlie Nordin, Don Ismail Mohamed
- FHHMPP46 / 393 Client Dissatisfaction At Public Health Facilities In Perak 646
: A Cross Sectional Descriptive Study From Sistem Pengurusan Aduan Awam, Ministry Of Health Malaysia, 2019-2024
Lau Kin Mun, Husna Maizura Ahmad Mahir
- FHHMPP47 / 394 From Paper Trails to Digital Tales: A Mixed-Methods 649
Implementation Study of CCMS Rollout in Rural Primary Care
Karen Christelle, Tong Yung Hung, Abby Chan Kai Ern, Mohd. Azzahi Mohamed Kamel, Mohd. Farid Abd. Hamid
- FHHMPP48 / 399 Silent Burden: Insights into α -Thalassaemia Carrier 653
Status from a Nationwide Adolescent Screening in Malaysia
Don Ismail Mohamed, Alisahkhairun Rahmat, Mohd Shahriel Mat Daud, Nurul Kausar Izzati Mohd Ghazali, Radziah Mohamad, Saidatul Norbaya Buang
- FHHMPP49 / 416 Expanding the Role of Community Nurses in Rural Clinics 656
for Elderly Care : Malaysia's Community-Based Ageing Initiative
Sheleaswani Inche Zainal Abidin, Noraliza Nordin Merican, Nurhayati Mardiah Manut, Nor Hasimawati Shaari, Shamsol Lot, Saidatul Norbaya Buang

FHHMPP50 / 441	Psychological Distress among Malaysian Infertile Individuals: A Comparison Between First Visit and Recurrent Fertility Clinic Visits <i>Noor Izni Mohamed Shapie, Nik Daliana Nik Farid, Rafdzah Ahmad Zaki</i>	660
FHHMPP51 / 444	Maternal Mortality: A Situational Analysis from 2020 to 2024 in an East Coast State of Peninsular Malaysia <i>Nur Akmal Ismail, Nurnajayati Omar, Yazreen Najihah Mohd Nor, Siti Nor Shuhada Mustfar</i>	663
FHHMPP52 / 350	Evaluating the Effectiveness of an Antimicrobial Stewardship Program in Malaysian Primary Health Care <i>Noraini M Yusof, Hazirah M Noor, Bee Kiau, Mardhiyah Kamal, Marziaty Shazreena Mohd Shah, Durga Murugia, Wan Noor Azlin Wan Idris, AF Azam Abd Rahman, Izwan Effendy</i>	666
FHHMPP53 / 407	Integrating Primary Care and Public Health in Malaysia: A Path Forward for Primary Healthcare Reform <i>Rima Marhayu Abdul Rashid, Noor Haslinda Ismail, Saidatul Nurbaya Buang, Mohd Safiee Ismail</i>	669
FHHMPP54 / 420	Seamless Healthcare, Digitally Delivered: Malaysia's Patient Summary Initiative <i>Chin Yangxin, Vivek Jason Jayaraj, Maheshwara Rao Appannan</i>	673
FHHMPP55 / 426	Reaching the Unreachable: A Review of Malaysia's Mobile Clinic Services in Advancing Primary Health Care and Universal Health Coverage <i>Hidayatul Fariha Sulaiman, Mohamad Hafizan Abd Hadi, Mastura Mohamad Tahir, Juriati Ismail, Azah Abdul Samad, Christina Baun Lian, Abdul Shukor Salha Azlie Ismail, Wan Mohd Izuadi Wan Mahmud</i>	676
FHHMPP56 / 432	Alcohol Consumption Patterns among Urban Residents in Malaysia <i>Fazila Haryati Ahmad, Mohd Hatta Abd Mutalip, Halizah Mat Rifin</i>	681
FHHMPP57 / 445	A Simulation-Based Cost-Effectiveness Analysis of Reflex DNA Versus Multi-Sample Adolescent Screening for Thalassaemia in East Malaysian Schools <i>Azrin Syahida Abd Rahim, Don Ismail Mohamed, Nour El Huda Abd Rahim</i>	684

E-POSTER PRESENTATION: OCCUPATIONAL HEALTH/ ENVIRONMENTAL HEALTH/ SOCIAL & HEALTH BEHAVIOUR/ OTHERS

- | | | |
|----------------|---|-----|
| OESHPP01 / 183 | Effect Of Employer-Sponsored Health Coverage on Oral Healthcare Utilisation: Findings from National Health and Morbidity Survey (NHMS) 2019
<i>Nur Elina Abdul Mutalib, Suhana Jawahir, Jabrullah Ab Hamid, Devi Shantini Rata Mohan, Adilius Manual, Iqbal Ab Rahim, Sarah Nurain Mohd Noh, Awatef Amer Nordin</i> | 689 |
| OESHPP02 / 184 | The Efficacy Of Anthelmintics Against Sth Infection In Population-Based Studies In Malaysia - Results Of A Scoping Review Analysis
<i>Muhammad Faiz Mohd Hisham, Fazila Haryati Ahmad, Filza Noor Asari, Noor Aliza Lodz, Norzawati Yoep, Eida Nurhadzira Muhammad, Nor Asiah Muhamad</i> | 693 |
| OESHPP03 / 186 | Developing and Validating Instruments to Identify Preferred Features of Systematic Grey Literature Review Automation Tools
<i>Ang Zen Yang, Shakirah Md Sharif, Melody Soong Yin Yin, Fun Weng Hong, Shaun Lee Wen Huey</i> | 699 |
| OESHPP04 / 193 | Effectiveness of KOSPEN Plus Mental Health Promotion Activity at Workplace: Findings from the KOSPEN-Plus Program in Malaysia
<i>Lim Kuang Kuay, Maznieda Mahjom, S Maria Awaluddin, Noor Syaqlah Shawaluddin, Tuan Mohd Amin Tuan Lah, Chan Ying Ying, Hamizatul Akmal Abd Hamid, Muhammad Fadhli Mohd Yusoff, Mohd Azahadi Omar</i> | 704 |
| OESHPP05 / 194 | The Role of Strained Family Relationships and Economic Hardship During COVID-19 Pandemic in Determining Adolescent Depression Based on Patient Health Questionnaire (PHQ-9) scores
<i>S Maria Awaluddin, Muhamad Khairul Nazrin Khalil, Lim Kuang Kuay, Noor Syaqlah Shawaluddin, Tuan Mohd Amin Tuan Lah, Maznieda Mahjom, Noor Ani Ahmad</i> | 708 |
| OESHPP06 / 196 | Healthcare Without Hardship: Are we are Financially Protected?
<i>Adilius Manual, Jabrullah Ab Hamid, Suhana Jawahir, Awatef Amer Nordin, Iqbal Ab Rahim, Sarah Nurain Mohd Noh, Nur Elina Abdul Mutalib, Devi Shantini Rata Mohan</i> | 712 |
| OESHPP07 / 200 | Do Our Adolescents Eat an Adequate Healthier Diet During The COVID-19 Pandemic?
<i>Eida Nurhadzira Muhammad, Filza Noor Asari, Muhammad Faiz Mohd Hisham, Ruhaya Salleh, Chong Zhuo Lin</i> | 716 |

OESHPP08 / 201	Tracking Lymphatic Filariasis Transmission Through Molecular Surveillance of <i>Brugia</i> Species in Sabah's Mosquito Vectors <i>Faizul Akmal Abdul Rahim, Mohd Amierul Fikri Mahmud, Mohd Hatta Abdul Mutalip, Tanrang Yusin, Mohd Azrool Rizal Mohd Azahari, Izhan Shahrin Jaafar</i>	720
OESHPP09 / 202	Targeting Dengue at Its Source: Spatial and Principal Component Analyses on <i>Aedes</i> Breeding Sites. <i>Mohd Amierul Fikri Mahmud, Faizul Akmal Abdul Rahim, Eida Nurhadzira Muhammad, Mohd Hazrin Hashim, Mohd Hatta Abdul Mutalip, Hanipah Shahr, Izfa Riza Hazmi</i>	723
OESHPP10 / 206	Primary Water Sources in Remote Communities: A Descriptive Study <i>Tuan Mohd Amin Tuan Lah, Lim Kuang Kuay, Maznieda Mahjom, S Maria Awaluddin, Noor Syaqlah Shawaluddin</i>	727
OESHPP11 / 211	The Influence of Temperature on Dengue Transmission Dynamics in Kuantan, Pahang <i>Mohd Amiru Hariz Aminuddin, Muhammad Al Azim Baharudin, Muhamad Isa Abdul Aziz, Khairul Aizat Mahdin</i>	730
OESHPP12 / 213	Determinants for Injury Among Healthcare Workers Involved in Occupational Accidents and Dangerous Occurrence in Terengganu <i>Hafizuddin Awang, Noriah Mahmud, Mohd Anuar Abd Rahman, Kasemani Embong</i>	734
OESHPP13 / 214	Predictors of Delayed Healthcare Seeking Among Dengue Patients in Klang District: A Logistic Regression Approach <i>Nur Nabila Abd Rahim, Hazwa Harith, Nurul Farehah Shahrir, Gurpreet Kaur Karpal Singh</i>	738
OESHPP14 / 222	Insufficient Water Intake and Its Association with Nutritional Status: Findings From The Adult Population Survey <i>Sulhariza Husni Zain, Nurzaime Zulaily, Khairul Hasnan Amali, Halizah Mat Rifin</i>	743
OESHPP15 / 227	Breaking the Barrier: What's Keeping Malaysians from Eating Fruits and Veggies? <i>Noorhayati Kassim, Teh Wai Siew, Rosnani Kassim, Nadia Amirudin, Siti Nurhanim Mohamed Aiman, Nurashma Juatan, Manimaran Krishnan</i>	746
OESHPP16 / 233	Bridging Spatial And Temporal Gaps in Dengue Prediction: A Deep Learning Approach <i>Sakshaleni Rajendiran, Noraishah Mohd Sham, Sarbhan Singh Lakha Singh, Yuvaneswary Veloo, Syahidiah Syed Abu Thahir, Nurulhusna Ab Hamid, Wan Ming Keong, Siti Morni Umor, Md Nazri Safar,</i>	750

Norimaniah Mazlan, Siti Masayu Yahaya, Nor Atika Abd Manap, Imanul Hassan Abdul Shukor, Jeyanthi Suppiah, Rozainanee Mohd Zain, Mohd Khairuddin Che Ibrahim, Radi Mohamad, Uswah Khairuddin, Ahmad `Athif Mohd Faudzi, Rohaida Ismail

- | | | |
|----------------|--|-----|
| OESHPP17 / 238 | Knowledge of Antibiotic Resistance among The General Population in Malaysia
<i>Chong Zhuo Lin, Noor Aliza Lodz</i> | 753 |
| OESHPP18 / 241 | Comparing Urban-Rural Disparities in Travel-Related Physical Inactivity: A Nationwide Study of the Malaysian Population
<i>Nurfatehar Ramly, Nor Izzati Amsah, Hasimah Ismail, Halizah Mat Riffin, Kishwen Kanna Yoga Ratnam, Syafinaz Mohd Sallehudin, Tuan Mohd Amin Tuan Lah, Sulhariza Husni Zain, Mohd Aznudin, Abdul Razak, Lim Kuang Kay</i> | 757 |
| OESHPP19 / 245 | It Takes Two to Tango - Understanding Perspectives on Indicators in Ministry of Health Malaysia
<i>Iqbal Ab Rahim, Muna Zahira Mohd Yusof, Awatef Amer Nordin, Devi Shantini Rata Mohan, Nur Elina Abdul Mutalib, Suhana Jawahir, Sarah Nurain Mohd Noh, Adilius Manual</i> | 760 |
| OESHPP20 / 246 | Breaking the Burnout Cycle: A Modified Delphi Protocol on the Development of a Psychoeducation Intervention Package for Nurses
<i>Norehan Jinah, Pangie Bakit, Ili Abdullah Sharin, Nor Haniza Zakaria, Siti Zubaidah Ahmad Subki, Izzuan Khirman Adnan, Nursyahda Zakaria, Lee Kun Yun</i> | 763 |
| OESHPP21 / 248 | Factors Influencing Cigarette Smoking Initiation Among Children: A Systematic Review And Meta-Analysis
<i>Nor Asiah Muhammad, Izzah Athirah Rosli, Nur Hasnah Ma'amor, Fatin Norhasny Leman, Tengku Puteri Nadiah Tengku Baharudin Shah, Nik Athirah Farhana Nik Azhan, Nurul Hidayah Jamalluddin, Nazihah Nazri, Normi Mustapha, Zulkarnain Abd Karim, Norliza Chemi, Nor Fariza Ngah, Muhammad Radzi Abu Hassan</i> | 766 |
| OESHPP22 / 249 | Antibiotic Use Among Children Under Five Years with Cough or Fever in Malaysia: A National Representative Study
<i>Chan Yee Mang, Khaw Wan-Fei</i> | 772 |
| OESHPP23 / 254 | Pufferfish Pandemonium: Public Perception and Awareness of Pufferfish in Kota Marudu, Sabah
<i>Ahmad Syukri Radzran, Mohamad Zulfikri Rusdi, Mohd Helmi Abdul Hamid, Sheila Miriam Mujin</i> | 776 |
| OESHPP24 / 262 | Emergency Department (ED) Overcrowding in MOH hospitals: Workload Disparities and Contributing Factors | 779 |

Jabrullah Ab Hamid, Adilius Manual, Nur Elina Abdul Mutalib, Iqbal Ab Rahim, Devi Shantini Rata Mohan, Suhana Jawahir, Sarah Nurain Mohd Noh, Awatef Amer Nordin

- OESHPP25 / 267 Prevalence and Predictors of Depression Among Healthcare Workers in a Rural District Health Office in Terengganu 783
Norhafizah Mohd Noor, Syahrul Faiz Zakari @ Zakaria, Nadhirah Ramli¹, Mohamad Zen Zakaria
- OESHPP26 / 269 Mental Health Challenges of Healthcare Workers in Selangor Amid a National Health Crisis 786
Nadia Mohamad, Siti Sara Yaacob, Mohd Faiz Ibrahim, Imanul Hassan Abdul Shukor, Mohd Zulfinainie Mohamad, Muhammad Farhan Mahmud, Rohaida Ismail
- OESHPP27 / 273 Title: Urban-Rural Perspectives on Socioeconomic Inequalities in Oral Healthcare Utilisation in Malaysia: Insights from a National Survey 790
Sarah Nurain Mohd Noh, Suhana Jawahir, Devi Shantini Rata Mohan, Iqbal Ab Rahim, Adilius Manual, Nur Elina Abdul Mutalib, Jabrullah Ab Hamid, Awatef Amer Nordin
- OESHPP28 / 279 From Policy to Practice: Uncovering Gaps in Virtual Consultation Implementation in Malaysian Public Health Clinics 793
Yea Lu Tay, Zalilah Abdullah, Min Fui Wong, Nur Hidayati Abdul Halim, Noor Hasidah Ab Rahman, Nur Khairah Badaruddin, Nurul Iman Jamalul-lail
- OESHPP30 / 283 Low Birth Weight Among Children Below 5 Years and Its Associated Factors: Findings from a Nationwide Study 796
Ruhaya Salleh, Sulhariza Husni Zain, Shubash Shander Ganapathy, Mohamad Aznuddin Abd Razak, Nurzaime Zulaily
- OESHPP31 / 297 Predicting Adolescent Obesity from Meal Patterns using Machine Learning 800
Nur Liana Ab Majid, Syahid Anuar, Kimberly Wong
- OESHPP32 / 300 Comparative Performance of Machine Learning Algorithms for Possible Sarcopenia Screening in Older Malaysian Adults 803
Kee Chee Cheong, Ng Chai Chen, Tay Chai Li, Kong Sie Zin, Ding Ai Lee, Nor Faizah Ghazali, Kiew Lee Boon, Lorna Chin Kin Tze, Thenmoli Palaniyappan, Srinevasarao Ramanaidu, Khalilati Barizah Binti Md Salimun, Zaleha binti Jusoh
- OESHPP33 / 302 Urine Iodine Status in Malaysia: A National Study in Adults 808
Noor ul-Aziha Muhammad, Ahmad Ali Zainuddin, Lalitha Palaniveloo, Ruhaya Salleh, Filza Noor Asari, Lim Kuang Kay, Chan Yee Mang

OESHPP34 / 305	Lost in Translation: How Coding Errors in Ophthalmology Undermine MyDRG-Based Hospital Reimbursement <i>Jin Ziang Tok, Deying Yu, Maznah Dahlui, Nazirah Hasnan, Tengku Ain Fathlun Tengku Kamalden, Amirah Azzeri, Mohd Hafiz Jaafar</i>	812
OESHPP35 / 309	Leveraging AI in Evaluation of Community Outreach Program for Detection of Prevalence and Causes of Abnormal Chest Radiography in Rural Areas of Sarawak <i>Melvin Chung Hsien Liang, Lai Kah Sheng, Nurul Amirah Masani, Teo Jia Chi, Rawa Anak Bau</i>	814
OESHPP36 / 314	Potential and Feasibility of Red Blood Cells Spectra for the Detection of Blood Disorders: A Proof-of-Concept Study (MOSTHA@POC) <i>William Kian Boon Law, Royan Hian Lee Ong, Nurul Atiqah Zulazmi, Lai Hui Pang, Siew Lian Chong, Kar Ying Yong</i>	817
OESHPP37 / 332	Designing and Developing a Game-based Learning Intervention Program (VAPGAMO) to Prevent Vaping Intention among Adolescent <i>Muhamad Zulhilmie Saruddin, Rosliza Abdul Manaf, Ahmad Zaid Fattah Azman, Farah Nadia Azman</i>	820
OESHPP38 / 335	Digital Lifelines: A Public Health Lens on Tech-Driven Disaster Response - A Narrative Review <i>Muhammad Zulhilmie Saruddin, Muhammad Izmanuddin Fitri Abdul Razak, Khadijahtul Qubra Amizah Hamzah, Syafiq Ameerul Ibtisyam Zulkiflee, Aidalina Mahmud</i>	822
OESHPP39 / 336	Prevalence and Factors Associated with Children Who Have Never Attended a Dental Clinic: Findings from a National Survey <i>Nur Faraeein Zainal Abidin, Khaw Wan-Fei, Hasimah Ismail, Shubash Shander</i>	825
OESHPP40 / 351	What Drives the Public to Seek Care at the Emergency Department's Green Zone? A Cross-Sectional Study at Hospital Tengku Ampuan Rahimah Klang <i>Norbaidurah Ithnain, Saiful Adli Suhaimi, Evi Diana Omar, Hasnah Mat, Manimaran Krishnan</i>	829
OESHPP41 / 361	Bridging the Gaps: Factors of Eye Care Utilisation Among Malaysia's Low-Income Groups Using Andersen Behavioural's Model <i>Nur Suhailah Alias, Noor Halilah Buari, Sabrina Subri</i>	832
OESHPP42 / 367	Knowledge of Rational Use of Medicines Among Know Your Medicine (KYM) Ambassadors in Malaysia: A National Cross-Sectional Study	836

Nurashma Juatan, Noorhayati Kassim, Rosnani Kassim, Nadia Amirudin, Siti Nurhanim Mohamed Aiman, Nursyazwani Jabir, Munira Muhammad, Maisara Abd Rahman, Atika Mahfuza Mahbub, Mohd Shahiri Abd Ghapar

- | | | |
|----------------|---|-----|
| OESHPP43 / 369 | Prevalence of Caregivers' Disciplinary Practices Among Malaysian Children Aged 12 to 59 Months: Findings from the National Health and Morbidity Survey 2022
<i>Nurul Haniyah Rosslan, Shubash Shander Ganapathy, Muhammad Hanafi Bakri, Norzawati Yeop</i> | 839 |
| OESHPP44 / 372 | Harnessing Artificial Intelligence and Ultraportable X-ray for Chest Screening in rural Bintulu: Detection Rates and Locality Variation
<i>Melvin Chung Hsien Liang, Nurul Amirah Masani, Lai Kah Sheng</i> | 842 |
| OESHPP45 / 376 | Urban-Rural Disparities in Inpatient Healthcare Utilisation in Malaysia: Insights from a National Survey
<i>Noor Hasidah Ab Rahman, Tay Yea Lu, Nurul Salwana Abu Bakar, Tan Yui Ping, Mohd Shahri Bahari</i> | 845 |
| OESHPP46 / 378 | Prevalence and Predictors of Self-Harm among Adolescents in Malaysia
<i>Rimah Melati Ab Ghani, Nor Asiah Muhamad, Suria Husin, Nur Hasnah Maamor, Izzah Athirah Rosli, Nik Athirah Farhana Nik Azhan, Tengku Puteri Nadiah Tengku Baharuddin Shah, Nor Hidayah Jamalluddin, Fatin Norhasny Leman, Norli Abdul Jabbar, Ling Shiao Ling, Normi Mustapha, Norliza Chemi, Norni Abdullah, Nurashikin Ibrahim</i> | 850 |
| OESHPP47 / 380 | Factors Associated with Beliefs in Physical Punishment Towards Children Aged 12-59 Months Among Malaysian Caregivers: Findings from the National Health and Morbidity Survey 2022
<i>Muhammad Hanafi Bakri, Shubash Shander Ganapathy, Nurul Haniyah Rosslan, Norzawati Yeop</i> | 854 |
| OESHPP48 / 387 | Too Tight to Work Right: Back Pain in Data Entry Among Laboratory Workers
<i>Imanul Hassan Abdul Shukor, Nurul Farehah Shahrir, Siew Wei Fern</i> | 857 |
| OESHPP49 / 402 | How Far Is Too Far? Comparing Straight-Line and Road-Network Travel Burdens for Low-Income Cancer Patients in Malaysia
<i>Farhana Aminuddin, Marhaini Mostapha, Tan Yui Ping, Nur Amalina Zaimi, Mohd Shahri Bahari, Mohd Shaiful Jefri, Sivaraj Raman, Nor Zam Azihan Mohd Hassan</i> | 861 |

OESHPP50 / 409	Association between HbA1c and Optical Coherence Tomography Angiography (OCTA) Parameters in Type 2 Diabetes Mellitus without Retinopathy <i>Abdallah Naqaweh, Shelina Oli Mohamed, Noor Haziq Saliman</i>	865
OESHPP51 / 414	Prevalence Of Refractive Error Among Malay Primary Schoolchildren In Denai Alam, Selangor <i>Fatin Nur Najwa Norazman, Nurul Syahidah Jasmi</i>	868
OESHPP52 / 415	Digital Transformation of COMBI in Dengue Prevention: Development and Evaluation of the eCOMBI-Denggi Mobile Application <i>Ahmad Farid Nazmi Abdul Halim, Mohd Rohaizat Hassan, Rozita Hod, Khaironi Yatim Sharif, Muhammad Luqman Mahamad Zakaria, Noor Khalili Mohd Ali, Rozita Ab Rahman, Mohd Fauzy Samsudin, Nur Faezah Che Mat, Karthik Sundram A/L Mohanasundram, Roslinda Aziz</i>	871
OESHPP53 / 417	Correlation Between HBA1c and Intra-Retinal Layers in Type 2 Diabetes Mellitus Without Retinopathy <i>Noor Haziq Saliman, Nasrul Rasydan Faizal, Abdallah Naqaweh, Shelina Oli Mohamed</i>	876
OESHPP54 / 422	Vitamin D Levels Among Female Adults and Factors Associated: Findings from National Health & Morbidity Survey (NHMS) 2024 <i>Lalitha Palaniveloo, Fazila Haryati Ahmad, Ahmad Ali Zainuddin</i>	879
OESHPP55 / 431	Development of a School-based Aedes Breeding Search and Destroy Online Checklist and Collaborative Dengue Transmission Risk Stratification of School Compounds in Wilayah Persekutuan Putrajaya, Malaysia <i>Mohd Fauzy Samsudin, Ahmad Farid Nazmi Abdul Halim, Nur Faezah Che Mat, Karthik Sundram Mohana Sundram, Roslinda Aziz, Rozita Ab Rahman</i>	882
OESHPP56 / 438	Expanding MyVAS for HIV Screening: A Case Report on Integrating Public Health Services into Malaysia's National Provider Platform <i>Nurain Amirah Zolkefli, Nurul Zariffa Saat, Siti Aishah Iskandar, Lee Wei Jia, Maheshwara Rao Appannan, Vivek Jason Jayaraj</i>	885
OESHPP57 / 440	Evaluation of the Chance2Act Behavioural Intervention (Chance2act) for Weight Loss Readiness among Adults with Type 2 Diabetes and Obesity <i>Noraini Mohd Saad, Mariam Mohamad, Aimi Nadira Mat Ruzlin, Mohd Hafeez Intiaz Hussein</i>	888
OESHPP58 / 274	Tobacco Advertising Exposure Among Malaysian Adults: Key Findings from GATS 2023	892

Nurzaime Zulaily, Hamizatul Akmal Abd Hamid, Thamil Arasu Saminathan, Tania Gayle Robert Lourdes, Muhammad Fadhli Mohd Yusoff

- OESHPP59 / 349 The Impact of Air Pollution-Related Mortality in Malaysia: Assessing the Burden of Disease and Economic Consequences 896
Mohamad Iqbal M, Nor Zam Azihan MH, Mohd Azahadi Omar
- OESHPP60 / 355 Sexual and Reproductive Health Knowledge, Attitudes, and Practices Among Men in an Economically Disadvantaged Community in Kuala Lumpur, Malaysia 899
Wan Farizatul Shima Wan Ahmad Fakuradzi, Nor Faiza Mohd. Tohit, Siti Athirah Zafirah Abdul Rashid, Nur 'Adnin Ahmad Zaidi.
- OESHPP61 / 366 Healthy Malaysia in Progress: Evaluating Agenda Nasional Malaysia Sihat (ANMS) for a Sustainable Future 902
Logeswary Krisnan, Affendi Isa, Vanitha Subramaniam
- OESHPP62 / 377 Parental Knowledge and Gaps: A Cross-Sectional Study on Benzene Exposure Awareness in Johor 905
Nabihah Ali, Shamsul Bahari Shamsudin, Haidar Rizal Toha
- OESHPP63 / 398 Prevalence of Food insecurity among adult in Malaysia: Findings from the National Health and Morbidity Surveys 2024 909
Ahmad Ali Zainuddin, Mohd Azmi Suliman, Ruhaya Saleh, Murnizar Mokhtar, Hasimah Ismail, Teh Wai Siew, Norashikin Ramlan, Khairul Zarina Mohd Yusop
- OESHPP64 / 413 Emergency or Not? Public Knowledge and Misuse of the Emergency Department Green Zone in Malaysia 913
Khairulnissa Abdul Kadir, Nurbaidurah Ithnain, Saiful Adli Suhaimi, Gunasundari Marimuthu, Elniee Melson, Logeswary Krishnan

ORAL PRESENTATION

EPIDEMIOLOGY (COMMUNICABLE/NON- COMMUNICABLE DISEASE)

EPIDOP01 / 251

Development, Validation and Usability Testing of “Wabak X” Card Game: A Serious Game on Disease X and Outbreak Preparedness for the Orang Asli in Selangor

Ameerah Su’ad Abdul Shakor¹, Mariam Mohamad¹, Khalid Ibrahim¹, Izandis Mohamad Sayed²

¹ *Department of Public Health Medicine, Faculty of Medicine, Universiti Teknologi MARA Sungai Buloh Campus, Jalan Hospital, 47000 Sungai Buloh, Selangor, Malaysia*

² *Hospital Orang Asli, Gombak, KM 24, Jalan Gombak, 53100 Kuala Lumpur, Malaysia*

Corresponding author’s email: ameerahsuad@moh.gov.my

Summary

“Wabak X” is a card game designed to complement the X-SIAGA intervention for outbreak preparedness among the Orang Asli (OA) in Selangor. The game focuses on five learning objectives: recalling outbreak preparedness kit items, understanding Disease X transmission from animals, raising awareness of its unpredictability, highlighting transmission through close contact, and demonstrating preparedness benefits. This study developed, validated, and iteratively tested the usability of the game with OA representatives and villagers to ensure cultural relevance and effective learning. Study findings demonstrated that the game was user-friendly and well-accepted by the OA community, showing potential as a scalable educational tool.

Keywords

Outbreak, Preparedness, Indigenous People, Games, Health Education

Introduction

Many previous outbreaks in Orang Asli (OA) communities have resulted in fatalities due to poor health awareness, socioeconomic challenges, and their lack of interest in participating in existing preparedness programmes¹. “Serious games” are a type of game-based learning that integrates educational content into games for knowledge and skill acquisition. Evidence on serious games as educational tools in preparedness programmes for the general public, especially for underserved communities is limited. “Wabak X” is a serious game designed as a card game to complement X-SIAGA, an intervention package for Disease X and outbreak preparedness among the OA in Selangor. “Wabak X” focuses on five learning objectives: recalling items in the outbreak preparedness kit, understanding Disease X transmission from animals, raising awareness of its unpredictability, highlighting transmission through close contact, and demonstrating the benefits of preparedness. This study aims to develop, validate, and test the usability of “Wabak X”.

Materials and Methods

“Wabak X” was developed, validated, and tested using Olsen et al.’s (2011) five-stage framework²: Storyboarding, Alpha 1 prototype, Alpha 2 prototype, Beta version, and Final build. The storyboarding of the game was informed by literature research and consultations with JAKOA officials and OA representatives. Subsequently, the game components underwent content validation with experts and face validation with the OA community. Alpha 1 usability testing employed in-house “game-breaking” sessions with non-target participants using a modified think-aloud method. Using the same method, Alpha 2 usability testing involved OA village leaders, committee members, and JAKOA representatives to refine cultural accuracy and assess whether “Wabak X” conveyed its learning objectives. Beta incorporated feedback, finalising game elements. Usability testing of the beta involved OA village members using a self-administered survey on comprehension and enjoyment. The final build underwent usability testing with a different group of OA village members using an adapted self-administered questionnaire³.

Results and Discussion

“Wabak X” was designed to be accessible and culturally appropriate, requiring no prior gaming experience, internet access, or electronic devices. Its storyboard was crafted with game mechanics that support the achievement of its five learning objectives. “Wabak X” features four card types: item, preparedness kit, action, and Disease X cards; where players collect item cards to build preparedness kits. As the Temuan sub-tribe predominates in Selangor, the game will feature artwork and terminology inspired by Temuan culture. Content (n=5) and face validation (n=14) of the game components demonstrated their relevance (CVI=1.0) and comprehensibility (FVI=0.96) respectively. Alpha 1 usability testing (n=14) found the game is best suited for 3 to 6 players aged 7 and above, with a 15 to 30-minute playtime. Since players relied on the numbers on item cards rather than memorising the preparedness items, the numerical elements were removed to reinforce recall. An additional action card was also introduced to enhance gameplay. Alpha 2 usability testing (n=5) confirmed cultural appropriateness and alignment with learning objectives. Feedback led to refinements in cultural portrayals, including depicting the hunter using a sumpit (blowpipe), adjusting the Tok Batin’s (village head) design, and modifying tempok (weaving) patterns. Beta usability testing (n=18) showed 88.9% understood the learning objectives, and 83.3% found the game enjoyable. Final build usability testing (n=42) showed high acceptability (85.7%) with no ethical concerns, 92.9% learning something new, and 88.1% feeling confident applying their knowledge. While 7.1% found the game difficult, 76.2% agreed instructions were clear, suggesting a potential for improved instructional clarity. Detailed results are in Table 1. Card games, though rarely used in public health interventions, is proven to effectively reinforce knowledge and skills (4). “Wabak X” is a novel, scalable educational tool for low-resource settings. Further research could assess its adaptability for other communities and long-term learning impact.

Table 1: Usability testing of the final build of “Wabak X” card game (N=42).

Domain/Item	*Percentage Agreement (%)
Do you like or dislike the game? (1=Strongly dislike,5=Strongly like)	88.1
Do you want to play the “Wabak X” card game again? (1=Not at all, 5=Really want to play again)	88.1
Would you recommend others to play the “Wabak X” card game? (1=Not recommend at all, 5=Highly recommend)	85.7
Is the “Wabak X” card game difficult to play? (1=Not difficult at all, 5=Very difficult)	7.1
Are the instructions for the “Wabak X” card game clear? (1=Not clear at all, 5=Very clear)	76.2
Is the “Wabak X” card game balanced between challenge and fun? (1=Not balanced at all, 5=Very balanced)	81.0
Does the “Wabak X” card game have a negative impact on the Orang Asli community? (1=No negative impact, 5=Major negative impact)	0.0
Is the “Wabak X” card game appropriate for the Orang Asli culture? (1=Not appropriate at all, 5=Very appropriate)	85.7
Is the artwork of the “Wabak X” card game appropriate for the Orang Asli culture? (1=Not appropriate at all, 5=Very appropriate)	85.7
Is the “Wabak X” card game effective in educating about Disease X and outbreak preparedness? (1=Not effective at all, 5=Very effective)	85.7
Did you learn something new about Disease X and outbreak preparedness from the “Wabak X” card game? (1=Learned nothing at all, 2=Learned a lot)	92.9
Are you confident in applying the knowledge and skills learned from the “Wabak X” card game? (1=Not confident at all, 5=Very confident)	88.1
Is the artwork of the “Wabak X” card game attractive? (1=Not attractive at all, 5=Very attractive)	85.7
Is the artwork of the “Wabak X” card game appropriate for the topic of outbreak preparedness? (1=Not appropriate at all, 5=Very appropriate)	88.1
Overall, how acceptable is the “Wabak X” card game? (1=Very bad, 5=Very good)	85.7

Note: *Represents the percentage of responses with ratings of 4 and 5 on the Likert scale.

Conclusion

This study has demonstrated that “Wabak X” is culturally appropriate, user-friendly, and well-accepted among the OA in Selangor. While improving instructional clarity may further enhance its usability, “Wabak X” nonetheless holds potential as an innovative and valuable serious game for Disease X and outbreak preparedness initiative for the OA community.

References

1. Sadeka S, Mohamad MS, Sarkar MSK. Disaster experiences and preparedness of the Orang Asli Families in Tasik Chini of Malaysia: A conceptual framework towards building disaster resilient community. *Progress in Disaster Science*. 2020;**6**.
2. Olsen T, Procci K, Bowers C. Serious Games Usability Testing: How to Ensure Proper Usability, Playability, and Effectiveness. In 2011. p. 625-34.
3. Sekhon M, Cartwright M, Francis JJ. Development of a theory-informed questionnaire to assess the acceptability of healthcare interventions. *BMC Health Serv Res*. 2022;**22**(1):279.
4. Muthiyan G, Kasat P, Vij V, et al. Effectiveness of an Innovative Card Game as a Supplement for Teaching Factual Content to Medical Students: A Mixed Method Study. *Cureus*. 2023.

EPIDOP02 / 270

A Comparative Study of XGBoost, SVM, and Random Forest for Hypertension Risk Prediction Among Malaysian Adults

Ridwan Sanaudi¹, Muhd Zulfadli Hafiz Ismail¹, Zamtira Seman¹, Evi Diana Omar¹, Hasnah Mat¹, Asyraf Syahmi Mohd Noor¹, Yusrina Mohd Yusoff¹, Anis Syakira Jailani², Munerah Mohamad Zaman¹, Ainil Zafirah Abd Karim, Nabilah Hanis Zainuddin¹, Najjah Tohar¹, Zurina Razalee¹, Nik Noor Syamimi Ismail¹, Mohd Azahadi Omar¹

¹ Sector for Biostatistics & Data Repository, NIH, Ministry of Health Malaysia

² Research Grant Unit, NIH, Ministry of Health Malaysia

Corresponding author's email: ridwan.s@moh.gov.my

Summary

Hypertension continues to be a major public health concern in Malaysia, making a significant contribution to the burden of cardiovascular disease. This study evaluates the performance of three machine learning models, which are XGBoost, Support Vector Machine (SVM), and Random Forest, in predicting hypertension risk among Malaysian adults, using data from the 2015 and 2019 National Health and Morbidity Surveys (NHMS). The analysis included 30,399 participants and 25 predictor variables, with the Random Over-Sampling Examples (ROSE) technique applied to address class imbalance. XGBoost showed the best performance with an AUC of 0.827, followed by Random Forest with 0.821 and SVM with 0.787. The most important predictors identified were age, waist circumference, and diabetes status. These findings suggest that XGBoost could be effectively implemented in national health screening programmes to support early detection of hypertension.

Keywords

Hypertension, Machine Learning, XGBoost, NHMS, Risk Prediction

Introduction

Hypertension affects approximately 30% of Malaysian adults and is a major risk factor for cardiovascular diseases and premature mortality¹. Despite various public health initiatives, early detection and risk stratification remain inadequate, particularly in resource-limited settings². Recent advances in artificial intelligence present new opportunities to improve hypertension screening through data-driven approaches³. This study aims to compare the predictive performance of three machine learning algorithms which are XGBoost, SVM, and Random Forest in identifying hypertension risk among Malaysian adults. The findings will contribute to the development of more effective, scalable screening tools aligned with Malaysia's digital health transformation⁴.

Materials and Methods

The study utilised pooled data from the 2015 and 2019 NHMS, comprising 30,399 adult respondents. Hypertension was defined as systolic blood pressure ≥ 140 mmHg or diastolic blood pressure ≥ 90 mmHg, or current use of antihypertensive medication⁵. Twenty-five variables encompassing demographic characteristics, clinical parameters, and lifestyle factors were included as predictors. The ROSE technique was applied to address class imbalance. Model training employed 5-fold cross-validation with hyperparameter tuning via grid search. Performance was

evaluated using standard metrics including Accuracy, Sensitivity, Specificity, Precision, F1 Score, and Area Under the Curve (AUC). Although the NHMS employed a complex sampling design involving stratification and clustering, these features were not incorporated into the machine learning models. As such, the findings should be interpreted as predictive rather than population-representative, which represents a methodological limitation.

Results and Discussion

XGBoost emerged as the best-performing model with an AUC of 0.827, outperforming Random Forest (AUC=0.821) and SVM (AUC=0.787). These results align with previous studies demonstrating XGBoost's superiority in handling complex medical datasets. In classification performance, XGBoost achieved an accuracy of 75.23%, sensitivity of 75.72%, specificity of 74.38%, and precision of 83.35%, metrics that are clinically meaningful for screening purposes. Feature importance analysis revealed age as the strongest predictor, consistent with global epidemiological patterns of hypertension. Waist circumference and diabetes status were also significant predictors, supporting the known metabolic links between these conditions. The finding that socioeconomic factors demonstrated relatively weaker associations contrasts with some Western studies, possibly reflecting different healthcare access patterns in Malaysia. The superior performance of XGBoost can be attributed to its gradient boosting architecture, which effectively handles complex variable interactions while minimising overfitting. These results suggest that machine learning models, particularly XGBoost, could significantly enhance hypertension risk prediction in clinical and community settings, potentially reducing screening costs by 20-30% compared to traditional methods.

Table 1: Performance metrics comparison of machine learning models

Metric	XGBoost	Random Forest	SVM
Accuracy	75.23%	74.68%	72.82%
Sensitivity	75.72%	74.52%	74.29%
Specificity	74.38%	74.96%	70.35%
Precision	83.35%	83.45%	80.93%
F1 Score	79.36%	78.73%	77.47%
AUC	0.827	0.821	0.787

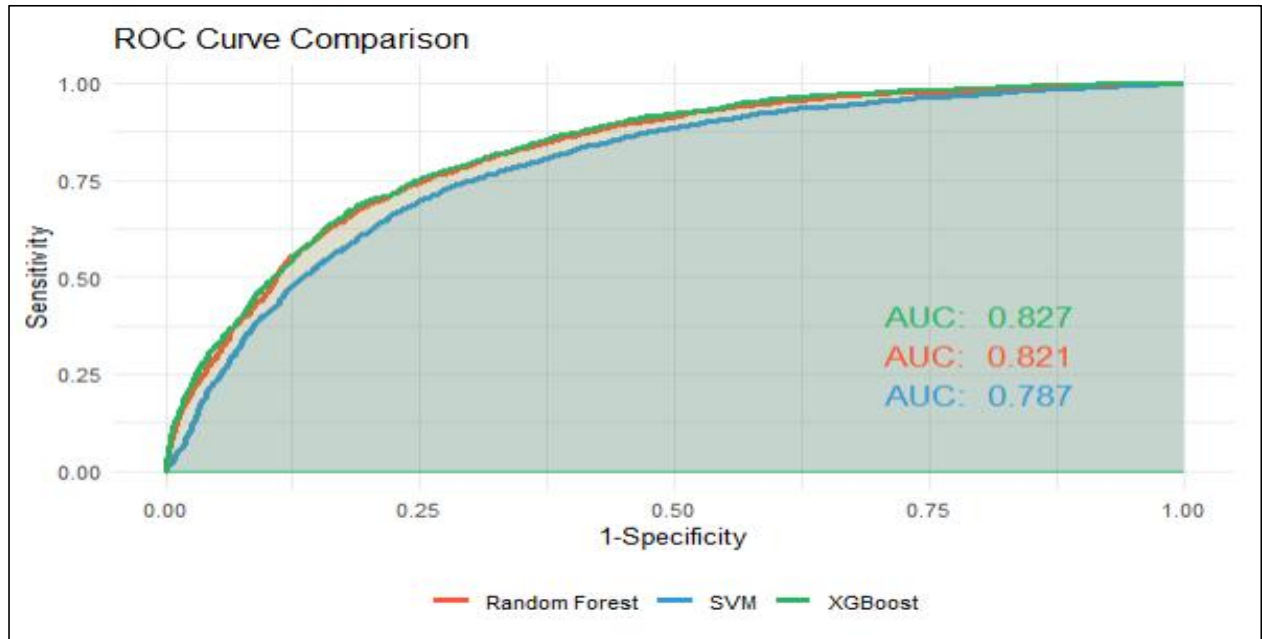


Figure 1: ROC curves for XGBoost, Random Forest and SVM

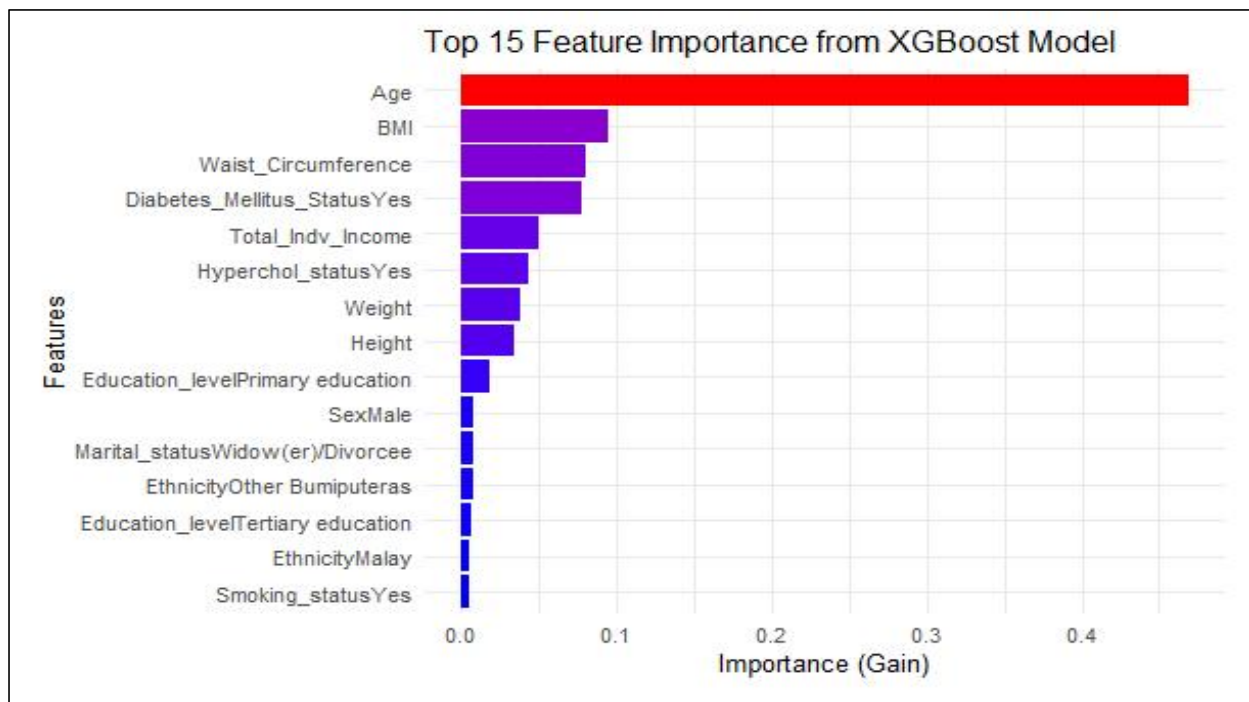


Figure 2: Top 15 Feature importance plot from XGBoost model

Conclusion

This study demonstrates that XGBoost is the most effective machine learning model for hypertension risk prediction among Malaysian adults, outperforming both Random Forest and SVM. The identification of key modifiable risk factors, particularly waist circumference and diabetes status, provides valuable insights for targeted public health interventions. Integration of this model into primary care screening programmes could improve early detection rates and enable more efficient allocation of healthcare resources. Future research should focus on external validation in diverse populations and real-world implementation studies to assess clinical utility.

References

1. Institute for Public Health, Malaysia. National Health and Morbidity Survey 2019: Vol. 1: NCDs - Non-Communicable Diseases: Risk Factors and Health Problems. 2020.
2. Unger T, Borghi C, Charchar F, et al. 2020 International Society of Hypertension Global Hypertension Practice Guidelines. *Hypertension*. 2020;**75**(6):1334-57.
3. Esteva A, Robicquet A, Ramsundar B, et al. A guide to deep learning in healthcare. *Nat Med*. 2019;**25**(1):24-9.
4. Ministry of Health Malaysia. Malaysia Health Technology Assessment Report on Digital Health Interventions. 2022.
5. Williams B, Mancia G, Spiering W, et al. 2018 ESC/ESH Guidelines for the management of arterial hypertension. *Eur Heart J*. 2018;**39**(33):3021-104.

EPIDOP03 / 292

Factors Associated with Tuberculosis Recurrence in Besut, Terengganu: A Case Control Study

Mardhiyyah Azmi¹, Hafizuddin Awang¹, Mohd Anuar Abd Rahman², Kasemani Embong²

¹ Besut District Health Office

² Terengganu State Health Department

Corresponding author's email: drmardhiyyahazmi@moh.gov.my

Summary

Recurrent tuberculosis (TB) is a key indicator of TB control program effectiveness. This case-control study analysed data reported between 2015 and 2024 to determine the prevalence and factors associated with TB recurrence. Of 867 cases, 35 (4.04%) were recurrent. Using descriptive statistics and logistic regression, the study identified significant associations between TB recurrence and older age, abnormal chest X-ray findings, and HIV-positive status. These findings emphasise the importance of targeted interventions and closer monitoring of high-risk groups to prevent recurrence and strengthen TB control efforts in the district.

Keywords

Tuberculosis; Recurrence; Risk Factors; HIV status; Chest X-ray.

Introduction

Tuberculosis (TB) remains a significant global public health challenge, with 10.8 million new cases reported worldwide in 2023¹. Malaysia contributes notably to this burden, particularly in regions with socioeconomic challenges². One of the key indicators of TB control program effectiveness is the recurrence of TB, defined as a new TB episode in individuals who were previously treated and declared cured³. TB recurrence can result from endogenous reactivation or exogenous reinfection and is often influenced by patient-related, clinical, or healthcare system factors⁴. Despite advancements in TB detection and treatment in Malaysia, recurrent TB continues to pose a concern, potentially indicating gaps in long-term disease control. This study was conducted to determine the prevalence and factors associated with TB recurrence in Besut District, Terengganu, over a ten-year period. Identifying these risk factors is crucial for planning targeted interventions to improve TB outcomes in high-risk populations.

Materials and Methods

A retrospective unmatched case-control study was conducted using data from the National Tuberculosis Registry (NTBR), involving all TB cases notified in Besut District between January 1st, 2015, and December 31st, 2024. Recurrent TB cases were defined as individuals previously treated for TB and cured, then developed a new episode during the study period. Controls were patients who were diagnosed and had no history of previous TB infection. The data were collected and analyzed using SPSS version 25. Descriptive statistics were used to describe baseline characteristics of the study population. The chi-square or Fisher exact test identified variables potentially associated with TB recurrence. Factors with a p-value < 0.25 were included in a multivariable logistic regression model to

determine independent predictors of recurrence. A p-value < 0.05 was considered statistically significant in the final analysis.

Results and Discussion

A total of 867 TB cases were reviewed. Of these, 35 (4.04%) were identified as recurrent TB cases. The remaining 832 cases were all newly diagnosed TB cases. As for case control study, 34 recurrent cases and 210 new cases as a control were analysed. Descriptive analysis revealed that recurrent TB cases were more common among older individuals (mean 52.8, SD $\pm$ 13.691), males (82.4%), and those with coexisting risk factors such as HIV infection and abnormal chest X-ray findings. Univariate analysis identified several variables with p-values < 0.25, including age, gender, HIV status, abnormal chest radiographic findings, and smoking history. In the multiple logistic regression model, three factors were independently predictors of TB recurrence namely age (Adjusted Odds Ratio [AOR]: 1.029; 95% CI: 1.006-1.053; p = 0.012), moderately advanced lesion (AOR: 0.159; 95% CI: 0.041-0.612; p = 0.007) and HIV positive status (AOR: 4.603; 95% CI: 1.148-18.456; p = 0.031) (Table 1).

Table 1: Factors associated with tuberculosis recurrence by multiple logistic regression

Factors	B	S.E	Wald (df)	aOR (95% CI)	p-value
Age	0.029	0.012	6.246 (1)	1.029 (1.006-1.053)	0.012
Gender					
Male				1	
Female	-0.651	0.586	1.237 (1)	0.521 (0.165-1.643)	0.266
Smoking status					
No				1	
Yes	0.268	0.474	0.321 (1)	1.308 (0.517-3.310)	0.571
Chest X-ray finding					
No lesion				1	
Minimal lesion	-0.798	0.609	1.717 (1)	0.450 (0.136-1.486)	0.190
Moderately advanced	-1.838	0.688	7.150 (1)	0.159 (0.041-0.612)	0.007
Far advanced	0.499	0.754	0.437 (1)	1.647 (0.375-7.223)	0.508
HIV status					
Negative				1	
Positive	1.527	0.709	4.643 (1)	4.603 (1.148-18.456)	0.031

The overall prevalence of TB recurrence in this study is consistent with reported rates in other regions of Malaysia and neighboring countries, indicating a persistent public health challenge [3,5]. Although Malaysia has made commendable progress in TB treatment coverage and cure rates, recurrent TB cases suggest ongoing challenges in long-term patient management, especially in high-risk groups [1,2]. Age was significantly associated with recurrence, with older individuals at higher risk. This may be attributed to age-related immune senescence, increased presence of comorbidities, and physiological changes that impair the host's ability to control latent infections or respond effectively to treatment [4]. Moreover,

abnormal radiographic findings may indicate extensive disease or incomplete resolution, increasing the risk of relapse [5]. HIV-positive status also emerged as a strong predictor, aligning with existing evidence of immunosuppression increasing susceptibility to reinfection or reactivation [5].

Conclusion

The prevalence of TB recurrence in Besut District over the ten-year period indicates a persistent public health challenge in TB management. The findings highlight the importance of intensified monitoring and tailored follow-up strategies for high-risk TB patients, particularly those with HIV, abnormal chest imaging, and older age.

References

1. World Health Organization. Global Tuberculosis Report 2024. Geneva: WHO; 2024.
2. Malaysian Ministry of Health. Management of Tuberculosis (4th Edition). Putrajaya: Disease Control Division, MoH Malaysia; 2021.
3. Gan SH, KhinMar KW, Ang LW, et al. Recurrent Tuberculosis Disease in Singapore. *Open Forum Infect Dis*. 2021;8(7):ofab340
4. Mirsaeidi M & Sadikot R. Patients at High Risk of Tuberculosis Recurrence. *International Journal of Mycobacteriology*. 2018;7(1):p 1-6.
5. Selimin DS, Ismail A, Ahmad N, Ismail R, Mohd Azman NF, Azman A. Tuberculosis Treatment Outcome in Patients with TB-HIV Coinfection in Kuala Lumpur, Malaysia. *Journal of Tropical Medicine*. 2021;2021(1):9923378.

EPIDOP04 / 299

Depression among Tuberculosis Patients in Sarawak

Zulkifli Mohd Nor Faizal¹, Sahak Noorzilawati¹, Saimon Rosalia¹

¹ *Department of Community Medicine and Public Health, Faculty of Medicine and Health Sciences, Universiti Malaysia Sarawak,*

Corresponding author's email: drnoorzila@gmail.com

Summary

Tuberculosis (TB) remains a major public health issue in Malaysia, particularly in Sarawak, which consistently reports high case burdens. Depression is a common comorbidity among TB patients, adversely affecting treatment adherence and outcomes. This study aimed to determine the prevalence and associated factors of depression among TB patients in Sarawak. The prevalence was 9.9%. Bivariate analysis showed associations with social support, patient satisfaction, and treatment side effects, but only stigma and marital status remained significant after adjustment. These findings underscore the need for integrated mental health strategies that address stigma, enhance social support, and improve patient experiences within TB care services.

Keywords

Tuberculosis, Depression, Perceived stigma, Social support, Sarawak

Introduction

Tuberculosis continues to be one of the foremost causes of mortality globally, due to a single infectious disease¹. In 2022, the number of newly diagnosed tuberculosis cases reached 7.5 million, the highest recorded total since global surveillance by the WHO¹. Depression is an often documented comorbid mental condition in individuals diagnosed with tuberculosis, with a significantly greater prevalence compared to individuals without tuberculosis². However, the risk factors and predictors for depression among tuberculosis patients in Malaysia is still unknown^{3,4}. The existence of depression in individuals afflicted with tuberculosis can result in significant consequences, especially when it remains undetected⁵. This study aims to determine the prevalence of depression and its associated factors among tuberculosis patients in Sarawak.

Materials and Methods

This cross-sectional study employed multi-stage stratified sampling across Sarawak government tuberculosis treatment centres (PR1). A sample of 660 participants was calculated using Epi Info version 7.2.5.0, based on a 95% confidence level, 5% margin of error, design effect of 2, and a reference prevalence of 27.7% (3). Data were collected via a self-administered questionnaire comprising sociodemographic information, the Patient Health Questionnaire-9 (PHQ-9), Multidimensional Scale of Perceived Social Support, Tuberculosis-Related Stigma Scale, Patient Satisfaction Questionnaire Short-Form, and clinical data. Analyses were conducted using IBM SPSS version 28. Bivariate analysis involved Chi-square tests, independent samples t-tests, and Spearman's rank-order correlation to examine associations with depression. For multivariate analysis, hierarchical logistic regression was used to identify true predictors of depression among tuberculosis patients. Model 1

included sociodemographic and clinical factors; Model 2 added perceived stigma, social support and marital status; and the Final Model incorporated living arrangements, locality and patient satisfaction.

Results and Discussion

A total of 555 tuberculosis patients were enrolled in this study. Of these, 375 (67.6%) had no depression, 125 (22.5%) had mild depression, 43 (7.7%) had moderate depression, 8 (1.4%) had moderately severe depression, and 4 (0.7%) had severe depression. Patients with a PHQ-9 score of 10 or above were categorised as having depression, yielding an overall prevalence of 9.9% among tuberculosis patients in Sarawak. From bivariate analysis, perceived stigma, perceived social support from friends and patient satisfaction towards healthcare services were statistically significant (correlations ranging from 0.10 to 0.30). Those with side effects to tuberculosis treatment were also found to be significant. However, after adjusting for confounders in multivariate analysis, only perceived stigma remained significant and marital status were found to be significant. Patients reporting higher perceived stigma were 1.12 times more likely to be depressed compared to those with lower stigma (Adjusted Odds Ratio [AOR] = 1.12, 95% CI: 1.07-1.18, $p < .001$). In addition, patients who were not married had 2.25 times the odds of experiencing depression compared to married individuals (AOR = 2.25, 95% CI: 1.06-4.75, $p = .035$). The prevalence of depression (9.9%) in this study is slightly higher than that reported in Kuching district (7.7%), both using the PHQ-9 tool. Conversely, a study in Kedah using the Beck Depression Inventory reported a significantly higher prevalence of 27.7%, suggesting possible differences in psychosocial stressors or measurement tools. Increased perceived stigma may contribute to social isolation, reduced self-esteem, and chronic stress, all of which can heighten depression risk. Similarly, unmarried TB patients may lack spousal support—both emotional and financial—particularly during periods of isolation, further increasing their vulnerability to depression.

Table 1 Hierarchical logistic regression analysis

	Model 1					Model 2					Model 3				
	B	Sig.	Exp(B)	95% C.I. for EXP(B)		B	Sig.	Exp(B)	95% C.I. for EXP(B)		B	Sig.	Exp(B)	95% C.I. for EXP(B)	
				Lower	Upper				Lower	Upper				Lower	Upper
Constant	-0.88	.562	0.41			-2.08	.319	0.12			-2.59	.313	0.08		
Age	0.01	.664	1.01	0.98	1.03	0.01	.428	1.01	0.98	1.04	0.02	.265	1.02	0.99	1.04
Income Cat(1)	0.60	.507	1.82	0.31	10.58	0.48	.631	1.61	0.23	11.17	0.39	.692	1.48	0.21	10.34
Gender(1)	-0.10	.772	0.91	0.48	1.73	-0.17	.618	0.84	0.42	1.67	-0.14	.680	0.87	0.44	1.72
Ethnic		.932					.951					.960			
Ethnic(1)	-0.09	.789	0.91	0.47	1.77	-0.11	.754	0.90	0.45	1.79	-0.07	.847	0.93	0.47	1.87
Ethnic(2)	-0.16	.751	0.86	0.33	2.23	-0.06	.907	0.94	0.34	2.61	-0.13	.804	0.88	0.31	2.49
Education status		.408					.547					.503			
Education status(1)	-0.90	.227	0.41	0.10	1.75	-0.50	.534	0.60	0.12	2.96	-0.55	.501	0.58	0.12	2.87
Education status(2)	-0.48	.464	0.62	0.17	2.24	-0.06	.934	0.94	0.23	3.90	-0.07	.926	0.93	0.22	3.94
Occupation		.829					.817					.753			
Occupation(1)	-0.46	.541	0.63	0.15	2.74	-0.45	.564	0.64	0.14	2.94	-0.50	.521	0.60	0.13	2.81
Occupation(2)	-0.37	.599	0.69	0.18	2.72	-0.29	.695	0.75	0.18	3.15	-0.29	.694	0.75	0.18	3.17
Family History(1)	-19.05	.999	0.00	0.00		-19.23	.999	0.00	0.00		-19.09	.999	0.00	0.00	
Types of Tuberculosis		.265					.215					.244			
Types of Tuberculosis(1)	-1.50	.103	0.22	0.04	1.36	-1.90	.080	0.15	0.02	1.25	-1.79	.094	0.17	0.02	1.35
Types of Tuberculosis(2)	-1.48	.139	0.23	0.03	1.62	-1.83	.113	0.16	0.02	1.54	-1.79	.118	0.17	0.02	1.58
Phase of TB treatment		.274					.611					.626			
Phase of TB treatment(1)	0.80	.119	2.24	0.81	6.15	0.54	.321	1.71	0.59	4.97	0.53	.336	1.69	0.58	4.95
Phase of TB treatment(2)	0.54	.294	1.71	0.63	4.68	0.44	.408	1.55	0.55	4.42	0.45	.399	1.57	0.55	4.52
Side effects of TB treatment(1)	0.80	.051	2.22	1.00	4.96	0.80	.067	2.23	0.95	5.25	0.83	.059	2.30	0.97	5.46
Comorbidities		.598					.439					.531			
Comorbidities(1)	-0.35	.443	0.71	0.29	1.71	-0.63	.200	0.53	0.20	1.40	-0.57	.261	0.56	0.21	1.53
Comorbidities(2)	-0.43	.318	0.65	0.28	1.52	-0.41	.383	0.67	0.27	1.66	-0.38	.424	0.68	0.27	1.74
Perceived stigma						0.11	<.001***	1.12	1.06	1.17	0.11	<.001***	1.12	1.07	1.18

Social support (Total)	0.04	.515	1.04	0.92	1.17	0.03	.620	1.03	0.91	1.17
Social support (Family)	-0.04	.752	0.96	0.77	1.21	-0.01	.927	0.99	0.79	1.24
Social support (Friends)	-0.12	.189	0.89	0.75	1.06	-0.11	.245	0.90	0.75	1.08
Marital status(1)	0.61	.089	1.84	0.91	3.72	0.81	.035*	2.25	1.06	4.75
Locality(1)						0.34	.518	1.41	0.50	3.99
Patient satisfaction with healthcare services						-0.01	.500	0.99	0.94	1.03
Living arrangement							.357			
Living arrangement(1)						0.57	.306	1.77	0.59	5.29
Living arrangement(2)						1.04	.152	2.84	0.68	11.78
Hosmer and Lemeshow test	14.49 (.070)		4.73 (.786)					1.89 (.984)		
Nagelkerke R square	0.05		0.17					0.18		

*p <.05

***p <.001

Marital status (1) = Married

Conclusion

Depression affects nearly one in ten TB patients in Sarawak, with stigma and marital status being key associated factors. Integrated mental health interventions are crucial, particularly to reduce stigma and strengthen social support systems within tuberculosis care.

References

1. WHO. Global Tuberculosis Report 2023 [Internet]. 2023. Available from: <https://www.who.int/teams/global-tuberculosis-programme/tb-reports/global-tuberculosis-report-2023>
2. Zhang K, Wang X, Tu J, et al. The interplay between depression and tuberculosis. *J Leukoc Biol.* 2019;**106**(3):749-57.
3. Zakaria R, Amri NS, Mohamad N. Stigma and Depression among Tuberculosis Patients in Kedah, Malaysia. *IIUM Med J Malays.* 2022;**21**(4).
4. Ying TC, Aziz NAA, Kamaluddin R, et al. Prevalence of Depression and Associated Factors among Tuberculosis Patients in Primary Care in the District of Kuching, Sarawak. 2018;8.
5. Rouf A, Masoodi MA, Dar MM, et al. Depression among Tuberculosis patients and its association with treatment outcomes in district Srinagar. *J Clin Tuberc Mycobact Dis.* 2021;**25**:100281.

EPIDOP05 / 318

A Competing Risk Analysis of Cardiovascular Events among People Living with HIV- Early findings from CardHIV Study

Hoon Shien Teh¹, Kim Heng Tay², Yvonne Mei Fong Lim³, Su Lan Yang¹, Wen Yea Hwang¹

¹ Centre for Clinical Epidemiology, Institute for Clinical Research, National Institutes of Health, Ministry of Health Malaysia

² Department of Internal Medicine, Sungai Buloh Hospital, Ministry of Health Malaysia

³ Centre for Clinical Care and Outcomes Research, Institute for Clinical Research, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: tehhsh@crc.moh.gov.my

Summary

Cardiovascular disease (CVD) is an emerging health concern among people living with HIV (PLHIV), particularly in Asian countries where data are limited. This study estimated the cumulative incidence and incidence rates of CVD among PLHIV in Malaysia using a competing risk approach. We analysed data from the Malaysian Antiretroviral Therapy Cohort (MATCH) cohort, excluding individuals with pre-existing CVD. Findings revealed a substantial long-term CVD burden, with a 3.8% risk at 10 years and an incidence rate of 4.63 per 1,000 person-years. These results underscore the importance of integrating cardiovascular risk screening and management into long-term HIV care strategies.

Keywords

Human immunodeficiency virus, cardiovascular disease, competing risk, People Living with Human Immunodeficiency Virus, epidemiology

Introduction

HIV remains a major public health challenge, with 6.7 million PLHIV in the Asia-Pacific region in 2023, making it the second-largest epidemic globally¹. While antiretroviral therapy (ART) has significantly improved survival, the focus is increasingly shifting from AIDS-related to non-AIDS-related morbidities, particularly CVD. PLHIV face a heightened risk of CVD due to ART-related side effects, metabolic changes, and traditional risk factors such as smoking and hypertension. However, most existing research has focused on Black and Caucasian populations, leaving a knowledge gap in regions like Asia^{2,3}. This is concerning, given that approximately nearly 50% of global CVD deaths occur in Asia⁴. Therefore, we aim to estimate the burden and incidence of CVD among PLHIV in Malaysia, in the presence of competing risks, to better inform public health strategies.

Materials and Methods

This cohort included HIV-positive Malaysian patients from the MATCH database (2007-2023). Individuals with pre-existing CVD or who developed CVD within one year of HIV diagnosis were excluded. The primary outcome was a composite of fatal and non-fatal CVD events. Hospitalizations were identified through linkage with the Patient Management Information System (SMRP), and mortality data were obtained from the National Registration Department and Department of Statistics Malaysia. Patients were followed from HIV diagnosis until the first CVD event, death, or December 31, 2023. Cumulative incidence functions (CIF) were used to estimate CVD risk with competing risks from other causes. Gray's test assessed group differences, and subgroup analyses were conducted by ART regimen, age group, and ethnicity. Ethical approval was obtained from the Medical Research and Ethics Committee, Ministry of Health Malaysia (NMRR-ID-23-01983-QSM).

Results and Discussion

We included 7,098 patients with a median follow-up of 8.8 years. Most were male (91.1%) and Malay (51.1%), with a median age at diagnosis of 31.7 years. During follow-up, 287 patients experienced cardiovascular events. The 10-year cumulative incidence of cardiovascular events was 3.8% (Figure 1), with an incidence rate of 4.63 per 1,000 person-years (95% CI: 4.11-5.20). The median age of CVD onset was 47 years, considerably younger than the general Malaysian population⁵ (median 58 years). In comparison, the 10-year cumulative incidence of death from other causes was much higher, at 12.8%. Higher cardiovascular risk was associated with older age, Indian ethnicity, and the use of protease inhibitors (PI) or abacavir. The incidence rate was approximately six times higher among abacavir users and about two times higher among PI users compared to non-users. No major differences were observed among treatment-naïve individuals or those on other regimens. Despite the significant competing risk of non-CVD mortality, the incidence of CVD remains clinically meaningful, particularly given its early onset and long-term implications for quality of life and healthcare burden. This is especially relevant for individuals on ART regimens associated with increased cardiovascular risk. Due to potential stigmatization, barriers to healthcare access in the PLHIV population are likely greater than in the general population. Integrating CVD management into long-term HIV care is therefore essential to achieve equitable health outcomes. The strengths of our study include the large cohort size and long follow-up, offering valuable insights into the long-term cardiovascular effects of HIV and ART. However, the lack of data on traditional cardiovascular risk factors, such as hypertension, diabetes, and lipid profiles, is a limitation. Future research should incorporate these factors and address unmeasured confounding.

Conclusion

Our findings highlight a significant burden of CVD among PLHIV. At 10 years, the estimated risk of CVD is 3.8%. With aging and prolonged survival, integrating cardiovascular risk management into routine HIV care is crucial to address this growing health concern.

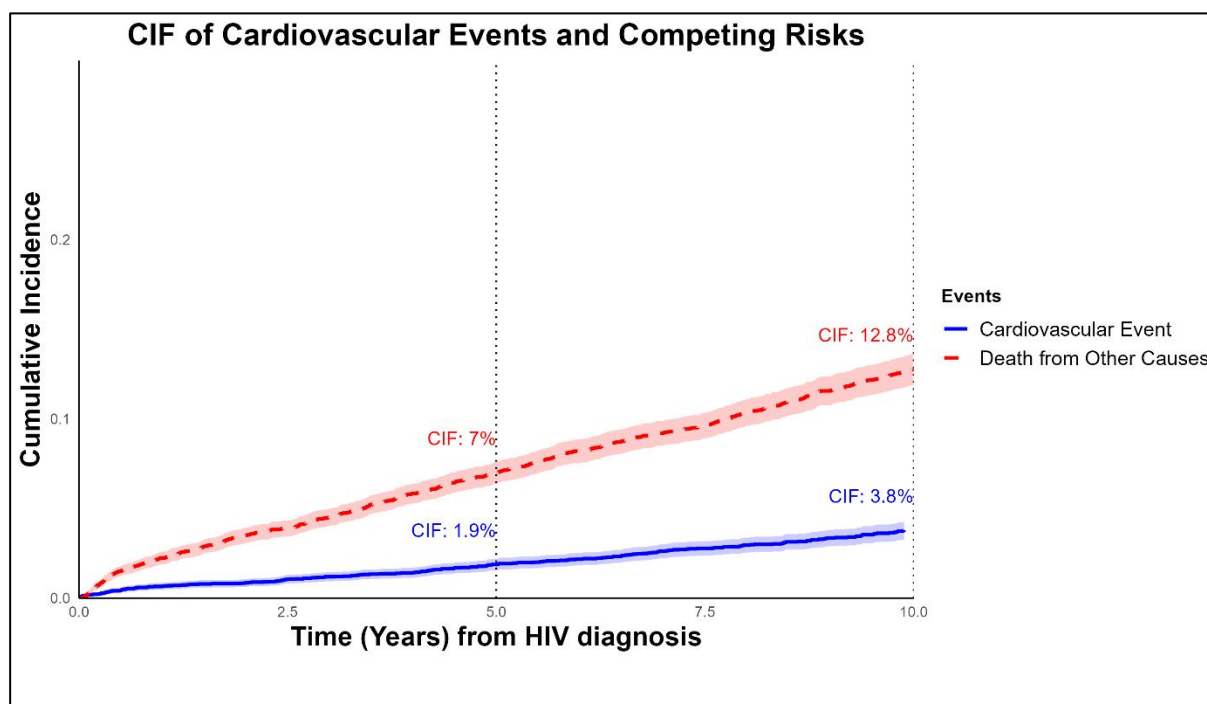


Figure 1: CIF of cardiovascular events in the presence of competing risks

Acknowledgements

We would like to acknowledge the following institutions for their contributions to this research.

1. The Biostatistics & Data Repository Sector (SBDR), National Institute of Health, Setia Alam, for providing the data linkage service
2. The National Registration Department (Jabatan Pendaftaran Negara, JPN) for their willingness to share mortality records for research purposes; and
3. The Malaysian Health Data Warehouse (MyHDW), for their support in data management and coordination

References

1. WHO. J0482-Who-las-Hiv-Statistics_Aw-1_Final_Ys. 2024; 1-8.
2. Islam FM, Wu J, Jansson J, Wilson DP. Relative risk of cardiovascular disease among people living with HIV a systematic review and meta-analysis. 2012; 453-68.
3. Shah AS, Stelzle D, Lee KK, *et al*. Global Burden of Atherosclerotic Cardiovascular Disease in People Living with the Human Immunodeficiency Virus: A Systematic Review and Meta-Analysis. *Circulation* 2018; **138**: 1100-12.
4. Ohira T IH. Cardiovascular Epidemiology in Asia-an overview. *Circ J* 2013; **77**: 1646-52.
5. Deepak Bhavnani C, Yean Yip AF, Tiong Kiam O. The Annual Report Year 2018 - 2019 Ncvd - Acs Registry. 2019; : 17-9.

EPIDOP06 / 324

Epidemiology of Measles and Factors Associated with Laboratory-Confirmed Measles in Johor Bahru from 2020 until 2024

Md Faizul Abd Razak¹, Haidar Rizal Toha¹, Muhammad Saffuan Azli¹

¹ *Johor Bahru District Health Office, Ministry of Health Malaysia*

Corresponding author's email: dr.mdfaizul@moh.gov.my

Summary

Measles elimination has proven to be challenging. Despite sufficient measles-containing vaccine coverage, Malaysia reported the highest incidence rate of confirmed measles in this region. This study aimed to describe the characteristics of measles cases and identify factors associated with laboratory-confirmed measles in Johor Bahru. Among 417 measles cases reported between 2020 and 2024, 12.7% were laboratory confirmed. In 2024, the incidence rate of confirmed measles in Johor Bahru was 68.33 cases per million population, in which it has been rising significantly since 2022. Age, gender, immunisation status, and diagnosing facilities were significantly associated with laboratory-confirmed measles in Johor Bahru.

Keywords

Measles, laboratory-confirmed measles, Johor Bahru, factor associated, incidence

Introduction

Measles is a highly contagious, vaccine-preventable diseases that causes acute febrile illness and remains a major public health concern globally. In Malaysia, despite having good measles containing vaccine (MCV) coverage, the number of measles cases still high. Furthermore, Malaysia has yet to achieve measles elimination despite implementing Measles Elimination Program since 2004¹. In 2024, Malaysia recorded the highest measles incidence rate among Western Pacific countries (110.5 cases per 1,000,000 population), nearly double the rate reported in 2023 (58.7 cases per 1,000,000 population)². Measles elimination proved to pose significant challenges. Thus, trend analysis and identification of factor associated with laboratory-confirmed measles are critical to improving diagnosis, case detection, and the planning of prevention and control strategies, particularly in Johor Bahru district. This study aimed to describe the trends and characteristics of measles cases and to identify factors associated with laboratory-confirmed measles cases in Johor Bahru Districts.

Materials and Methods

This cross-sectional study used secondary surveillance data of measles cases reported in the Johor Bahru district from 2020 to 2024. Data were extracted from the Measles Investigation Information System (SM2), which contains relevant investigation information on all measles cases. Variables available in SM2 include sociodemographic data, medical and disease details, immunisation history, and laboratory investigations. No sampling method was applied, as all the cases were included in this study.

Extracted data were checked and cleaned using Microsoft Excel before being exported to SPSS for further analyses. Descriptive analyses were conducted to describe the trends and characteristics of measles cases in Johor Bahru. Subsequently, cases without any laboratory confirmatory test were excluded from further analyses. Simple logistic regression and multiple logistic regression were then conducted to identify factors associated with laboratory-confirmed measles cases.

Results and Discussion

A total of 497 measles cases were notified between 2020 and 2024, of which 63 (12.7%) were laboratory confirmed. Since 2021, both the number of reported cases and the proportion of laboratory-confirmed cases steadily increased. The incidence rate of confirmed measles cases (including clinically compatible, laboratory-confirmed, and epidemiologically linked) rose from 2.92 cases per 1 million population in 2020 to 68.33 cases per 1 million population in 2024 (Figure 1). Although an apparent decline in the incidence rate was observed during the COVID-19 pandemic in 2020 and 2021, it may not reflect the actual situation, as limitations in healthcare access and surveillance likely masked the underlying rising trend³. The mean age of measles cases was 4.47 years, ranging from 1 month to 55 years, with a male-to-female ratio of approximately 1:1. Most cases were Malaysian (99.0%), Malay (95.2%), had no complications (99.4%), were not admitted (94.6%), and were detected passively (95.2%). More cases were vaccinated (50.3%) compared to unvaccinated (38.0%). Of the 497 notified cases, 411 were included in the multivariable analysis, while 86 cases were excluded due to absence of confirmatory test, often resulting from epidemiologically linked or patient refusal. Multiple logistic regression analysis revealed that laboratory-confirmed measles was significantly associated with being aged 1-6 years (AdjOR = 6.28; 95% CI: 2.42-16.32), 7-12 years (AdjOR = 10.23; 95% CI: 3.48-30.09), 13-17 years (AdjOR = 14.65; 95% CI: 2.37-90.59), above 18 years (AdjOR = 6.12; 95% CI: 1.13-33.19), female sex (AdjOR = 2.08; 95% CI: 1.07-4.01), unvaccinated status (AdjOR = 15.02; 95% CI: 5.89-38.27), incomplete vaccination (AdjOR = 65.50; 95% CI: 21.28-201.67), and diagnosis at a government hospital (AdjOR = 6.72; 95% CI: 2.81-16.06) (Table 1). These findings were in agreement with previous studies^{4,5}.

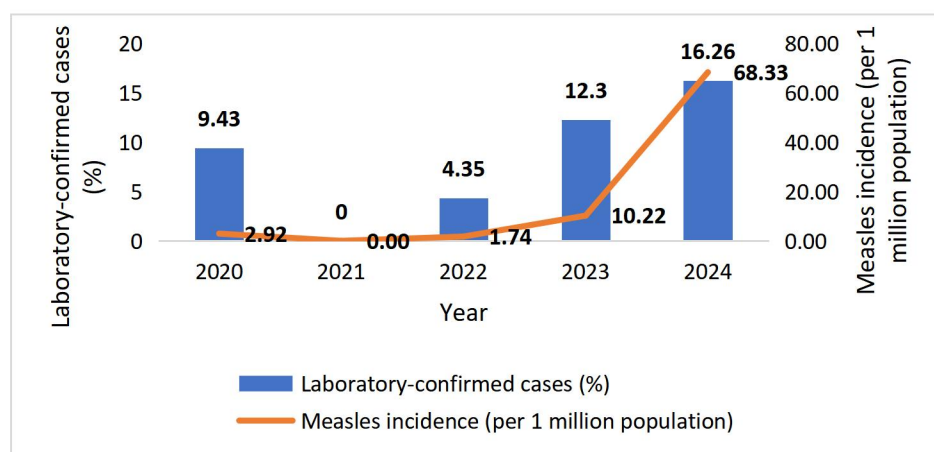


Figure 1: Proportion of laboratory-confirmed cases (%) and confirmed measles incidence (per 1 million population) in Johor Bahru district from 2020 to 2024 (n=497)

Table 1: Association between characteristic of measles cases with laboratory-confirmed measles in Johor Bahru district using Multiple Logistic Regression (n = 411)

Variable	B	Adjusted OR (95% CI)	Wald Statistic (df)	p- value
Age Group (years)				
< 1		1		
1 - 6	1.84	6.28 (2.42, 16.32)	14.25 (1)	<0.001
7 - 12	2.33	10.23 (3.48, 30.09)	17.84 (1)	<0.001
13 - 17	2.68	14.65 (2.37, 90.59)	8.34 (1)	0.004
≥ 18	1.81	6.12 (1.13, 33.19)	4.41 (1)	0.036
Gender				
Male		1		
Female	0.73	2.08 (1.07, 4.01)	4.72 (1)	0.030
Immunisation Status				
Vaccinated		1		
Unvaccinated	2.71	15.02 (5.89, 38.27)	32.20 (1)	<0.001
Incomplete	4.18	65.50 (21.28, 201.67)	53.13 (1)	<0.001
Diagnosing Facilities				
Government Clinic		1		
Government Hospital	1.91	6.72 (2.81, 16.06)	18.39 (1)	<0.001
Private Facilities	-0.96	0.39 (0.14, 1.07)	3.33 (1)	0.068

Constant = -5.309; Hosmer Lemeshow test, p-value = 0.198

Forward LR and Backward LR method applied; No multicollinerity and no interaction

Conclusion

From 2020 until 2024, a total of 417 measles cases were reported in Johor Bahru, of which 12.7% of them were laboratory-confirmed. The measles incidence rate is significantly increased with age, gender, immunisation status and diagnosing facilities were identified as factors associated with the laboratory-confirmed measles in Johor Bahru.

References

1. Takashima Y, Aslam SK, Evans R, Mariano KM, Lee CW, Wang X, et al. Measles and Rubella Elimination in the Western Pacific Region in 2013-2022: Lessons Learned from Progress and Achievements Made during Regional and Global Measles Resurgences. *Vaccines* [Internet]. 2024 Jul 22;12(7):817. Available from: <https://doi.org/10.3390/vaccines12070817>
2. Measles-Rubella Bulletin 2025 [Internet]. World Health Organization, Regional Office for the Western Pacific. 2025 Mar [cited 2025 Apr 3]. Available: <https://iris.who.int/bitstream/handle/10665/380379/Measles-Rubella-Bulletin-2025-Vol-19-No-03.pdf>
3. Moodley D, Goren K. Measles masked by COVID-19: a literature review. *Univ West Ont Med J* [Internet]. 2022 Mar 24;90(1). Available from: <https://doi.org/10.5206/uwomj.v90i1.14007>
4. Daud MRHM, et al. Five-Year trend of measles and its associated factors in Pahang, Malaysia: a Population-Based Study. *International Journal of Environmental*

Research and Public Health [Internet]. 2022 Jun 30;19(13):8017. Available from: <https://doi.org/10.3390/ijerph19138017>

5. Tahoun MM, et al. Factors associated with measles infection in Afghanistan surrounding the 2021 outbreak: A multivariable analysis. *Open Forum Infectious Diseases* [Internet]. 2025 Mar 11; Available from: <https://doi.org/10.1093/ofid/ofaf153>

EPIDOP07 / 325

Prevalence and Risk Factors of Cataract Formation in Diabetic Patients in Johor Bahru: A Population-Based Analysis

Loganathan Salvaraji¹, Haidar Rizal Bin Toha¹, Ng Wei Meng²

¹ *Johor Bahru District Health Office. Non-Communicable Disease Department, Johor Bahru.*

² *DrPH Student, Public Health Medicine Department, Medical Faculty, UKM, Malaysia.*

Corresponding author's email: drhaidar@moh.gov.my

Summary

This cross-sectional study of 14,504 T2DM patients in Johor Bahru found a 15.2% cataract prevalence. Age (OR=1.02), diabetes duration (OR=1.78-2.45), HbA1c (OR=2.14), and eGFR (OR=0.99) were significant predictors to cataract developments in these population. Ethnicity (Chinese, Indian) showed univariate associations, but not after adjustment. The predictive model (AUC=0.682) had high sensitivity (77.4%) but low specificity (49.7%), useful for screening despite false positives. Missing data and small ethnic subsamples limited power. Eye screening and glycemic control are critical, though model refinement and longitudinal studies are needed to enhance interventions in Malaysia.

Keywords

Diabetes Mellitus, Cataract, Risk factors, Johor Bahru, Predictive Model, Prevalence

Introduction

Cataract is characterised by opacification of lens, remain a leading cause of visual impairment and blindness worldwide. According to Global Disease 2019, cataract remained the largest contributor to global blindness in adults aged 50 years and older in 2020, with over 15 million individuals, approximately 45% of the 33.6 million cases of global blindness. Prevalence of Cataract in Adults aged 50 years and older in Malaysia is 26.8% according to National Eyes Survey II ¹. The prevalence and predictors of cataracts in diverse populations remain understudied, limiting targeted interventions in local contexts. This study investigates the prevalence and risk factors of cataracts among T2DM patients in Johor Bahru, aiming to inform clinical practice and public health strategies. Our objectives are to determine the prevalence of cataracts, determine sociodemographic and clinical risk factors, and construct a predictive model for cataract risk in this population.

Materials and Methods

This cross-sectional study analyzed secondary data from 14,504 T2DM patients (Jan-Dec 2024) in Johor Bahru District Health Clinics, excluding Type 1 Diabetes Mellitus, defaulters, and those with incomplete fundus assessments. Data on age, gender, ethnicity (Malay, Chinese, Indian, Borneo, Others), diabetes duration (<10, 11-20, 21-30, >30 years), HbA1c, eGFR, and cataract status (binary outcome) were collected. Statistical analyses used the Julius AI Analytics Platform and R (4.2.0), employing

univariate, bivariate (t-tests, chi-square), and multivariate logistic regression (odds ratios, 95% CI). Model performance was assessed via ROC curve analysis (AUC, sensitivity, specificity). Quality assurance included cross-validation and residual analysis.

Results and Discussions

The prevalence of cataracts was 15.2% (n=2,209). Multivariate analysis identified age (OR=1.02 per year, $p<0.001$), diabetes duration (OR=1.78 for 11-20 years, 2.45 for 21-30 years, 2.06 for >30 years, $p<0.001$), HbA1c (OR=2.14, $p<0.001$), and eGFR (OR=0.99 per unit increase, $p<0.001$) as significant predictors. Gender was not associated ($p=0.11$). Chinese (OR=1.66) and Indian (OR=1.51) ethnicities had higher odds in univariate analysis, but not after adjustment ($p>0.05$), suggesting confounding by age and diabetes duration. The predictive model showed moderate discriminative ability (AUC=0.682), with high sensitivity (77.4%) but low specificity (49.7%), indicating utility for identifying at-risk patients but a high false-positive rate. Missing data (e.g., urine protein 40.4%, microalbumin 75.4%) and small sample sizes for Borneo (n=293) and "Others" (n=54) ethnicities limited statistical power. The South Korean Ansan Cohort reported a 19.1% cataract incidence over 10 years, similar to our 15.2% prevalence in Johor Bahru T2DM patients². Age, diabetes duration, HbA1c, and eGFR were confirmed as significant cataract risk factors in multivariate analysis, aligning with literature highlighting age and duration as key predictors. A dose-response relationship with diabetes duration reflects hyperglycemia's cumulative impact (2-4) CKD links to higher cataract prevalence^{3,5}. Univariate HbA1c discrepancies may stem from confounding (e.g., treatment effects in older patients). Ethnic associations diminished post-adjustment, suggesting confounding by age, duration, or unmeasured factors like healthcare access, genetics, or UV exposure. Limitations include the cross-sectional design, missing data (urine protein 40.4%, microalbumin 75.4%), selection bias, single-center generalizability, unmeasured confounders (e.g., smoking, BMI), and binary cataract classification.

Table 1 Sociodemographic and Clinic Parameter of Respondents (n = 14,504)

Variable	Value
Patient Characteristics (N = 14,504)	
Demographics	
Age (years), mean $\pm$ SD	61.0 $\pm$ 11.8
Gender, n (%)	
Male	6083 (41.9%)
Female	8410 (58.0%)
Ethnicity, n (%)	
Malay	7077 (48.8%)
Chinese	4086 (28.2%)
Indian	2635 (18.2%)
Borneo	293 (2.0%)
Others	54 (0.4%)

DM Duration, n (%)	
<10 years	8850 (61.0%)
11-20 years	3998 (27.6%)
21-30 years	630 (4.3%)
>30 years	82 (0.6%)
Clinical Parameters	
HbA1c (mmol/mol), mean $\pm$ SD	8.1 $\pm$ 2.1
eGFR (mL/min/1.73m ²), mean $\pm$ SD	86.4 $\pm$ 28.1
Cataract Status, n (%)	
No	12295 (84.8%)
Yes	2209 (15.2%)
Fundus Camera Results, n (%)	
Normal	10696 (73.7%)
Cataract	2209 (15.2%)
Retinopathy	1599 (11.0%)
Urine Tests, n (%)	
Protein	
Normal	4120 (28.4%)
Abnormal	4528 (31.2%)
Microalbumin	
Normal	3041 (21.0%)
Abnormal	523 (3.6%)

Table 2 Bivariate and Univariate between Presence of Cataracts and Variables.

Variable	Cataract		X ²	P-value
	Yes	No		
Gender (N=14,493)				
Male	882(14.50%)	5,201(85.50%)	4.38	p=0.112
Female	1,325(15.76%)	7,085(84.24%)		
Age(Years)	64.07($\pm$ 11.55)	60.46($\pm$ 11.74)	13.45*	p<0.001
Ethnicity(N=14,145)				
Malay	1,022(14.44%)	6,055(85.56%)	65.74	p<0.001
Borneo	17(5.80%)	276(94.20%)		
Chinese	718(17.57%)	3,368(82.43%)		
India	423(16.05%)	2,212(83.95%)		
Others	7(12.96%)	47(87.04%)		
DM Duration (N=13,560)				
<10 years	988(11.16%)	7,862(88.84%)	330.96	p<0.001
11-20 years	848(21.21%)	3,150(78.79%)		
21-30 years	179(28.41%)	451(71.59%)		
>31 years	26(31.71%)	56(68.29%)		
HbA1c	7.87($\pm$ 2.04)	8.14($\pm$ 2.07)	5.49*	p<0.001
eGFR(mL/min/1.73m²)	76.22($\pm$ 22.01)	88.21($\pm$ 27.94)	16.88*	p<0.001

*t-test

Table 3 Univariate and Multivariate OR Between Cataracts and Predictors

Variable	Univariate OR(95%CI)	p-value	Multivariate OR(95%CI)	p-value
Age(Years)	1.03(1.02-1.03)	<0.001	1.02(1.02-1.03)	<0.001
Ethnicity				
*Malay	1.00		1.00	
Borneo	0.72(0.33-1.56)		0.69(0.31-1.52)	
Chinese	2.27(1.35-4.14)	<0.001	1.66(0.97-3.10)	
Indian	1.94(1.15-3.56)	<0.05	1.51(0.88-2.79)	
Others	1.65(0.56-4.41)		1.63(0.54-4.45)	
DM Duration				
*<10 years	1.00		1.00	
11-20 years	2.15(1.92-2.41)	<0.001	1.78(1.58-2.00)	<0.001
21-30 years	3.35(2.72-4.11)	<0.001	2.45(1.97-3.03)	<0.001
>31 years	3.38(1.98-5.58)	<0.001	2.06(1.19-3.44)	<0.001
HbA1c	0.93(0.91-0.96)	<0.001	2.14(1.40-3.43)	<0.001
Egfr (mL/min/1.73m2)	0.98(0.98-0.99)	<0.001	0.99(0.99-0.99)	<0.001

*reference group

Conclusion:

Age, diabetes duration, HbA1c, and eGFR are key predictors of cataracts in T2DM patients, with longer diabetes duration and poor glycemic control increasing risk. Regular eye screening and improved glycemic control are essential for high-risk groups. The moderate predictive model supports screening but requires refinement (e.g., additional variables, machine learning) to reduce false positives. Future longitudinal studies, severity-specific analyses, and validation in diverse populations can enhance generalizability and inform targeted interventions, reducing the burden of cataracts in Malaysia.

Acknowledgments:

The authors would like to thank the Director General of Health Malaysia for the permission to publish this paper. We would like to extend our gratitude to Non-Communicable Disease (NCD) Department Johor Bahru District Health Clinic and University Kebangsaan Malaysia for their support.

References

1. Yap JF, Ng QX, Wai YZ, Isahak M, Salowi MA, Moy FM. Prevalence of cataract and factors associated with cataract surgery uptake among older persons in Malaysia: A cross-sectional study from the National Eye Survey II. *Trop Doct.* 2022 Apr;**52**(2):325-30.
2. Jeong IS, Lee EJ, Kim MS, Yu JO, Yun HS, Jeong JH, et al. Incidence and Predictors of Cataract among People with Type 2 Diabetes Mellitus: Using Secondary Data

Analysis from the Ansan Cohort of the Korean Genome and Epidemiology Study. *J Korean Acad Nurs*. 1645974000; **52**(1):24-35.

3. Ivanescu A, Popescu S, Gaita L, Albai O, Braha A, Timar R. Risk Factors for Cataracts in Patients with Diabetes Mellitus. *J Clin Med*. 2024 Jan; **13**(23):7005.
4. Drinkwater JJ, Davis WA, Davis TME. A systematic review of risk factors for cataract in type 2 diabetes. *Diabetes Metab Res Rev*. 2019; **35**(1):e3073.
5. Huang CY, Lee JI, Chang CW, Liu YH, Huang SP, Chen SC, et al. Chronic kidney disease and its association with cataracts-A cross-sectional and longitudinal study. *Front Public Health*. 2022; **10**:1029962.

EPIDOP08 / 334

Leading Causes of Death Among Children Aged 0-14 Years in Malaysia: A Comparison between 2019 and 2023

Tham Sin Wan ¹, Khaw Wan-Fei ¹, Nazirah Alias ¹, Nur Hamizah Nasaruddin ¹, Nur Diyana Rosnan ¹, Wan Kim Sui ¹, Mohd Azmi Suliman ¹, Shubash Shander Ganapathy¹, Mohd Azahadi Omar ²

¹ Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

² Sector for Biostatistics & Data Repository, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: drthamsinwan@moh.gov.my

Summary

This study analysed childhood mortality in Malaysia, revealing congenital conditions, neonatal complications, and road injuries as the leading causes of death in 2019 and 2023. The findings indicated an increasing burdens and notable sex-specific differences. These results underscore the urgent need to strengthen neonatal care, enhance injury prevention strategies, and improve emergency obstetric services to reduce preventable child deaths and support Malaysia's progress towards global child survival targets.

Keywords

Child mortality, Burden of disease, Cause-specific, Neonatal health, Malaysia

Introduction

Children's health remains a global priority. Child mortality serves as a key indicator of a nation's health and future economic potential, as each preventable death impacts families and society. Reducing child mortality is central to achieving the Sustainable Development Goals (SDGs), particularly SDG 3, which Malaysia actively supports ¹. Understanding the current causes of death among children is crucial for identifying priority health issues and guiding effective interventions. Malaysia's National Children's Policy and the Child Health 2021-2030 framework² demonstrate the country's commitment to holistic child well-being, yet its success depends on accurate, up-to-date mortality data. This study aims to address this gap by describing the leading causes of death among children aged 0-14 years in Malaysia in 2023 and comparing these findings with mortality data from 2019.

Materials and Methods

This study analysed all registered deaths among children aged 0-14 years in Malaysia for the year 2019 and 2023, with mortality data obtained from the Department of Statistics Malaysia (DOSM). A total of 162 specific diseases were included, classified according to the International Classification of Diseases, 10th Revision (ICD-10) codes, based on the previous Malaysian Burden of Disease (MBOD) study³. Causes of death were estimated using a redistribution method to address ill-defined causes. All

statistical analyses were conducted using R statistical software. The World Standard Population (2000-2025), from the World Health Organization, was used as the reference population to calculate age-adjusted mortality rates (AAMR) through the direct method of age standardisation. A comparison of the leading causes of death between 2019 and 2023 was conducted to assess changes over time.

Results and Discussion

In 2023, a total of 4,933 deaths were recorded among children aged 0-14 years in Malaysia. Males accounted for 2,896 deaths (58.7%), while females accounted for 2,037 deaths (41.3%). Among males aged 0-4 years, congenital heart anomalies were the leading cause of death, whereas neonatal preterm birth ranked first among females. For children aged 5-14 years, road injuries emerged as the leading cause for both sexes, with notably higher mortality rates among males. Lower respiratory infections remained a significant cause across age groups, while leukaemia, and brain and central nervous system cancers ranked third among males and females, respectively (Table 1). These findings align with global patterns, in which congenital anomalies, neonatal conditions, and external causes such as injuries dominate childhood mortality profiles¹. Observed sex differences in mortality may reflect biological vulnerabilities during early development and greater male exposure to fatal injuries due to behavioural and environmental factors⁴. These trends highlight the need for targeted, age- and sex-specific health interventions to reduce child mortality.

Table 1: Total deaths and age-adjusted mortality rates (AAMR) for the top three causes of death among males and females by age group, Malaysia, 2023

Rank	0-4 years old	5-14 years old
Male		
1	Congenital heart anomalies 270; 22.2	Road injuries 174; 6.5
2	Neonatal preterm birth 207; 17.0	Lower respiratory infection 49; 1.8
3	Birth asphyxia and trauma 123; 10.1	Leukaemia 46; 1.7
Female		
Rank	0-4 years old	5-14 years old
1	Neonatal preterm birth 186; 16.2	Road injuries 46; 1.8
2	Congenital heart anomalies 183; 15.9	Lower respiratory infection 41; 1.6
3	Lower respiratory infection 83; 7.2	Brain and central nervous system cancer 24; 1.0

Note: Values are presented as total deaths; AAMR (per 100,000 population).

Comparison of mortality data from 2019 to 2023 (Table 2) revealed notable changes. Congenital anomalies and neonatal preterm birth continued to impose a substantial burden, reflecting ongoing challenges in perinatal and neonatal care¹. Mortality from road injuries increased sharply by over 60%, highlighting critical gaps in injury

prevention, particularly in road safety initiatives. Additionally, the emergence of birth asphyxia and trauma among the top five causes underscores the urgent need to strengthen intrapartum and emergency obstetric care to prevent avoidable child deaths.

Table 2: Comparison of mortality attributed to the top 5 causes of death among children aged 0-14 years in Malaysia between 2019 and 2023

R	Cause of deaths	Total deaths				AAMR (per 100,000 population)			
		2019	2023	Absolute change, N	Percent change (%)	2019	2023	Absolute change	Percent change (%)
1	Congenital heart anomalies	465	489	+24	5.2	6.1	6.9	+0.8	+13.1
2	Neonatal preterm birth	366	393	+27	7.4	4.8	5.6	+0.8	+16.7
3	Lower respiratory infections	287	263	-24	-8.4	3.8	3.6	-0.2	-5.3
4	Road injuries	213	342	+129	+60.6	2.8	4.5	+1.7	+60.7
5	Drowning ^a	191	23	-168	-88.0	2.5	0.3	-2.2	-88.0
	Birth ^b asphyxia and trauma	163	191	+28	+17.2	2.1	2.7	0.6	+28.6

AAMR-Age-adjusted mortality rate

a - Drowning rank 5th in 2019, and rank 19th in 2023

b - Birth asphyxia and trauma rank 5th in 2023, and rank 6th in 2019

Conclusion

This study underscores rising burdens from congenital conditions, neonatal complications, and road injuries in Malaysia. Strengthening healthcare services, particularly neonatal care, injury prevention, and emergency obstetric support, is essential for reducing preventable child deaths and achieving global health goals.

References

1. Paulson KR, Kamath AM, Alam T, et al. Global, regional, and national progress towards Sustainable Development Goal 3.2 for neonatal and child health: all-cause and cause-specific mortality findings from the Global Burden of Disease Study 2019. *Lancet* 2021; 398(10303):870-905.
2. Abd Hamid IJ, Taib F. Healthcare equity and access to care for Malaysian children. *Malays J Paediatr Child Health* 2024; 30(1):13-5.
3. Institute for Public Health. *Malaysian Burden of Disease and Injury Study 2019*. Putrajaya: Ministry of Health Malaysia; in press.
4. Rogers RG, Everett BG, Onge JMS, Krueger PM. Social, behavioral, and biological factors, and sex differences in mortality. *Demography* 2010; 47:555-78.

EPIDOP09 / 342

Modelling Dengue Incidence and Its Association with Temperature in Johor Bahru, Malaysia

Nur Sujaihah Hanafi¹, Akashah Abdullah¹, Luqmanul Hakim Junaiden¹, Haidar Rizal Toha¹

¹ Johor Bahru District Health Office, Ministry of Health, Malaysia

Corresponding author's email: sujaihanafi3@yahoo.com

Summary

Previous research frequently indicates that meteorological factors, such as temperature, may influence dengue transmission; however, the findings have been inconsistent. This study aims to examine the association between temperature and dengue incidence in Johor Bahru, Malaysia. Daily data on dengue incidence and temperature were collected from 2022 to 2023. A combination of time-stratified case-crossover design and distributed lag non-linear model (DLNM) were employed. There was a non-linear association between daily mean temperature and dengue incidence with the most pronounced effects were observed at lower temperatures (23.0°C - 25.0°C). The highest risk was observed at 23°C, at 1-day lag and lasting for 3 days. 12.28% (95% CI: 3.78%, 19.57%) of dengue incidence in Johor Bahru were attributed to daily mean temperature. Our study highlights the critical importance of implementing effective strategies to mitigate the impact of temperature on dengue transmission.

Keywords

Temperature, dengue, time-stratified case-crossover design, distributed lag non-linear model (DLNM)

Introduction

The increase in average global temperature has initiated a series of events leading to climate change. The phenomenon has significantly implicated the spread of vector borne disease such as dengue fever¹. Dengue fever transmission in particular, is significantly influenced by temperature with warmer temperature speeding up mosquitoes development and breeding rates, increased virus replication, influencing human behaviour and movement pattern, potentially increasing their exposure to mosquitoes bites^{2,3}.

Materials and Methods

We performed a time-stratified case crossover design combined with DLNM to examine the association between daily dengue incidence and mean temperature, including their lagged effects, in Johor Bahru from 2022-2023. A time-stratified stratum was initially created as a new variable in the dataset, by dividing 730 time-series intervals (representing two years of daily data) into equally sized, non-overlapping strata defined as day of week within the same month and year. This stratification allowed the model to control for long-term variations and seasonality.

Subsequently, a core model was developed using a quasi-Poisson regression, conditioned on the time stratum previously constructed, incorporating categorical data on daily rainfall and a dummy variable of public holiday (PH) as a confounder. A cross-basis matrix was then constructed for daily mean temperature to facilitate the simultaneous presentation of its association with dengue incidence across predictors and lag dimensions. We selected a maximum of seven days lag, as suggested by Wu *et al.* (2018) and specified a natural cubic spline with 4 and 3 *degrees of freedom (df)* for the predictor and lag effects, respectively. The results were reported as odd ratio (OR) with corresponding 95% confidence interval (CI) and attributable fraction. All statistical analyses were conducted using “gnm” and “dlnm” package in R software.

Results and Discussion

A total of 11,299 dengue incidence were reported in Johor Bahru from 1st January 2022 to 31 December 2023, averaging 15 cases per day. Using 26°C as a reference point, temperature below this threshold exhibited a significant inverse non-linear association. The highest odds of exposure were observed at temperature 23°C (OR 3.26, 95% CI: 1.58, 6.72), with the odds decreasing as temperature increased. Conversely, temperatures above the reference point demonstrated a non-significant association (Figure 1 and 2). The most pronounced single lag effect of the 1st percentile temperature (24°C) was observed at 1-day lag (OR 1.12, 95% CI: 1.04, 1.21), persisting for three days, while its cumulative lag effect was strongest at a 0-7 day lag (OR 1.82, 95% CI: 1.25, 2.66). In contrast, the 99th percentile temperature did not exhibit any significant lag effect on dengue incidence. In Johor Bahru, the underlying mechanism may involve the breeding and survival of mosquitoes. Lower temperatures, within a specific range could potentially reduce the developmental period of mosquitoes, the incubation period, and the rate of viral development, thereby increasing the number of infectious mosquitoes and elevating the likelihood of dengue infection⁴.

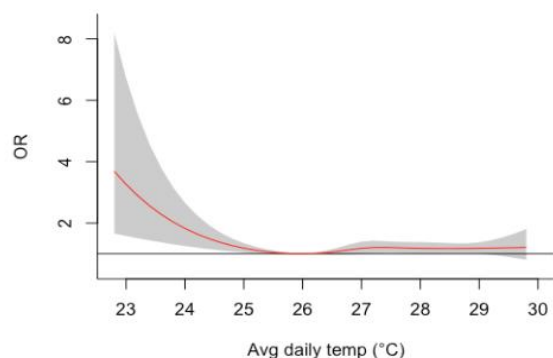


Figure 1: Overall cumulative association between daily mean temperature and dengue incidence Johor Bahru from 2022-2023

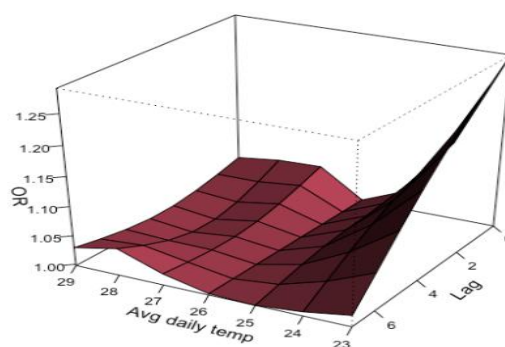


Figure 2: The 3D plot of exposure-lag response

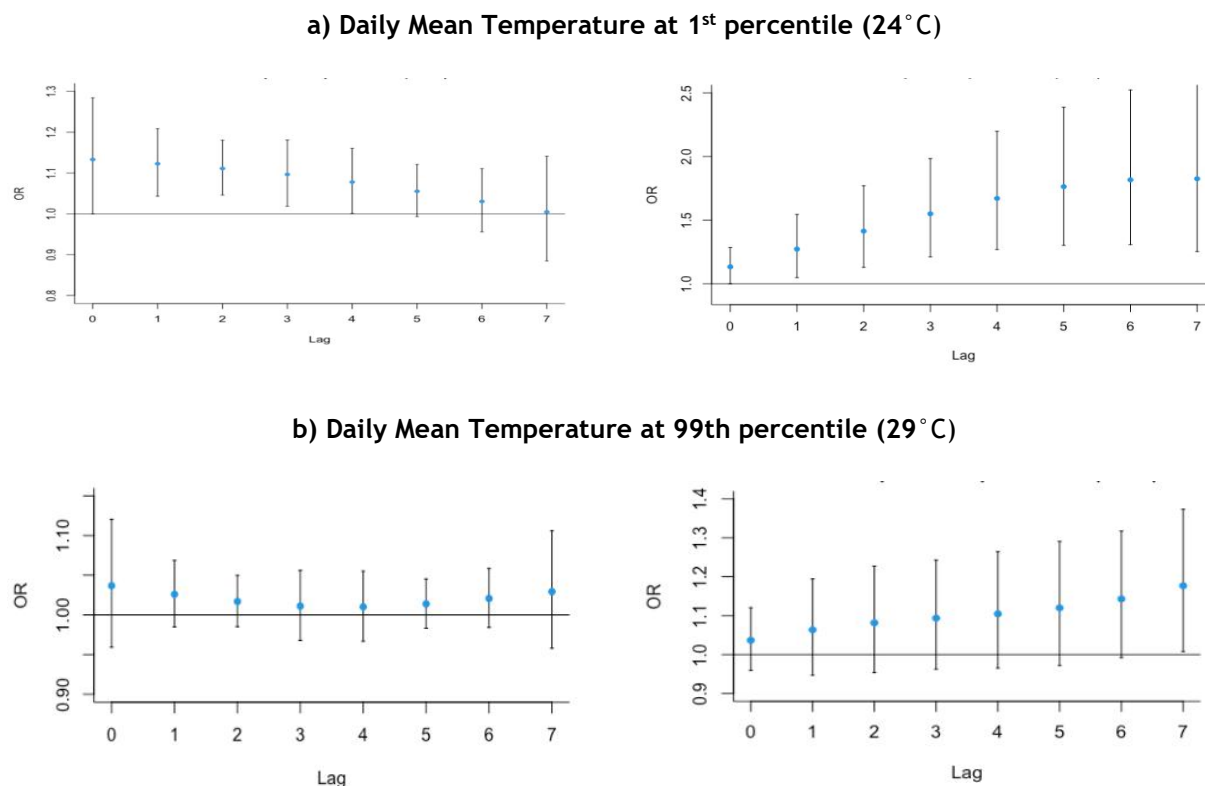


Figure 3: Association between single (Left) and cumulative (Right) lag effect between daily mean temperature and dengue incidence in Johor Bahru from 2022-2023

Conclusion

Our study highlights the critical importance of implementing effective strategies to mitigate the impact of ambient temperature on dengue transmission. Such measures will offer guidance and serve as an early warning system to address the unprecedented global health challenges posed by climate change.

References

1. Campbell KM, Lin CD, Iamsirithaworn S, Scott TW. The complex relationship between weather and dengue virus transmission in Thailand. *Am J Trop Med Hyg* 2013; **89**(6):1066-80. Available from: <https://ajtmh.org/doi/10.4269/ajtmh.13-0321>
2. Gan SJ, Leong YQ, Barhanuddin MFH, et al. Dengue fever and insecticide resistance in *Aedes* mosquitoes in Southeast Asia: a review. *Parasite Vectors* 2021; **14**(1):315. Available from: <https://doi.org/10.1186/s13071-021-04785-4>
3. Wang Y, Wei Y, Li K, et al. Impact of extreme weather on dengue fever infection in four Asian countries: a modelling analysis. *Environ Int* 2022; **169**:107518. Available from: <https://doi.org/10.1016/j.envint.2022.107518>
4. Wu X, Lang L, Ma W, et al. Non-linear effects of mean temperature and relative humidity on dengue incidence in Guangzhou, China. *Sci Total Environ* 2018; **628-629**:766-71. Available from: <https://doi.org/10.1016/j.scitotenv.2018.02.136>

EPIDOP10 / 347

Assessing the of accuracy of Artificial Intelligence Diagnostic in Tuberculosis screening: Sensitivity and Specificity in Rural Sarawak

Melvin Chung Hsien Liang¹, Teo Jia Chi¹, Nurul Amirah Masani¹, Lai Kah Sheng¹, Ooi Mann Chek¹

¹ *Bintulu Health Clinic, Ministry of Health Malaysia*

Corresponding author's email: melvinchunghl@hotmail.com

Summary

This study evaluated the performance of Artificial intelligence (AI) in the interpretation of chest x-rays (CXR) during tuberculosis screening programmes in rural Sarawak between January and December 2024. A total of 350 adults underwent CXR screening with ultraportable x-ray unit by purposive sampling and their CXR images were analysed by both Lunit INSIGHT CXR software and radiologist independently. The sensitivity was calculated to be 88.9% with a specificity of 86.1%. These findings highlight the potential of AI in early detection of respiratory diseases particularly tuberculosis in low resource settings.

Keywords

Artificial Intelligence, Chest X-ray, Sensitivity, Specificity, Tuberculosis

Introduction

Tuberculosis remains a public health crisis and early detection is crucial in rural communities with limited healthcare access, where diagnostic delays can lead to increased transmission and poorer health outcomes¹. Chest X-ray (CXR) remains as the most common imaging tool for detecting pulmonary abnormalities and often its effectiveness is hindered by inter-reader variability and shortages of skilled personnel in interpretation of the CXR images in low resource setting². Artificial intelligence (AI) assisted interpretation has emerged as a promising solution to improve diagnostic accuracy in resource-limited environments. This study evaluates the diagnostic performance of an AI system for CXR interpretation during TB screening in rural Sarawak. The sensitivity and specificity are assessed by comparing the AI interpretation against radiologists to determine its potential as an effective screening tool.

Materials and Methods

A retrospective cross-sectional study was conducted by analysing data from 350 adults who participated in a mobile Tuberculosis screening program in Bintulu district, Sarawak between January to December 2024. All eligible participants were provided with written informed consent prior to undergoing chest radiography using a Fujifilm FDR XAIR XD2000 ultraportable X-ray unit. Each of the CXR images underwent dual independent assessment by the AI (Lunit Insight V3.1.4.12 software) and interpretation by radiologist blinded to the AI results. Demographic data, medical history, radiologist's report and AI's interpretation were extracted via medical

records and structured data collection form. The diagnostic performance of the AI (sensitivity and specificity) was calculated using radiologist interpretation as gold standard. Statistical analysis was performed using SPSS version 30. The study was approved by the relevant institutional ethics committee.

Results and Discussion

Among 350 participants screened, the majority were aged 31-50 years (50.2%), of Iban ethnicity group (63.1%) and from lower income group B40 (68.0%). The study evaluated the AI's diagnostic performance. Sensitivity and specificity of the AI compared to radiologists were 88.9% and 86.1% with significant $p < 0.001$. The AI's sensitivity and specificity align with studies in comparable settings. For instance, Sarkar et al. (2022) reported 89.7% sensitivity and 85.2% specificity for AI systems in rural India, while Pande et al. (2023) demonstrated similar performance across diverse African and Asian populations^{3,4}. Among 56 true positives, radiologists collectively agreed with AI that there's positive lesion 69.5% (full agreement 28.5%, partial agreement 21.4%, identified additional lesions 19.6%) and disagreed with the remaining AI's finding. These findings reinforce AI's reliability as a triage tool in regions with limited radiological infrastructure.

Table 1: Demographics characteristics of participants (n = 350)

Variable	n (%)
Age	
20 and below	6(1.7)
21-30	50(14.3)
31-40	80(22.8)
41-50	96(27.4)
51-60	59(16.8)
61 and above	59(16.8)
Gender	
Male	202 (57.7)
Female	148 (42.3)
Ethnicity	
Malay	37 (10.6)
Iban	221(63.1)
Chinese	35(10.0)
Other Bumiputera	50(14.3)
Foreigners	7(2.0)
Religion	
Islam	52 (8.0)
Buddhist	30 (92.0)
Christianity	185 (52.9)
Atheist	83 (23.7)
Income Group (RM)	
Below 1950	160(45.7)
1950-3729	78(22.3)

3730-8649	92(26.3)
More than 8650	20(5.7)

Table 2: Diagnostic performance of AI against Radiologist (N=350)

CXR Interpretation	Radiologist Positive	Radiologist negative	P-value
AI Positive	56	40	<0.001
AI Negative	7	247	

Table 3: Types of agreement between AI and Radiologist in true positives. (n=56)

Types of agreement	n (%)
Full	16 (28.5)
Partial	12 (21.4)
Additional lesion	11 (19.6)
Reject	17 (30.3)

Conclusion

The study demonstrates that the AI system achieved high diagnostic accuracy (88.9% sensitivity and 86.1% specificity) in detecting chest X-ray abnormalities, underscoring its potential to enable earlier diagnosis and treatment of tuberculosis in rural Sarawak. By integrating mobile digital radiography with AI-driven analysis, this approach will be able to strengthen tuberculosis screening in resource-limited settings.

References

1. World Health Organization. *Global tuberculosis report 2023*. Geneva: World Health Organization; 2023.
2. Qin ZZ, Sander MS, Rai B, et al. Using artificial intelligence to read chest radiographs for tuberculosis detection: a multi-site evaluation of three deep learning systems. *Lancet Digit Health* 2019; 1(1):e543-54. doi:10.1016/S2589-7500(19)30199-5
3. Sarkar S, Zaveri A, Kulkarni A, et al. Deep learning for tuberculosis detection in chest radiographs: a cross-sectional evaluation of five AI systems in India. *Lancet Digit Health* 2022; 4(4):e235-43. doi:10.1016/S2589-7500(21)00276-5
4. Pande T, Cohen C, Pai M, et al. Computer-aided detection of pulmonary tuberculosis in chest radiographs: a multi-site evaluation of AI systems across Africa and Asia. *Nat Commun* 2023; 14(1):4330. doi:10.1038/s41467-023-38982-9

EPIDOP11 / 363

Towards a Mentally Healthier Nation: Expert Consensus on a Depression Intervention for Patients in Primary Care

Asma' Khalil¹, Zahir Izuan Azhar¹, Chen Xin Wee¹, Norley Shuib²

¹ Department of Public Health Medicine, Faculty of Medicine, Universiti Teknologi MARA, Sungai Buloh Campus, Selangor

² Department of Psychiatry, Faculty of Medicine, Universiti Teknologi MARA, Sungai Buloh Campus, Selangor

Corresponding author's email: ummukamil@gmail.com

Summary

The Mindfulness-based Intervention (MBI) toolkit is a structured, evidence-based resource developed to assist primary healthcare providers (PHCPs) in delivering care to patients with mild to moderate depression. Rooted in mindfulness principles, the toolkit integrates psychoeducation, mindfulness practices and relaxation techniques aimed at cultivating present-moment awareness. A Modified Delphi Method involving multidisciplinary experts was employed to refine content, ensuring cultural relevance and practical applicability within primary care settings. Through iterative rounds of expert feedback, the toolkit underwent significant revisions to enhance feasibility and usability to support primary healthcare providers in effectively managing mild to moderate depression.

Keywords

Mindfulness-Based Interventions, Depression, Primary Healthcare, Toolkit Development, Delphi Method

Introduction

Depression is a growing concern within Malaysia's primary healthcare system due to limited mental health resources and structured interventions. Mindfulness-Based Interventions (MBIs) have been globally recognised as evidence-based strategies for enhancing mental well-being¹ but lack structured implementation tools for primary healthcare providers (PHCPs) in local contexts². The MBI toolkit was conceptualised to address this gap by providing a practical, culturally appropriate manual to support PHCPs in managing mild to moderate depression. The development process adopted a structured expert consensus approach to ensure that content and practical implementation align with real-world primary care settings.

Materials and Methods

Mindfulness practices enhance awareness of thoughts, emotions, and bodily sensations, supporting early identification and management of depressive symptoms. The initial draft of the toolkit was developed by the first author based on the Self-Determination Theory, which emphasizes autonomy, competence, and relatedness as key motivational drivers in reducing depression severity. A narrative review of the

literature on MBIs, particularly those used in primary care settings, guided the selection of components. For example, grounding, mindful breathing, and unhooking practices were chosen to support autonomy and self-regulation; relaxation techniques promoted competence in stress management; while essential care practices enhanced patient-provider connectedness, aligning with the need for relatedness. All selected practices were adapted to fit local cultural values and the practical context of Malaysian primary healthcare.

This initial version formed the basis for subsequent expert review using the Modified Delphi method. A purposive panel of eight multidisciplinary experts, comprising psychiatrists, family medicine specialists, public health medicine specialist, medical officer, clinical psychologists, and counselors were recruited for their expertise in mental health and primary care.

Each Delphi round involved independent expert ratings on five domains (content validity, usability, cultural appropriateness, practical application, and effectiveness) using a 5-point Likert scale (1= Strongly Disagree to 5= Strongly Agree). Consensus was defined as $\geq 70\%$ of experts rating an item as 4 or 5 (5). The quantitative feedback guided iterative refinements between rounds, ensuring that only components meeting high consensus standards were retained. Qualitative feedback in the open-ended sections was thematically analysed after each Delphi round to guide revisions such as clarifying language, restructuring content, and modifying or replacing components to enhance contextual relevance, clarity and feasibility.

Results and Discussion

The initial draft of the toolkit was structured into two comprehensive sections. The first section, 'Guide for Primary Care Providers', provided foundational knowledge, including mental health literacy, psychoeducation, essential communication skills, and an introduction to MBI. The second section, 'Toolkit for Managing Depression' comprised twelve mindfulness practices, designed to offer practical strategies that PHCPs could apply in managing patients with mild to moderate depression such as mindful breathing, mindful walking, mindful sleep, relaxation techniques and positive psychology.

In Round 1, feedback led to the removal of Body Scan and 3-Minute Breathing Space practices due to feasibility concerns in primary care settings. Additionally, the sequence of components was restructured to enhance usability and logical flow, ensuring PHCPs could easily integrate the toolkit into routine consultations. The second draft presented ten streamlined practices with improved structure. In Round 2, consensus was successfully achieved, with over 70% of respondents providing positive ratings (≥ 4.0) for all components. Mean scores further supported this with most sections scoring ≥ 4.8 , and an overall rating of 4.6. This reflects high agreement on content relevance, cultural appropriateness, and practical application (Table 1).

This expert-driven, iterative process underscores the importance of integrating evidence-based mindfulness approaches with practical clinical insights, to develop a contextually relevant mental health tool for effective depression management.

Table 1: Expert panel overall rating scores of the toolkit

Components included in the initial draft Round 1	Rating Score	Components included in Round 2	Rating Score
PART 1: GUIDE TO PRIMARY CARE PROVIDER			
a) Understanding Mental Health	4.2	a) Understanding Mental Health	4.9
b) Psychoeducation	4.0	b) Psychoeducation	4.8
c) Introduction to Mindfulness-Based Intervention	4.3	c) Essential Care and Practices: Communication Skills	4.8
d) Essential Care and Practices: Communication Skills	4.3	d) Introduction to Mindfulness-Based Intervention	4.8
PART 2: TOOLKIT FOR MANAGING MILD TO MODERATE DEPRESSION PATIENTS			
a) Grounding Technique	4.4	a) Grounding Technique	4.8
b) Unhooking	4.3	b) Unhooking	4.6
c) Mindful Breathing	4.3	c) Mindful Breathing	4.8
d) Body scan	Removed		
e) Bringing Awareness to Daily Routine	4.2	d) Bringing Awareness to Daily Routine	4.8
f) Mindful Eating	4.2	e) Mindful Eating	4.8
g) 3-minute breathing space	Removed		
f) Mindful Sleep	4.3	f) Mindful Sleep	4.8
g) Mindful Walking	4.3	g) Mindful Walking	4.8
h) Positive Psychology	4.2	h) Positive Psychology	4.7
i) 10-seconds Breathing Exercise for Relaxation	4.1	i) 10-seconds Breathing Exercise for Relaxation	4.8
j) Progressive Muscle Relaxation	4.1	j) Progressive Muscle Relaxation	4.6
OVERALL REMARKS OF THE MIND-WELL KIT	3.9	OVERALL REMARKS OF THE MIND-WELL KIT	4.6

Conclusion

The MBI toolkit has been systematically developed through expert consensus to ensure practical, culturally relevant application in primary care. The forthcoming validation phase will ensure that the practical toolkit effectively supports primary healthcare providers in managing mild to moderate depression patients.

References

1. Kriakous SA, Elliott KA, Lamers C, Owen R. The effectiveness of mindfulness-based stress reduction on the psychological functioning of healthcare professionals: a systematic review. *Mindfulness (N Y)* 2021; **12**(1):1-28. <https://doi.org/10.1007/s12671-020-01500-9>
2. Othman S, Essau CA. Adolescent health risk behaviors and mental health: evidence from the Malaysian National Health and Morbidity Survey 2017. *Asia Pac J Public Health* 2019; **31**(8 Suppl):6S-7S. <https://doi.org/10.1177/1010539519887322>
3. Querstret D, Morison L, Dickinson S, et al. Mindfulness-based stress reduction and mindfulness-based cognitive therapy for psychological health and well-being in nonclinical samples: a systematic review and meta-analysis. *Int J Stress Manag* 2020; **27**(4):394-411. <https://doi.org/10.1037/str0000165>
4. Schneider P, Farrokhyar F, Duong A, et al. Moving forward through consensus: protocol for a modified Delphi approach to determine the top research priorities in the field of orthopaedic oncology. *BMJ Open* 2016; **6**:e011780. doi:10.1136/bmjopen-2016-011780

EPIDOP12 / 389

Understanding the Home Tobacco Environment among Non-Tobacco Users in Malaysia: Insights from the National Health and Morbidity Survey 2023

Mohd Ruhaizie Riyadzi¹, Hamizatul Akmal Abd Hamid¹, Halizah Mat Rifin¹, Thamil Arasu Saminathan¹, Tania Gayle Robert Lourdes¹, Hasimah Ismail¹, Wan Kim Sui¹, Kishwen Kanna Yoga Ratnam¹, Joan Sonny Limbowoi Saimin¹, Norhafizah Sahril¹, Muhammad Fadhli Mohd Yusoff¹

¹Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

Corresponding authors: mohdruhaizie@moh.gov.my

Summary

This study analyzes data from NHMS 2023 to estimate the prevalence and correlates of perceived household tobacco exposure among non-tobacco-using adults (≥ 18 years) in Malaysia. An estimated 25.1% (4.87 million) reported such exposure, with higher prevalence among females, rural dwellers, individuals with lower education and income, and those with depression or hypertension. These associations reflect significant health and social disparities in secondhand exposure. Aligned with Malaysia's Tobacco Endgame 2040, which targets tobacco-free homes, especially for child protection, these findings underscore the urgency of evidence-based, population-specific interventions to mitigate involuntary exposure and advance tobacco control efforts.

Keywords

non-tobacco user, tobacco environment, exposure at home, secondhand smoke, secondhand vaping aerosol

Introduction

The home tobacco environment poses a hidden public health risk. Non-users may be involuntarily exposed to emissions from cigarettes, vapes, or heated tobacco products, increasing risks of adverse health outcomes and tobacco use initiation¹. Secondhand exposure is rising globally, especially among disadvantaged groups². This study aims to estimate the prevalence and describe characteristics of non-tobacco-using adults (≥ 18 years) in Malaysia exposed to household emissions from tobacco and nicotine products.

Materials and Methods

This study utilized data from the NHMS 2023: Non-Communicable Diseases, a nationally representative survey conducted by the Institute for Public Health, Ministry of Health Malaysia. A two-stage stratified random sampling method was applied. Trained personnel conducted face-to-face interviews using structured questionnaires adapted from the Global Adult Tobacco Survey (GATS)³. Adults aged ≥ 18 years were eligible. Data analysis was performed using IBM SPSS Statistics version 26.0 with

complex survey design. We estimated the prevalence of the perceived tobacco environment at home and examined its associations with sociodemographic characteristics and selected health outcomes using multivariate logistic regression (MLR) with significant value, $p < 0.05$.

Results and Discussion

Among 8,882 non-tobacco users aged ≥ 18 years, 25.1% (95% CI: 23.28-27.10; $n=2,321$), equivalent to approximately 4.87 million individuals, reported perceiving tobacco exposure at home. In Table 1, higher prevalence was observed among rural residents (33.7%), Malays or Orang Asli ethnicities (30.1%), females (29.1%), individuals aged 18-59 (26.4%), those with no or low education levels (27.8%), and individuals with depression (33.5%). MLR revealed urban residents had greater odds of perceiving exposure than rural residents (AOR=1.4, 95% CI: 1.24-1.58, $p < 0.001$). Males had higher odds than females (AOR=2.1, 95% CI: 1.90-2.40, $p < 0.001$), and those with no or lower education level had higher odds than those with higher education level (AOR=2.4, 95% CI: 2.03-2.89, $p < 0.001$). Ethnicities other than Malays and Orang Asli were more likely to perceive exposure (AOR=1.9, 95% CI: 1.73-2.16, $p < 0.001$). Low-income respondents (B40) were more affected than M40 or T20 (AOR=1.2, 95% CI: 1.06-1.32, $p = 0.003$). Perceived exposure was significantly associated with hypertension (AOR=1.5, 95% CI: 1.36-1.69, $p < 0.001$), sleep deprivation (AOR=1.1, 95% CI: 1.03-1.27, $p = 0.013$), and depression (AOR=1.6, 95% CI: 1.27-2.04, $p < 0.001$). The regression model showed good fit (Hosmer-Lemeshow $p = 0.117$; AUC=66.8%), no multicollinearity (VIF ≈ 1.0), and a correct classification rate of 75.5%. These findings highlight sustained involuntary tobacco exposure among vulnerable non-users and reinforce emerging evidence linking such exposure to adverse health outcomes.

Table 1: Association between non-tobacco users (≥ 18 years) in Malaysia ($N=8,882$) who perceived tobacco environment at home ($n=2,312$) with the sociodemographic and health outcome determinants

Variables	Prevalence, 95%CI	Estimated population (millions)	*Adjusted odd ratio (AOR), 95%CI
East Malaysia	28.0, 24.06-32.31	0.848	-
West Malaysia	23.7, 21.64-25.87	3.600	-
Urban	22.3, 20.20-24.47	3.249	1.5, 1.31-1.65, $p < 0.001$
Rural	33.0, 28.86-37.51	1.199	(Ref)
Malay or Orang Asli	29.5, 27.09-32.03	2.821	(Ref)
Other ethnicities	18.8, 16.30-21.55	1.627	1.8, 1.66-2.05, $p < 0.001$
Males	18.0, 15.57-20.74	1.334	2.0, 1.77-2.25, $p < 0.001$
Females	28.8, 26.73-30.91	3.114	(Ref)
18-59 years old	26.4, 24.31-28.52	3.986	(Ref)
≥ 60 years old	14.9, 12.86-17.20	0.462	2.0, 1.73-2.29, $p < 0.001$
Single or marriage compromised	23.3, 20.72-26.06	1.601	1.2, 1.07-1.33, $p = 0.001$

Married or living with partner	25.1, 23.00-27.23	2.840	(Ref)
No or lower education level	27.1, 25.01-29.21	4.055	2.5, 2.10-2.98, $p<0.001$
Higher education level	12.2, 10.17-14.65	0.388	(Ref)
Not working	22.2, 20.13-24.44	2.214	1.1, 1.00-1.26, $p=0.050$
Working	27.1, 24.70-29.57	2.214	(Ref)
Lower-income (B40)	25.2, 23.02-27.51	2.688	1.2, 1.03-1.29, $p=0.011$
Middle-income (M40) or higher-income (T20)	23.6, 20.81-26.65	1.760	(Ref)
Having diabetes mellitus	22.6, 19.48-26.08	0.662	-
Not having diabetes mellitus	24.8, 22.83-26.79	3.786	-
Having hypertension	21.4, 19.10-23.91	1.161	1.2, 1.08-1.36, $p=0.001$
Not having hypertension	25.7, 23.59-27.92	3.287	(Ref)
Having hypercholesterolemia	23.1, 20.86-25.47	1.434	-
Not having hypercholesterolemia	25.1, 22.94-27.40	3.014	-
Having at least one asthma attacked in the past 12 months	27.8, 20.62-36.33	0.083	-
No asthma attacked in the past 12 months	24.4, 22.50-26.33	4.357	-
Having sleep deprivation	26.7, 24.24-29.38	1.826	1.1, 1.03-1.27, $p=0.013$
Not having sleep deprivation	23.0, 20.95-25.22	2.622	(Ref)
Having depression	31.9, 26.12-38.40	0.238	1.6, 1.27-2.04, $p<0.001$
Not having depression	24.1, 22.26-26.08	3.859	(Ref)

Notes: *Multivariate logistic regression, ENTER mode. No interaction between variables in the final model. VIF-1.0, Hosmer-Lemeshow, $p=0.117$, the area under curve (AUC) = 66.8% and overall percentages in the classification table = 75.5%. The dashed symbol means variables were removed during Forward and Backward Logistic Regression mode.

Conclusion

In support of Malaysia's tobacco endgame 2040, where all tobacco use—including at home—will be prohibited, especially around infants and toddlers, this study highlights the urgent need for household-level interventions to protect non-users and vulnerable groups from tobacco environments at home and to advance a smoke-free generation.

Acknowledgement

We would like to express our appreciation to the Director General of Health on his permission to disseminate this finding in the 12th National Public Health Conference in conjunction with the 26th NIH Scientific Conference, 10-12 July 2025.

References

1. Ling MY, Lim KH, Hasani WS, et al. Exposure to secondhand smoke among school-going adolescents in Malaysia: findings from the tobacco and e-cigarettes survey among Malaysian adolescents (TECMA). *Tob. Induc. Dis.* **2020**;18:96.
2. Mohamed R, Naina-Mohamed I, Kumar J, et al. Smoking prevalence, exposure to secondhand smoke, and factors associated with smoking among medical, dental, and pharmacy students in a public university in Malaysia. *Tob. Induc. Dis.* **2024**;22:10-8332.
3. Institute for Public Health (IPH). *National Health and Morbidity Survey (NHMS) 2023: Non-Communicable Diseases and Healthcare Demand: Technical Report*. Kuala Lumpur: Ministry of Health Malaysia; 2024.
4. Abdul Mutalib RN, Abd Rani NL, Zulkifli A, et al. Knowledge, beliefs, and behaviors related to secondhand smoke and smoking in the home: a qualitative study with men in Malaysia. *Nicotine Tob. Res.* **2023**;25(4):821-7.
5. Lee HS, Su SJ, Yen ST, et al. Cigarette smoking and quitting by individuals in Malaysia. *J. Subst. Use.* **2023**;28(5):777-82.

EPIDOP13 / 390

When a Permanent Solution is Taken for a Temporary Problem: Exploring the Demographics of Suicide Mortality

Shubash Shander Ganapathy¹, Wan Kim Sui¹

¹Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: dr.shubash@moh.gov.my

Summary

Suicide is a urgent public health crisis. This study aims to describe the rates and patterns of mortality due to suicide between the year 2020 and 2023. The study was carried out using mortality data obtained from the Department of Statistics Malaysia (DOSM). The suicide rate in Malaysia was between 1.98 and 3.47 per 100,000 population in these years. Suicide rates were higher in West Malaysia, and hanging being the most common method of suicide. Comprehensive strategies for suicide prevention is essential for Malaysia.

Keywords

Suicide, SDG, mental health, urbanization

Introduction

Suicide is not just a mental health issue, but is increasingly recognized as an urgent public health crisis¹. The inclusion of suicide in the Sustainable Development Goals target 3.4.2 and the WHO's Thirteenth General Programme of Work has highlighted the importance of this issue and paved the way towards concentrated efforts towards monitoring and reducing suicide globally. Environmental, contextual, social, and biological factors all contribute towards the incidence of suicide². The multifaceted risks for suicide pose a significant challenge towards reducing the mortality arising from this complex phenomenon. A clear understanding of the trends and patterns is necessary towards preventing suicide. Despite this, there is paucity of data and studies looking into suicide, with scarce local data. This study aims to describe the rates and patterns of mortality due to suicide between the year 2020 and 2023.

Materials and Methods

The study was carried out using mortality data obtained from the Department of Statistics Malaysia (DOSM). For the first time in 2024, DOSM had established a Technical Working Group (TWG) to improve the data on mortality due to suicide, working closely and harmonizing their data the Royal Police Force of Malaysia (PDRM). International Classification of Diseases Tenth Edition (ICD-10) codes were used to identify the deaths due to suicide, with all deaths between X60 and X84 classified as suicide deaths³. Population figures were also obtained from DOSM, to determine the rates, and age-standardized rates. All analysis was carried out using Microsoft Excel.

Results and Discussion

A total of 3,813 deaths from suicide occurred in Malaysia between the year 2020 and 2023, with suicide rate between 1.98 and 3.47 per 100,000 population in these years. A total of 81.4% of the deaths happen among males, with a rate of 3.10 to 5.51 deaths per 100,000 each year, while females were found to have suicide death rates of 0.74 to 1.26 deaths per 100,000 each year. The mean age of suicide was 40.6 ± 16.6 years. A suicide rate of 3.47 per 100,000 population, is lower than the estimated global suicide rate of 5.4 per 100,000, but still higher than the regional estimate of 2.3 per 100,000⁴. Suicide rates were lower in the 2020, compared to other years, which show a more consistent pattern (Figure 1). This was most likely due to the pandemic and imposed Movement Control Order (MCO) during that period of time. The suicide rates were also found to be higher in West Peninsular Malaysia, with the highest rates reported in Penang (5.68 per 100,000), Kuala Lumpur (5.09 per 100,000) and Perak (4.46 per 100,000). The lowest rates of suicide were reported in Kelantan (0.95 per 100,000) and Terengganu (0.99 per 100,000) (Figure 2). This suggests an association between urbanization and suicide deaths. Hanging was the most common method of suicide, that being the method of choice between 65.6% and 75.2% of suicides each year. Falling from height accounted for 12.5% to 20.0% each year, while burning contributed to 2.0% and 3.6% of suicides each year. Analysis a small portion of data, where available from PDRM, found that 45.2% of deaths due to hanging happened due to mental health issues, 21.3% due to family problems, and 13.1% due to financial issues. This highlights a need for mental health care, especially in urban areas.

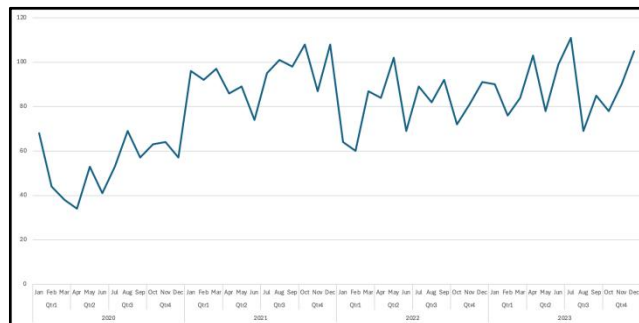


Figure 1: Trend of Suicide Mortality between Jan 2020 and Dec 2023



Figure 2: Distribution of Suicide Rates (per 100,000 population) by State in Malaysia

Conclusion

Every death due to suicide is a preventable mortality. Strategies for suicide prevention should be made fit for regional needs⁵. Action should be taken to improve mental health care, while improving public health measures, strengthening community networking, and implementing comprehensive plans to address the wider issues of socioeconomic factors.

References

1. American Public Health Association. Violence is a public health issue: public health is essential to understanding and treating violence in the U.S. <https://www.apha.org/policiesand-advocacy/public-health-policystatements/policydatabase/2019/01/28/violence-is-a-public-health-issue> (accessed Apr 28, 2025).
2. *Lancet Public Health*. A public health approach to suicide prevention. *Lancet Public Health* 2024;**9**:e709.
3. United Nations. SDG Indicator 3.4.2 metadata. <https://unstats.un.org/sdgs/metadata/files/Metadata-03-04-02.pdf> (accessed Apr 28, 2025).
4. Weaver ND, Bertolacci GJ, Rosenblad E, et al. Global, regional, and national burden of suicide, 1990-2021: a systematic analysis for the Global Burden of Disease Study 2021. *Lancet Public Health* 2025;**10**(3):e189-202.
5. World Health Organization. *Live life: an implementation guide for suicide prevention in countries*. <https://www.who.int/publications/i/item/9789240026629> (accessed Apr 30, 2025).

EPIDOP14 / 391

Antimicrobial Resistance Trends of Gram-Negative Infections in Malaysia: 2018 - 2022.

Audrey Huili Lim¹, Norazida Ab Rahman¹, Hana Farizah binti Zamri², Murnihayati Hassan², Rohaidah Hashim², Sheamini Sivasampu^{1,3}, Peter Seah Keng Tok¹

¹ Institute for Clinical Research, National Institutes of Health, Malaysia

² Institute for Medical Research, National Institutes of Health, Malaysia.

³ National Public Health Laboratory, Ministry of Health, Malaysia

Corresponding author's email: audreylim.moh@gmail.com

Summary

This study analysed trends in antimicrobial resistance (AMR) among key gram-negative pathogens in Malaysian public hospitals from 2018 to 2022. Using WHONET data and joinpoint regression, we observed significant fluctuations in resistance rates, with peaks for *Acinetobacter baumannii* and *Klebsiella pneumoniae* aligning with the height of the COVID-19 pandemic. *Pseudomonas aeruginosa* showed earlier increases, while *Escherichia coli* resistance rose post-2020. These findings suggest the pandemic contributed to AMR surges through increased antibiotic use and hospital strain. Strengthened AMR surveillance and stewardship efforts are crucial, especially during health crises, to mitigate resistance and preserve antibiotic efficacy.

Introduction

Antimicrobial resistance (AMR) is an escalating global health crisis that threatens the efficacy of antibiotics and undermines decades of progress in modern medicine. It contributes to increased morbidity, prolonged hospital stays, elevated healthcare costs, and higher mortality rates. Aerobic gram-negative bacilli, particularly *Enterobacteriaceae* and non-lactose fermenting organisms such as *Pseudomonas aeruginosa* and *Acinetobacter baumannii*, are leading causes of hospital-acquired infections and have shown alarming rates of resistance¹. In recent years, resistance among these pathogens has increased at an unprecedented rate, reaching levels that render some infections untreatable with conventional antibiotics. This study aims to describe the trends and temporal shifts in antimicrobial resistance among selected gram-negative organisms in Malaysian public hospitals from 2018 to 2022. Understanding these trends is crucial to identifying periods of elevated risk, evaluating the impact of systemic stressors such as the COVID-19 pandemic, and informing public health responses.

Materials and Methods

We analysed antimicrobial resistance data retrospectively from 35 public hospitals across Malaysia, extracted from the WHONET database maintained by the Ministry of Health Malaysia. The organisms of interest included carbapenem-resistant *Escherichia coli* (CREC) and *Klebsiella pneumoniae* (CRKP), as well as multidrug-resistant (MDR) *Acinetobacter baumannii* and (MDR) *Pseudomonas aeruginosa*. CREC and CRKP were

defined as resistance to either imipenem or meropenem. MDR refers to an isolate that exhibits resistance to more than two classes of antibiotic agents. Resistance rates were defined as the number of resistant isolates per 10,000 patient admissions. We applied joinpoint regression using the Joinpoint Trend Analysis Software (Version 5.4.0.0) developed by the Surveillance Research Program of the U.S. National Cancer Institute². This method identifies significant temporal changes in trend, known as changepoints. A log-linear model was used within each segment to calculate the monthly percentage change (MPC), with statistical significance defined as $p < 0.05$.

Results and Discussion

Multidrug-resistant (MDR) *Acinetobacter baumannii* exhibited the highest antimicrobial resistance (AMR) rates among the pathogens studied, peaking at 560 isolates per 10,000 admissions in August 2021 (Figure 1). Joinpoint regression identified three significant changepoints: a decline in resistance from January 2018 to March 2021 (MPC = -0.002), a sharp increase from March to August 2021 (MPC = +0.224), and a subsequent decline until December 2021 (MPC = -0.216), after which rates plateaued (Table 1). A similar trend was observed for CRKP, which also peaked in August 2021, coinciding with the height of COVID-19 hospitalizations in Malaysia³. This temporal overlap suggests that pandemic-related hospital strain—such as increased admissions, prolonged stays, and heightened antibiotic use—may have contributed to the spike in resistance. MDR *Pseudomonas aeruginosa* showed a different trajectory, with an initial increase beginning from a changepoint in November 2019, peaking later in October 2021 and declining thereafter (MPC = -0.02). This pattern suggests a possible pre-pandemic rise with only partial influence from COVID-19-related disruptions. In contrast, CREC remained stable until December 2020, followed by a significant and sustained increase through the study's end (MPC = +0.056), indicating differing transmission dynamics or antibiotic exposure patterns compared to the other organisms studied. These trends align with global observations of surges in resistant gram-negative infections during the COVID-19 pandemic⁴. This may be attributed to an increase in inappropriate antibiotic use in COVID-19 patients, which exerts selective pressure favouring the proliferation and spread of resistant pathogens⁵. However, the data should be interpreted with caution. Potential underreporting, variability in diagnostic capacity, and resource constraints during COVID-19 may have influenced surveillance accuracy. Hospitals overwhelmed by the pandemic may have deprioritized routine AMR testing or lacked the resources for consistent data collection, possibly leading to fluctuations unrelated to true resistance trends.

Conclusion

The COVID-19 pandemic may have significantly contributed to the emergence and spread of resistant gram-negative pathogens in hospitals, with resistance peaks aligning with increased COVID-19 admissions. This highlights the need for ongoing surveillance and targeted interventions to manage antimicrobial resistance during future health crises.

Table 1: Joinpoint regression analysis of rate of antimicrobial resistance microorganisms (isolates per 10,000 admissions) across 35 public hospitals from 2018 to 2022.

Microorganism	Segment	Period	MPC	P-value
<i>Acinetobacter baumannii</i>	Segment 1	January 2018 - March 2021	-0.002	0.364
	Segment 2	March 2021 - August 2021	0.224	<0.001
	Segment 3	August 2021 - December 2021	-0.216	0.004
	Segment 4	December 2021 - December 2022	0.007	0.485
<i>Pseudomonas aeruginosa</i>	Segment 1	January 2018 - November 2019	-0.047	<0.001
	Segment 2	November 2019 - October 2021	0.009	<0.001
	Segment 3	October 2021 - December 2022	-0.020	0.004
<i>Escherichia coli</i>	Segment 1	January 2018 - December 2020	-0.004	0.515
	Segment 2	December 2020 - December 2022	0.056	<0.001
<i>Klebsiella pneumoniae</i>	Segment 1	January 2018 - December 2018	-0.058	0.001
	Segment 2	December 2018 - March 2021	0.020	<0.001
	Segment 3	March 2021 - August 2021	0.164	0.006
	Segment 4	August 2021 - December 2022	-0.019	0.003

MPC: Monthly Percentage Change

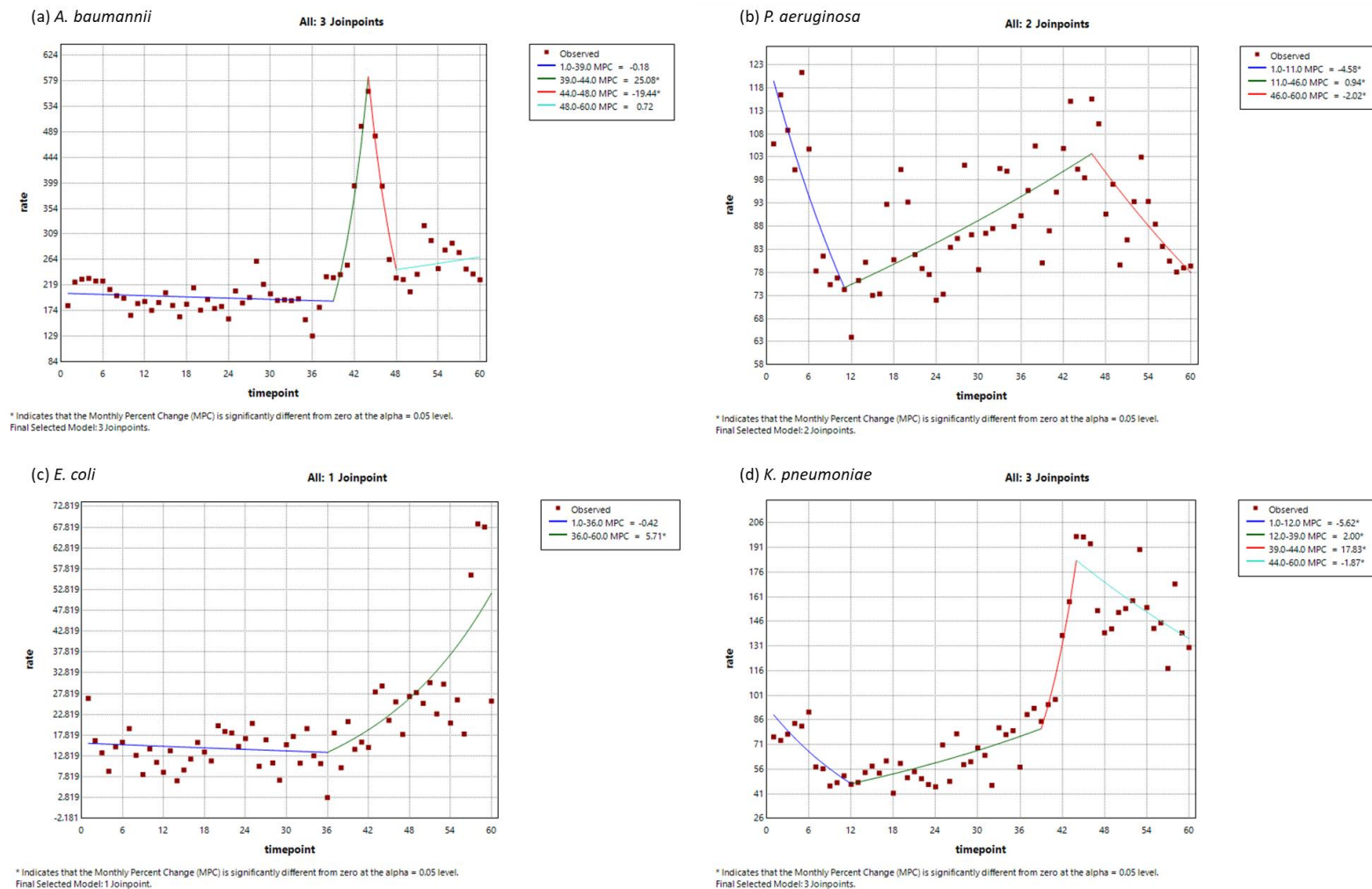


Figure 1: Trends in rates of (a) multidrug resistant *A. baumannii*, (b) multidrug resistant *P. aeruginosa*, (c) CRE *E. coli* (CREC), and (d) CRE *K. pneumoniae* (CRKP) (isolates per 10,000 admissions).

References

1. Mehrad B, Clark NM, Zhanel GG, et al. Antimicrobial resistance in hospital-acquired gram-negative bacterial infections. *Chest*. **2015**;147(5):1413-21.
2. National Cancer Institute. *Joinpoint Regression Program* [Internet]. Version 5.4.0.0. Statistical Methodology and Applications Branch, Surveillance Research Program; 2025.
3. Md Nadzri MN, Md Zamri ASS, Singh S, et al. Description of the COVID-19 epidemiology in Malaysia. *Front Public Health*. **2024**;12
4. Petrakis V, Panopoulou M, Rafailidis P, et al. The impact of the COVID-19 pandemic on antimicrobial resistance and management of bloodstream infections. *Pathogens*. **2023**;12(6).
5. Clancy CJ, Buehrle DJ, Nguyen MH. PRO: the COVID-19 pandemic will result in increased antimicrobial resistance rates. *JAC Antimicrob Resist*. **2020**;2(3):dlaa049. doi:10.1093/jacamr/dlaa049

EPIDOP15 / 396

Prevalence of Albuminuria in Malaysia: Early Signs of Kidney Damage in Diabetic and Non-Diabetic Populations

Tania Gayle Robert Lourdes¹, Thamil Arasu Saminathan¹, Mohd Azmi Bin Suliman¹

¹Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: drtania@moh.gov.my

Summary

Albuminuria, a key marker of early kidney damage, is strongly associated with diabetes mellitus (DM) and serves as a predictor for chronic kidney disease (CKD) progression. This study aimed to assess the prevalence of albuminuria among adults in Malaysia, according to diabetic status, using data from the MyCKD 2024 survey. Findings revealed that among all respondents, 23.6% of individuals with diabetes had albuminuria compared to 5.2% of those without diabetes. These results underscore the urgent need to implement routine albuminuria screening, particularly among high-risk diabetic populations, to facilitate early detection and intervention strategies aimed at preventing CKD progression.

Keywords

Albuminuria; Diabetes Mellitus; Chronic Kidney Disease; Prevalence; Malaysia

Introduction

Albuminuria, characterised by elevated levels of albumin in the urine, is a critical biomarker of early renal damage and endothelial dysfunction. It plays an essential role in diagnosing chronic kidney disease (CKD) and serves as a predictor of cardiovascular morbidity and mortality¹. Diabetes mellitus (DM) remains a leading global cause of albuminuria due to its adverse effects on glomerular function¹. In Malaysia, the prevalence of diabetes has been steadily increasing, now affecting approximately one in six adults², thereby heightening the risk of diabetic nephropathy—one of the primary contributors to end-stage renal disease (ESRD)³. Despite advancements in diabetes management, awareness and routine screening for albuminuria remain suboptimal, particularly within primary care settings⁴. Early detection through cost-effective urine tests can significantly delay or prevent CKD progression⁴. This study provides updated national estimates of albuminuria prevalence, emphasising its burden among individuals with or without diabetes to inform targeted screening and intervention policies.

Materials and Methods

The Population-Based Study on the Prevalence of Chronic Kidney Disease Among Adults in Malaysia (MyCKD) 2024 was a nationally representative, cross-sectional survey aimed at assessing kidney health among adults aged 18 years and above. A multistage stratified sampling approach was used to ensure representativeness across urban and rural populations. A total of 1,259 respondents participated in the study. Urinary albumin levels were measured using spot urine samples, classified by the standard clinical threshold classification: normoalbuminuria (<30 mg/g), microalbuminuria (30-300 mg/g), and macroalbuminuria (>300 mg/g)¹. Diabetes status was determined based on self-reported physician diagnosis or

elevated fasting blood glucose. Prevalence rates were estimated for the overall population and stratified by diabetic status. Data were analysed using R (version 4.4.1) with the survey package to account for sampling weights, strata, and clustering. Analyses incorporated complex survey design, reporting 95% confidence intervals (CI) and coefficients of variation (CoV) to ensure precision and reliability.

Results and Discussion

The total number of respondents in the study was 1,259, yielding a 80.8% response rate. There were 1,097 respondents without CKD and 160 respondents with CKD. Mean age in years was 49.2 overall while 61.1 for those with CKD and 47.4 for those without CKD. There were more female respondents (56.8%) compared to male respondents (43.2%). Majority of the respondents were of Malay/Orang Asli ethnicity (50.5%), secondary school educated (60.6%), B40 income category (74.5%), current smokers (77.6%) and current e-cigarette users (75.8%). Almost half of the respondents had hypertension (49.3%) while 21.7% had diabetes and 29.0% had hypercholesterolaemia. More than half of the respondents were overweight and obese (56.8%) while 59.3% had abdominal obesity. Microalbuminuria affected 17.9% of diabetics and 4.7% of non-diabetics, while macroalbuminuria was observed in 5.7% and 0.5%, respectively. The overall prevalence of albuminuria (combining microalbuminuria and macroalbuminuria) among adults in Malaysia was 7.5%. Among individuals diagnosed with diabetes, the prevalence of albuminuria was significantly elevated at 23.6%, compared to 5.2% among those without diabetes. A stark disparity was observed when stratified by diabetes status. These findings align with global patterns where diabetes is a predominant driver of early kidney damage [3]. The high proportion of albuminuria among diabetics in Malaysia reflects both the metabolic burden posed by uncontrolled hyperglycaemia and potential gaps in routine monitoring. International guidelines, including those by KDIGO, advocate for annual screening of albuminuria in all patients with diabetes as part of comprehensive CKD risk management¹. Moreover, albuminuria is not only a renal risk marker but also an independent predictor of cardiovascular events, further amplifying its public health significance. Proactive measures such as incorporating albuminuria screening into existing non-communicable disease (NCD) programmes could yield substantial benefits⁴.

Table 1: Prevalence of overall albuminuria (n = 1,259)

Albuminuria	Count	%	Upper CI	Lower CI	CoV
Normoalbuminuria	1,109	92.5	90.73	93.99	0.009
Microalbuminuria	120	6.3	4.94	7.94	0.120
Macroalbuminuria	30	1.2	0.81	1.79	0.199

Table 2: Prevalence of albuminuria by diabetes status (n=1,184*)

Albuminuria	Diabetes (n = 256)					No Diabetes (n = 928)				
	Count	%	Upper CI	Lower CI	CoV	Count	%	Upper CI	Lower CI	CoV
Normoalbuminuria	182	76.4	68.18	82.96	0.049	855	94.8	93.06	96.13	0.008
Microalbuminuria	54	17.9	12.20	25.47	0.186	64	4.7	3.46	6.41	0.156
Macroalbuminuria	20	5.7	3.63	8.97	0.228	9	0.5	0.21	1.05	0.403

*with some missing DM status

Conclusion

This study reveals a high burden of albuminuria among adults in Malaysia, especially those with diabetes. Routine screening for early detection and intervention are crucial to prevent CKD progression and cardiovascular risks. Albuminuria screening should be further emphasised in national NCD strategies as it offers a simple, low-cost method to detect early kidney damage and improve health outcomes.

References

1. Levey AS, et al. Definition and classification of CKD: a KDIGO update. *Kidney Int.* **2023**;103(4):820-35.
2. Institute for Public Health (IPH). *National Health and Morbidity Survey (NHMS) 2023: Non-Communicable Diseases and Healthcare Demand, Malaysia. Technical Report.* Kuala Lumpur: Institute for Public Health; 2024.
3. Goh BL, et al. Kidney disease in Malaysia: past, present, and future. *Nephrology (Carlton).* **2020**;25(S2):3-9.
4. Zhang L, et al. Screening strategies for CKD: focus on albuminuria detection. *Lancet Reg Health West Pac.* **2021**;12:100192.

EPIDOP16 / 403

Delay in Diagnosis among Dengue Cases in Perak: A Seven Year Retrospective Analysis

Nur Intan Kartiniawatie Kamaruddin¹, Mohd Fadhli bin Samsuri²

¹ Manjung District Health Office, Ministry of Health Malaysia

² Perak State Health Department, Ministry of Health Malaysia

Corresponding author's email: dr.kartiniewatie@moh.gov.my

Summary

Timely diagnosis and management of dengue infection play a critical role in improving patient outcomes and preventing outbreaks. Evidence has shown that delay in dengue diagnosis is associated with poor dengue outcomes. This study aimed to describe the socio-demographic, clinical, epidemiological and environmental characteristics of dengue cases registered in Perak State from 2018 to 2024, determine the proportion of cases with delay in diagnosis and determine factors associated with delay in diagnosis among such cases.

Keywords

Dengue. Delay in diagnosis. Dengue mortality.

Introduction

Without early recognition, patients who are at risk of developing severe dengue may not receive timely interventions, increasing dengue morbidity and mortality^{1,2}. Definition of delayed diagnosis varied with the accepted range to be within three to six days^{2, 3}, while Malaysia uses a cut-off point of three days from onset to diagnosis of dengue as part of the initiatives in its National Strategic Plan of Dengue Prevention and Control⁴. Delays in diagnosing dengue fever stem from multiple factors which can be grouped into patient-related, healthcare system-related, and disease-specific challenges⁵⁻⁷. This study was aimed to describe the socio-demographic, clinical, epidemiological and environmental characteristics of dengue cases registered in Perak State from 2018 to 2024, determine the proportion of cases with delay in diagnosis and determine factors associated with delay in diagnosis

Materials and Methods

This study employed cross sectional study design using secondary data obtained from e-Dengue registry. Cases diagnosed and registered in Perak State from 2018 to 2024 was sorted into a linelisting, cleaned and explored. Data was then analysed using IBM Statistical Package for Social Sciences Version 28 to answer research questions using descriptive and inferential statistical tests. Variables studied were grouped into outcome variables (delay in diagnosis defined as case diagnosed after three days of onset), and socio-demographic, epidemiological, clinical, and environmental characteristics. Chi square and multivariable analysis using logistic regression modelling were performed to identify factors associated with delay in diagnosis among dengue cases in Perak registered from 2018 to 2024. Model fit was checked to ensure all assumptions are met.

Results and Discussion

Out of 22,008 dengue cases registered in Perak, 55.1% were male, 97.1% were Malaysians, 50.3% of Malay ethnic group and 46.9% were employed. Median age of the patients were 34 years old (IQR=33). Majority of the patients did not have warning signs (65.8%), had positive NS1Ag test (69.7%), had thrombocytopenia (99.0%), and had normal total white cells (52.3%). Majority of cases were linked to outbreaks (62.3%) and were notified by government hospital (35.2%) and followed by government health clinics (31.7%), came from urban districts (74.5%), priority I area (80.9%), had dumping grounds (69.8%) and did not have empty land lots in their locality areas (53.4%).

8165 of cases were diagnosed after three days of onset (37.1%) and defined as having delayed diagnosis. Factors that were significantly associated with delay in diagnosis among registered dengue cases include admission to hospital (AOR=1.162, 95%CI=1.080,1.249, $P<0.001$), unemployment (AOR=1.104, 95%CI=1.034,1.179, $P=0.003$), notifications from private healthcare facilities (AOR=1.104, 95%CI=1.034, 1.179, $P=0.003$), positive NS1 Antigen (AOR=1.801, 95%CI=1.701, 1.907, $P=<0.001$), suburban locality (AOR=0.797, 95%CI=0.745, 0.852, $P<0.001$), and age (AOR=0.996, 95%CI=0.994,0.998, $P<0.001$).

Conclusion

Public health measures to improve timely diagnosis is necessary as more than one-third of cases were diagnosed after three days (later than outlined in national dengue prevention and control guidelines). Targeted measures such as awareness campaigns, engagement with local leaders and promotion for dengue testing among private practitioners can be considered to improve timely detection of dengue infection.

References

1. Wong PF, Wong LP, AbuBakar S. Diagnosis of severe dengue: challenges, needs and opportunities. *J Infect Public Health*. 2020;13(2):193-8.
2. Wongchidwan N, Wattanagoon Y, Luvira V, Iamsirithaworn S. Delayed care-seeking and outcome of dengue-infected patients. *Trop Doct*. 2018;48(1):30-3.
3. Linn NN, Kyaw KW, Shewade HD, et al. Notified dengue deaths in Myanmar (2017-18): profile and diagnosis delays. *F1000Res*. 2020;9:579.
4. Ministry of Health Malaysia. *Pelan Strategik Pencegahan dan Kawalan Denggi Kebangsaan*. Putrajaya: Ministry of Health Malaysia; 2022.
5. Nelwan EJ, Syam AF, Nelwan EJ. Dengue fever diagnosis during the COVID-19 pandemic: challenges and perspectives. *Infect Dis Rep*. 2023;15(2):250-8.
6. Ng LG, Tan LK, Tan CH, et al. Dengue knowledge, attitudes, and practices and their impact on dengue incidence in Singapore. *Am J Trop Med Hyg*. 2021;104(3):810-6.
7. Fonseca-Portilla RB, García-Correa C, Martínez-Vega RA. Self-medication practices and delayed healthcare seeking in dengue patients: a study from Mexico. *PLoS Negl Trop Dis*. 2021;15(6):e0009531.

EPIDOP17 / 408

Prevalence of Chronic Kidney Disease in Malaysia: Findings from the MyCKD 2024 Study

Thamil Arasu Saminathan¹, Sunita Bavanandan², Loh Chek Loong³, Muhammad Fadhli¹, Mohd Azmi bin Suliman¹, Tania Gayle Robert Lourdes¹, Halizah Mat Riffin¹, Hasimah Ismail¹, Esther Tan Zhao Zhi⁴, Irene Wong⁵, Hamizatul Akmal Abd Hamid¹, Noor Ani Ahmad¹

¹ Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

² Hospital Kuala Lumpur

³ Hospital Raja Permaisuri Bainun, Ipoh

⁴ Hospital Selayang

⁵ Hospital Tengku Ampuan Rahimah, Klang

Corresponding Author: thamilarasu.s@moh.gov.my

Summary

Chronic kidney disease (CKD) is a major global public health issue, contributing significantly to increased morbidity, premature mortality, and escalating healthcare costs. The burden of CKD is amplified in countries facing high rates of non-communicable diseases (NCDs), such as Malaysia. This study presents updated national prevalence estimates of CKD based on data from the MyCKD 2024 survey. Using the latest CKD-EPI 2021 equation, the overall CKD prevalence among Malaysian adults was found to be 7.3%. The analysis revealed notable variations across demographic groups and clinical conditions. These findings emphasise the critical need for sustained surveillance, early detection programmes, and targeted public health interventions to manage and reduce the CKD burden.

Keywords

Chronic kidney disease, Prevalence, Malaysia, Non-communicable diseases, public health

Introduction

Chronic kidney disease (CKD) affects nearly 10% of the global adult population, posing a substantial risk for cardiovascular diseases, kidney failure, and premature death¹. In Malaysia, CKD prevalence increased from 9.1% in 2011 to 15.5% in 2018, reflecting both a growing disease burden and enhanced detection efforts^{2,3}. This rise has placed additional strain on the healthcare system due to the high costs associated with dialysis and long-term management. In response, the Ministry of Health Malaysia introduced the National Action Plan for Healthy Kidneys 2018-2025, aiming to curb CKD progression through prevention, early diagnosis, and integrated care. The Population-Based Study on the (MyCKD) 2024 study provides essential data to assess current trends, evaluate public health strategies, and guide future policy decisions to address CKD effectively.

Materials and Methods

The MyCKD 2024 study was a nationwide cross-sectional survey conducted among adults aged 18 years and above, across Malaysia. A multistage stratified sampling design was employed to ensure national representativeness. CKD was defined

according to the *Kidney Disease: Improving Global Outcomes* (KDIGO) guidelines. Classification was based on the CKD-EPI 2021 equation, incorporating estimated glomerular filtration rate (eGFR) and persistent albuminuria measurements from collected blood and urine samples. Prevalence estimates were calculated using complex survey methods in R (version 4.4.1) with the ‘survey’ package, accounting for weighting, stratification, and clustering. Importantly, the standardisation approach, sampling design, and analytical framework remained consistent with the MyCKD 2018 survey. Importantly, both surveys followed consistent methodology, ensuring comparability through identical use of survey weights, multistage design, and standardised analysis procedures.

Results and Discussion

A total of 1,265 respondents participated in the study. The overall prevalence of CKD in Malaysia was 7.8%, demonstrating a significant reduction compared to the 15.5% reported in 2018. This reduction is epidemiologically meaningful and not attributable to methodological changes, as the same CKD-EPI 2009 equation, sampling design, and laboratory standardisation were applied in both surveys. In addition, the data processing and statistical analysis approaches were maintained consistently between surveys, ensuring comparability. When reanalysed using the newer CKD-EPI 2021 equation, the prevalence dropped slightly further to 7.3%, reinforcing the trend.

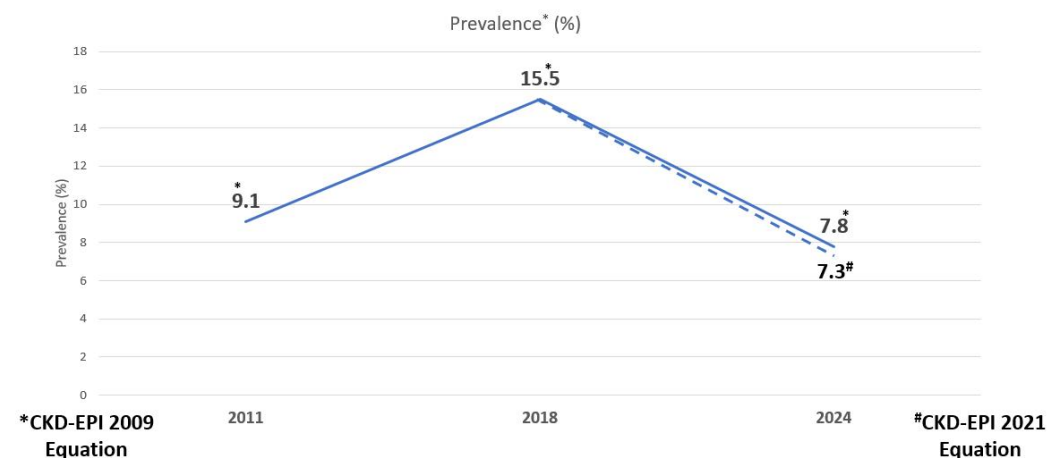


Figure 1: Trend of CKD Prevalence in Malaysia

Figure 1 illustrates the trend in CKD prevalence over recent years. The decline in CKD prevalence likely reflects the positive impact of public health initiatives, including improved NCD management and increased kidney health awareness. It may also be partially influenced by COVID-19-related mortality among high-risk individuals, with similar downward trends observed in countries like Taiwan and China following national CKD strategies ^{4,5}. Subgroup analysis showed higher CKD prevalence among females (8.1%) and rural populations (9.7%), highlighting potential disparities in risk exposure and access to healthcare services. Clinical factors strongly associated with higher CKD prevalence included diabetes (25.1%), hypercholesterolaemia (20.5%), cardiovascular disease (24.7%), and abdominal obesity (8.9%). Additionally, individuals with lower educational attainment and those classified as overweight or obese exhibited elevated prevalence rates. The

findings reaffirm the importance of targeted interventions, especially for high-risk populations. Continued nationwide screening, public education, and alignment with the National Action Plan for Healthy Kidneys are essential to sustain this positive trend and further reduce the CKD burden in Malaysia.

Conclusion

The MyCKD 2024 study highlights a promising decline in CKD prevalence in Malaysia, likely reflecting progress in public health efforts, NCD management, and early detection. Nonetheless, challenges remain among vulnerable and high-risk groups. Sustaining these gains requires continued prioritisation of CKD in the national health agenda, with emphasis on prevention, equitable access, and surveillance. Strengthening multi-sectoral collaboration and upholding the National Action Plan for Healthy Kidneys will be key to achieving lasting reductions in CKD burden and improving population health.

References

1. Jadoul M, et al. The major global burden of chronic kidney disease. *Lancet Glob Health*. 2024;12(3):e342-3.
2. Hooi LS, et al. Prevalence of CKD among adults in West Malaysia. *Kidney Int*. 2013;84(5):1034-40.
3. Saminathan TA, et al. Prevalence of CKD in Malaysia: a nationwide study. *BMC Nephrol*. 2020;21:344.
4. Hwang SJ, et al. CKD care programs and incident kidney failure: a study of a national disease management program in Taiwan. *Kidney Int Rep*. 2021;6(6):1505-13.
5. Zhang L, et al. Prevalence of chronic kidney disease in China: results from the Sixth China Chronic Disease and Risk Factor Surveillance. *JAMA Intern Med*. 2023;183(1):81-9.

EPIDOP18 / 411

Invisible Exposure: Epidemiologic Clues from a Mucormycosis Outbreak in a Maternal and Child Centre in East Coast of Peninsular Malaysia

Noorfariza Nordin ¹, Hasniza Abdullah ², Azmani Wahab ³, Suhaiza Sulaiman⁴, Nor Zubaidah Kadir ³, Radhiah Abu Bakar ³

¹ *Gua Musang District Health Office, Kelantan State Health Department, Ministry of Health Malaysia*

² *Kelantan State Health Department, Ministry of Health Malaysia*

³ *Terengganu State Health Department, Ministry of Health Malaysia*

⁴ *Epidemiology Intelligence Program (EIP) Malaysia*

Corresponding author's email: drnoorfariza@moh.gov.my

Summary

In 2023, an extensive mucormycosis outbreak occurred in a maternal and child centre in east coast of Peninsular Malaysia affecting 55 neonates with a 23.6% case fatality rate. The investigation identified nosocomial transmission linked to environmental contamination, including linens and equipment, with *Rhizopus* species isolated from clinical and environmental samples. Risk factors include neonates delivered via caesarean section, and critically ill. Low index of suspicion, delayed in case detection, and delayed outbreak declaration had contributed to prolonged transmission. This outbreak highlights the need for robust surveillance on fungal infection, strict linen management, and improved infection prevention measures to prevent future fungal outbreaks in neonatal healthcare settings.

Keywords

Mucormycosis, nosocomial infection, linen contamination, fungal surveillance, neonatal death

Introduction

Mucormycosis is an infection caused by species of filamentous molds called mucormycetes belonging to order Mucorales. It primarily affects immunocompromised individuals and is rare in neonates ^{1,2,4}. In neonatal, mucormycosis often mimics necrotizing enterocolitis (NEC), with high mortality and diagnostic challenges. In April 2023, a case of mucormycosis was reported by a maternal and child centre in east coast of Peninsular Malaysia, and outbreak was declared on September 2023 after nine (9) cases were recorded including seven (7) neonatal death, mainly in Neonatal Intensive Care Unit (NICU). The prolonged outbreak was notified to the state Communicable Disease Unit in December 2025 and subsequently the Epidemic Intelligence Program (EIP) team was activated to identify the possible source and risk factors as well as to provide recommendations to halt the outbreak transmission.

Materials and Methods

An outbreak investigation including the epidemiological, laboratory, and environmental investigation was conducted. Operational case definition was established for suspected, probable, and confirmed cases. Case findings were done by reviewing registered cases from April to December 2023. Medical records for all probable and confirmed cases were investigated including the socio-demography details, clinical details, neonatal risk, mother risk and laboratory profile. The line listing of the cases was developed and updated. An environmental risk assessment was done through a walkthrough survey to assess the risk of infection in the centre including in the central clean linen store. The environmental sampling results including equipment and linen samples taken by the centre's team were reviewed. Descriptive analysis was employed and data were analysed using Jamovi 1.6.15

Results and Discussion

A total of 55 cases were recorded including 23 confirmed and 32 probable cases with an overall case fatality rate of 23.6% (Table 1). Most infected were term neonates (54.6%) delivered via caesarean section (69.1%). Gastrointestinal signs with radiological evidence were common. Of the 12 neonates who underwent laparotomy, 9 (75%) was histologically confirmed as mucormycosis originating from the stomach. The epidemic curve (Figure 1) indicated a prolonged continuous point source outbreak. Cases were infrequent during the initial 5-months period with high case fatality ($8/10=80.0\%$) which markedly reduced ($5/40=12.5\%$) after declaration of the outbreak. Out of 197 environmental samples, 26 (13.2%) tested positive for fungal contamination with linen and equipment had the highest positivity rates, 18.8% and 18.6% respectively. The presence of multiple cracked linen storage surfaces and disinfection cycles for incubators exceeded recommended intervals, and served as potential fungal reservoirs. Air sampling in operating theatres showed persistent fungal presence before and after terminal cleaning. This prolonged outbreak was contributed by a low index of suspicion in the beginning, delayed diagnosis and case detection, no proper laboratory surveillance on fungal infection and late declaration of the outbreak. The cases were concentrated in NICU due to pockets of immunocompromised neonates requiring extensive care and undergoing multiple procedures ^{1,2,4}. Nosocomial infection of mucormycosis occurs with gastrointestinal tract (GIT) involvement that results from ingestion of fungal spores, umbilical catheterization, and assisted ventilation (1,2,4). Positive environmental samples were found in clean linens and equipment; and in line with a study by Duffy (2014) that found hospital linens as a possible vehicle for *Rhizopus* and has been isolated from cultures of clean linens ³.

Table 1: Characteristics of cases in mucormycosis outbreak (n=55)

Variables	Confirmed cases (n=23)		Probable cases (n=32)		Total (n=55)	
	n	(%)	n	(%)	n	(%)
Gestation						
Term (≥ 38 wk)	15	(65.2)	15	(46.7)	30	(54.6)
Prem (< 38 wk)	8	(34.8)	17	(53.1)	25	(45.4)
Neonatal Risk						
RDS						
PPHN	7	(30.4)	14	(43.8)	21	(38.2)
Presumed sepsis	6	(26.1)	4	(12.5)	10	(18.2)
Septicemic shock	5	(21.7)	2	(6.3)	7	(12.7)
Neonatal asphyxia	1	(4.4)	1	(3.1)	2	(3.6)
Others	2	(8.7)	4	(12.5)	6	(10.9)
	2	(8.7)	7	(21.8)	9	(16.4)
Status						
Alive	13	(56.5)	29	(90.6)	42	(76.4)
Death	10	(43.5)	3	(9.4)	13	(23.6)

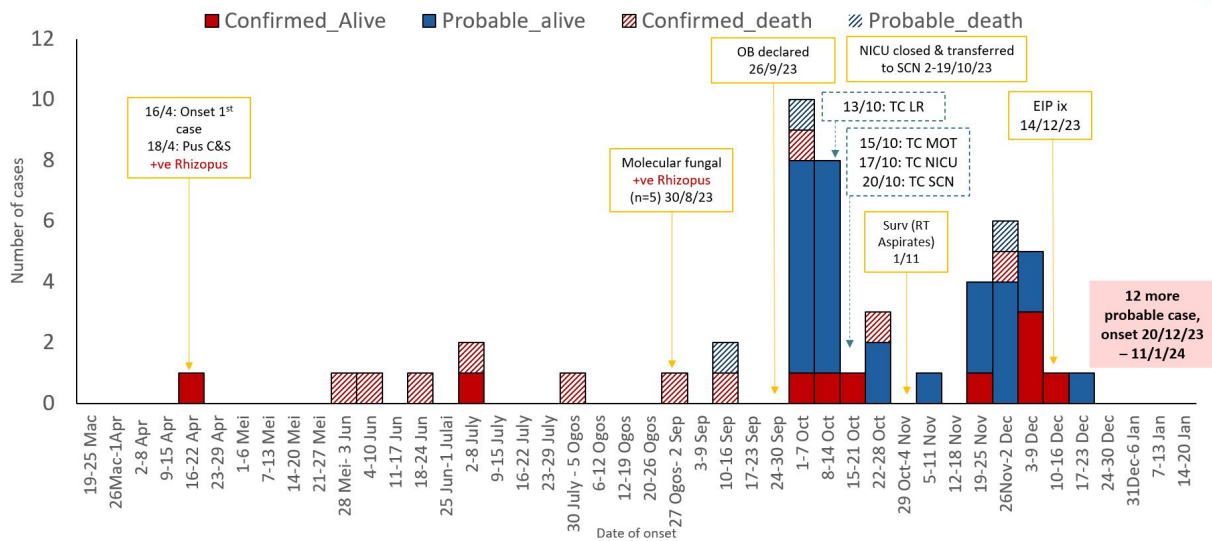


Figure 1: Epidemic curve of mucormycosis outbreak

Conclusion

Despite being rare, this was an extensive mucormycosis outbreak among neonates with devastating outcomes and high case fatality rate. A proper linen management, strict compliance on the IPC, early detection and aggressive management of the cases would prevent further outbreak and essential to reduce the mortality.

References

1. Hartnett KP, Jackson BR, Perkins KM, et al. A guide to investigating suspected outbreaks of mucormycosis in healthcare. *J Fungi*. 2019;5(3):69. doi:10.3390/jof5030069.
2. Bowers JR, Monroy-Nieto J, Gade L, et al. *Rhizopus microsporus* infections associated with surgical procedures, Argentina, 2006-2014. *Emerg Infect Dis*. 2020;26(5):937-44. doi:10.3201/eid2605.191045.
3. Duffy J, Harris J, Gade L, et al. Mucormycosis outbreak associated with hospital linens. *Pediatr Infect Dis J*. 2014;33(5):472-6. doi:10.1097/INF.0000000000000261.
4. Mathur NB, Gupta A. Neonatal zygomycosis with gastric perforation. *Indian Pediatr Case Rep*. 2013; unpublished page range (please confirm).
5. Smith RM, Lee J, Mody RK. Determining the incubation time of mucormycosis: a systematic review. *Open Forum Infect Dis*. 2015;2(Suppl 1):461. doi:10.1093/ofid/ofv133.336.

EPIDOP19 / 439

Advancing Community-Based Diabetes Self-Screening: A Hypothetical AI-Driven Risk Prediction Model Using National Health Surveillance Data

Che Muhammad Nur Hidayat Che Nawi¹

¹ *Machang District Health Office, 18500 Machang, Kelantan*

Corresponding author's email: cm.nurhidayat@moh.gov.my

Summary

The burden of undiagnosed diabetes in Malaysia highlights the need for innovative, scalable risk prediction tools. This study aimed to simulate and evaluate an AI-powered diabetes risk prediction model based on the hypothetically generated data that mimic Malaysian national screening data, with the intention of integrating it into a self-screening digital platform. The random forest model achieved an AUC of 0.8481, with high specificity (0.9988) but low sensitivity (0.0033), suggesting further calibration is required for real-world application. Top predictors included random glucose, BMI, systolic blood pressure, and family history of diabetes. The model has potential to enhance early detection in the community when deployed via user-friendly web applications such as DIAPro, which can be accessed at <https://drchehidayat.shinyapps.io/DIAPro/>.

Keywords

Diabetes, Risk Prediction, Artificial Intelligence, Random Forest

Introduction

Diabetes is a growing public health concern in Malaysia, with a substantial number of undiagnosed cases¹. The National Health Surveillance Initiative (NHSI) collects valuable individual health data that can be repurposed for risk stratification². With the advancement of machine learning, predictive models using such data offer an opportunity to implement scalable, personalized risk assessment tools. This study explores the feasibility of using a random forest algorithm to develop a diabetes risk prediction model and deploy it in a prototype self-screening web app, DIAPro.

Materials and Methods

A synthetic dataset simulating NHSI variables was used, containing demographic and clinical predictors such as age, sex, body mass index (BMI), systolic and diastolic blood pressure, random glucose, total cholesterol, smoking status, physical activity, and family history of diabetes. The synthetic dataset was generated using random sampling from parametric distributions informed by known population-level characteristics reported in NHSI datasets. The data was split into training (80%) and testing (20%) sets. Models developed included logistic regression, random forest, and neural networks using the tidymodels framework in R software^{3,4}. Model performance was evaluated using accuracy, AUC, sensitivity, and specificity. The random forest model was selected for the Shiny app prototype based on comparative performance.

Results and Discussion

The random forest model achieved the best performance among the tested algorithms, with accuracy of 0.8481, AUC of 0.3558, and specificity of 0.9988 (Table 1). However, sensitivity was notably low at 0.0033, indicating a high false-negative rate under current thresholds. Feature importance analysis revealed random glucose, BMI, systolic blood pressure, and family history as the top predictors (Figure 1, Figure 2). A Shiny web app, DIAPro, was developed to demonstrate the model's functionality in community-based self-screening. Despite promising specificity, the low sensitivity highlights the need for recalibration or ensemble strategies before wider implementation.

Table 1: Model Performance Metrics

Model	Accuracy	AUC	Sensitivity	Specificity
Logistic Regression	0.8486	0.3354	0.00	1.00
Random Forest	0.8481	0.3558	0.0033	0.9988
Neural Network	0.8461	0.3636	0.017	0.9941

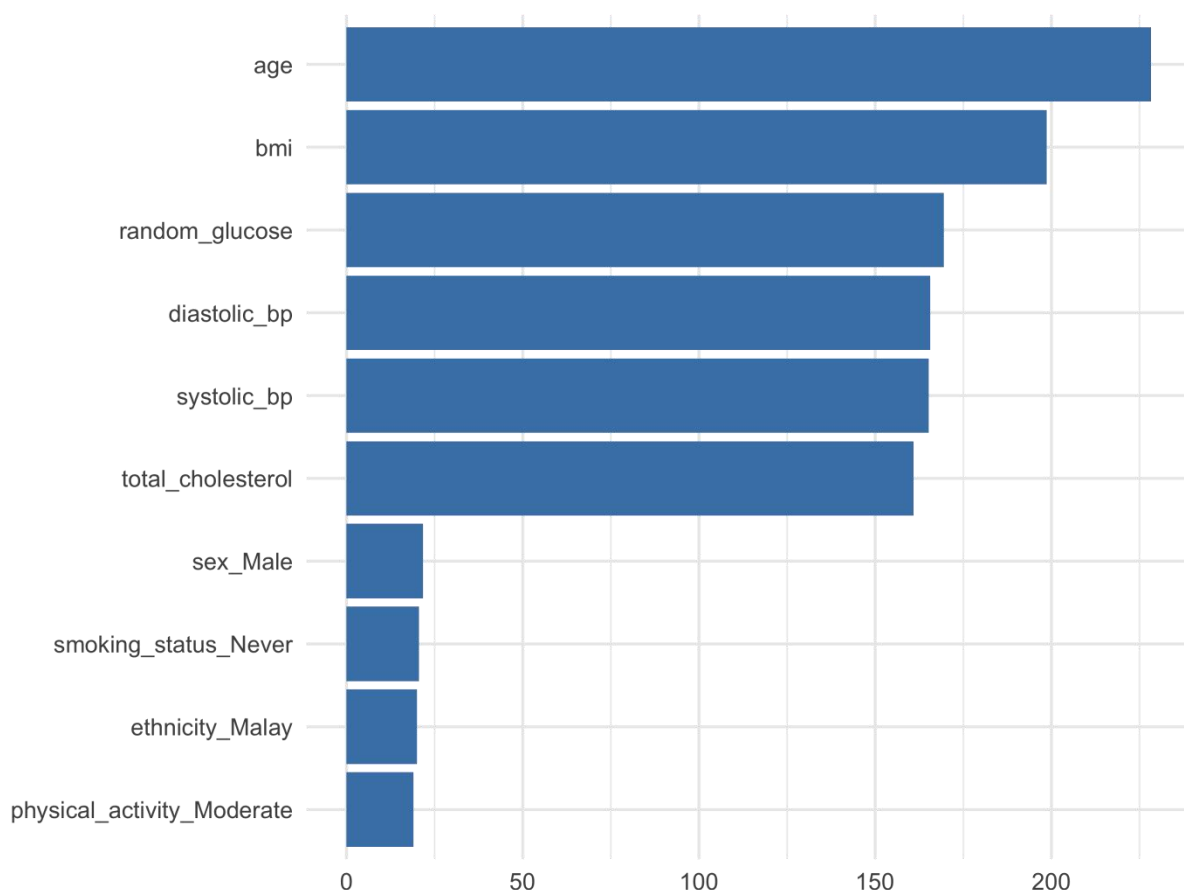


Figure 1: Top 10 most important predictors of diabetes based on the random forest model using simulated NHSI data. Variable importance is calculated using the mean decrease in Gini impurity, with random glucose, BMI, and systolic blood pressure identified as dominant predictors.

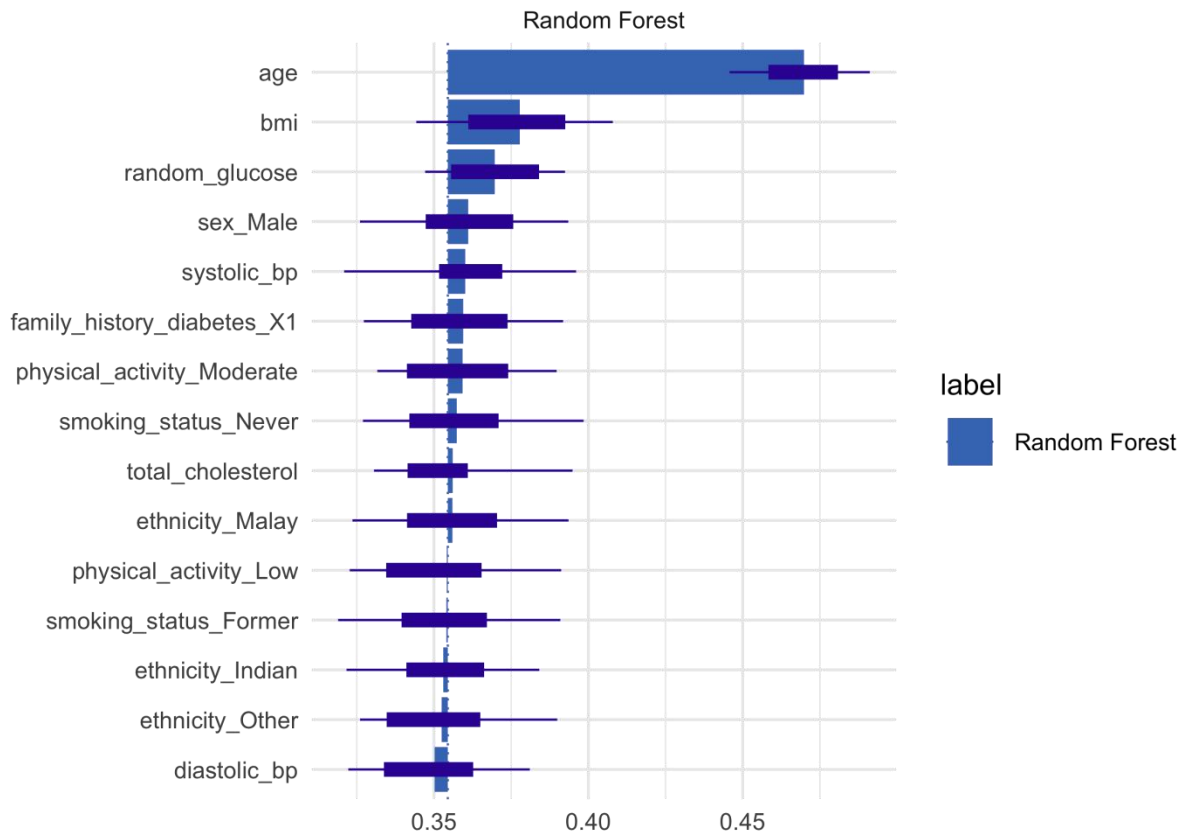


Figure 2: SHAP-like decomposition of variable contributions to diabetes prediction using the DALEX model_parts() method. Each bar represents the raw importance (drop-out loss) of the variable in the random forest model, highlighting the most influential features in individual risk prediction.

Conclusion

This hypothetical study supports the feasibility of using AI-driven models for community-based diabetes self-screening using national surveillance data. While the DIAPro tool demonstrates potential as a risk stratification instrument, the random forest model was selected for its overall performance and interpretability. Future iterations will focus on improving sensitivity through recalibration and model optimization to ensure reliable early detection.

References

1. *National Health and Morbidity Survey (NHMS) 2023*. Putrajaya: Ministry of Health Malaysia; 2023.
2. *National Health Screening Initiative (NHSI)* [Internet]. [cited 2025 May 15]. Available from: <https://www.moh.gov.my/index.php/pages/view/4582?mid=1510>
3. R Core Team. *R: A Language and Environment for Statistical Computing* [Internet]. Vienna: R Foundation for Statistical Computing; 2023 [cited 2024 Jun 19]. Available from: <https://www.R-project.org/>
4. Kuhn M, Wickham H. *Easily Install and Load the "Tidymodels" Packages* [R package tidymodels version 1.3.0]. CRAN: Contributed Packages [Internet]. 2025 Feb 21 [cited 2025 May 15]. Available from: <https://CRAN.R-project.org/package=tidymodels>

FAMILY HEALTH / HEALTH MANAGEMENT

FHHMOP01 / 174

Exploring Digitalisation Challenges in Implementing Integrated Care in Langkawi's Healthcare System

Devi Shantini A/P Rata Mohan¹, Nur Azmiah Zainuddin¹, Tengku Mohamad Iskandar Tengku Mohamad Rosman², Sri Devi A/P Sukumaran², Mohd Suhaili Muhamed Shueib³, Adlan Zafrulan Ismail⁴

¹ Institute for Health Systems Research, National Institutes of Health, Ministry of Health Malaysia

² Institute for Health Management Research, National Institutes of Health, Ministry of Health Malaysia

³ Langkawi District Health Office, 07000 Kuah, Kedah

⁴ Hospital Sultanah Maliha, 07000 Langkawi, Kedah

Corresponding author's email: devishantini@moh.gov.my

Summary

Healthcare digitalization is pivotal for advancing integrated care, yet implementation faces barriers in resource-limited settings. This study explores the challenges faced by Langkawi's healthcare in incorporating digitalization in integrated care. A qualitative study was conducted using in-depth interviews and focus group discussions with physicians, nurses, medical officers, and healthcare administrators. Data were analysed using the Rainbow Model of Integrated Care framework. Key challenges identified were restrictive policies, insufficient digital infrastructure, dated digital resources, limited communication and coordination, and fragmented information sharing. Addressing these barriers require systemic changes such as infrastructure investment and curation of supportive policies to realise integrated care practices.

Keywords

Integrated care, digitalisation, Langkawi, challenges, policies

Introduction

Integrated care (IC) is a strategic approach designed to counter the fragmentation of care to produce seamless, person-centred care across the continuum¹. In Langkawi, the island's geographical isolation and evolving healthcare demands highlight the importance of IC to ensure coordinated and efficient service delivery. While digitalisation tools such as electronic health records, and virtual consultations play an important role in being enablers of IC, little is known about the specific barriers faced by Langkawi's healthcare system in adopting these solutions. This study aims to explore the challenges faced by Langkawi's healthcare system in adopting digitalisation as a pathway toward achieving integrated care.

Materials and Methods

A qualitative study design was utilised involving 42 in-depth interviews (IDIs) and seven focus group discussions (FGDs) with 64 participants. Public healthcare providers interviewed were implementers, managers, and directors from clinics, hospital, Langkawi district and Kedah state health department while private sector respondents were general practitioners (GPs). IDIs enabled individuals to share personal perspectives in depth while FGDs facilitated discussions on common challenges and solutions among participants. Participants were selected based on their roles, working experience in Langkawi and involvement in policy planning for Langkawi. Data were collected face-to-face and virtually, audio-recorded, transcribed verbatim and analysed using NVivo 14. Framework analysis with the Rainbow Model of Integrated Care (RMIC) was employed. RMIC is a framework used to evaluate integrated care by showing how healthcare works at different levels—clinical (patient care), professional (teamwork among providers), organisational (coordination between institutions), functional (information and resource sharing), system (policies and funding), and normative (shared values and goals)—to create a seamless, patient-centred experience². Ethical approval was obtained for this study (NMRR ID-24-00377-RBI).

Results and Discussion

The results highlighted significant challenges across multiple dimensions of integration from the RMIC model—namely systemic, organisational, functional, professional, and clinical. The lack of a unified approach to building a digital infrastructure environment and the presence of restrictive policies are examples of system integration challenges. Limited availability of basic resources such as computers and reliable internet connectivity has further been impacted by policies that temporarily restrict the procurement of digital assets.

Interoperable health information systems like the Medical Programme Information System (MPIS) and Cloud-Based Clinic Management System (CCMS) hinder effective workflows between hospitals and clinics. Despite Langkawi having a small healthcare network, the inability to link these systems leads to inefficiencies in service delivery, making it difficult for organisations to function cohesively to achieve organisational integration. Additionally, functional integration faces barriers such as outdated digital resources. Old computers, poor internet connectivity, and reliance on external hard drives disrupt essential duties such as data management to virtual training sessions.

Professional integration is dampened by challenges in communication and coordination among healthcare providers. Similarly, clinical integration is obstructed by fragmented information sharing between healthcare facilities. The heavy reliance on manual processes for retrieving patient data and the absence of real-time access to information create silos that hinder effective teamwork. Professionals have limited ability to collaborate and respond to patient needs in a timely manner which leads to a disruption in care continuity.

No challenges concerning digitalisation were identified from the normative integration dimension. However, the existing digitalisation challenges across other dimensions must be addressed using a multi-faceted approach that embodies the principles of integrated care to create a more cohesive healthcare system in Langkawi³.

Conclusion

To address these barriers effectively, a strategic approach is essential to incorporate digitalisation in Langkawi's healthcare system for effective integrated care practices. This can be achieved by building a supportive digital ecosystem, enforcing shared standards amongst organisations, and curating policies that foster the growth of digitalisation.

Acknowledgements

The authors would like to thank the Director General of Health, Malaysia for his permission to publish this article. We would like to thank all research team members for their contributions to this study. We are thankful for the kind cooperation of all respondents in this study.

References

1. Cresswell K, Anderson S, Elizondo AM, et al. Opportunities and challenges of promoting integrated care through digitalisation-Learning lessons from large-scale national programmes in England. *Health Policy and Technol.* 2024;**13**(2):100838.
2. Humphries R. Integrated health and social care in England - Progress and prospects. *Health Policy.* 2015;**119**(7):856-9.
3. Valentijn PP. Rainbow of Chaos: A study into the Theory and Practice of Integrated Primary Care. *Int J of Integr Care.* 2016.

FHHMOP02 / 178

Geographic Information Systems (GIS) Mapping of Primary Care Services: Do Older Adults in Malaysia Have Equitable Access?

Suhana Jawahir¹, Jabrullah Ab Hamid¹, Nur Elina Abdul Mutalib¹, Awatef Amer Nordin¹, Devi Shantini Rata Mohan¹, Adilius Manual¹, Iqbal Ab Rahim¹, Sarah Nurain Mohd Noh¹

¹Centre for Health Equity Research, Institute for Health Systems Research, National Institutes of Health, Ministry of Health Malaysia, Malaysia

Corresponding author's email: suhana.j@moh.gov.my

Abstract

This study aimed to identify and compare the geographical accessibility of primary care services for older adults in Malaysia. The level of accessibility to primary care services was assessed using the availability ratio, calculated by dividing the number of public and private facilities by the number of older adults in each sub-district. Data analysis was done using Lorenz Curves and Concentration Index (CI), alongside the creation of bivariate choropleth maps. Findings reveal significant geographical inequalities in accessibility exist. These disparities highlight the need for strategic interventions to ensure equitable access to primary care services for older adults.

Keywords

Ageing population, primary care services, accessibility, Malaysia, Geographic Information Systems (GIS)

Introduction

Malaysia is undergoing a demographic shift towards an ageing society, with a growing older population driving increased demand for healthcare services due to their evolving and complex health needs. The uneven distribution of these services can exacerbate vulnerabilities among older people, particularly in areas with high proportions of older adults. Primary health care plays a critical role in delivering healthcare services as it serves as the first point of contact for the population. This study aimed to identify and compare the geographical accessibility of primary care services for the older population across Peninsular and East Malaysia, stratified by ageing status. By identifying disparities in service availability, this study will offer insights to guide policymakers in planning equitable health service delivery, that prioritises older adults.

Materials and Methods

The study employed Geographic Information Systems (GIS) for spatial mapping. Older adults (aged 65 and older) data were derived from the 2020 population census [1], while the primary care facilities data and their locations were obtained from publicly available web sources [2], and aggregated at the sub-district level. The level of accessibility was assessed using the availability ratio, calculated by dividing the number of public and private facilities by the number of older adults in each sub-district. Data analysis was conducted using Lorenz Curves and Concentration Indices (CI) in STATA v18, alongside the creation of bivariate

choropleth maps in QGIS3. The greater the deviation from the equality line, the larger the degree of inequality. CI ranges from -1 to +1, where 0 suggests no inequality. A bivariate choropleth map visualising the ageing status (ageing, aged, and super-aged) [3] and availability ratios [4] (Table 1) was produced, highlighting the role of digitalisation in healthcare accessibility analysis.

Table 1. Categorisation and designation of ageing status

Ageing status [3]	Proportion of older adults	Ratio of public facilities per 10,000 older adults	Ratio of private facilities per 10,000 older adults	Designation
Ageing	7.0-13.9%	<1.00	<1.00	Ageing - Low
		1.00-1.99	1.00-9.99	Ageing - Medium
		≥2.00	≥10.00	Ageing - High
Aged	14.0-19.9%	<1.00	<1.00	Aged - Low
		1.00-1.99	1.00-9.99	Aged - Medium
		≥2.00	≥10.00	Aged - High
Super-aged	≥20.0%	<1.00	<1.00	Super-aged - Low
		1.00-1.99	1.00-9.99	Super-aged - Medium
		≥2.00	≥10.00	Super-aged - High

Results and Discussion

A total of 2,524,788 older adults in Malaysia, alongside 1080 public facilities and 9867 private facilities, aggregated across 2103 sub-districts, were included in this study. The analysis revealed significant geographical inequalities in the accessibility of primary care services for older adults in both Peninsular and East Malaysia (Figure 1). The Lorenz curves showed that the distribution of private facilities in both regions was further from the equality line compared to public facilities, reflecting greater disparities. Notably, there was geographical variation in primary care services distribution across the country. In Sabah, aged and super-aged areas showed much lower ratios of both public and private facilities (Figure 2). This is particularly concerning, as areas with the highest proportions of older adults are the most underserved. Low availability of healthcare services is associated with low utilisation, which, in turn, heightens the risk of preventable diseases, complications from untreated conditions, and adverse health outcomes [5].

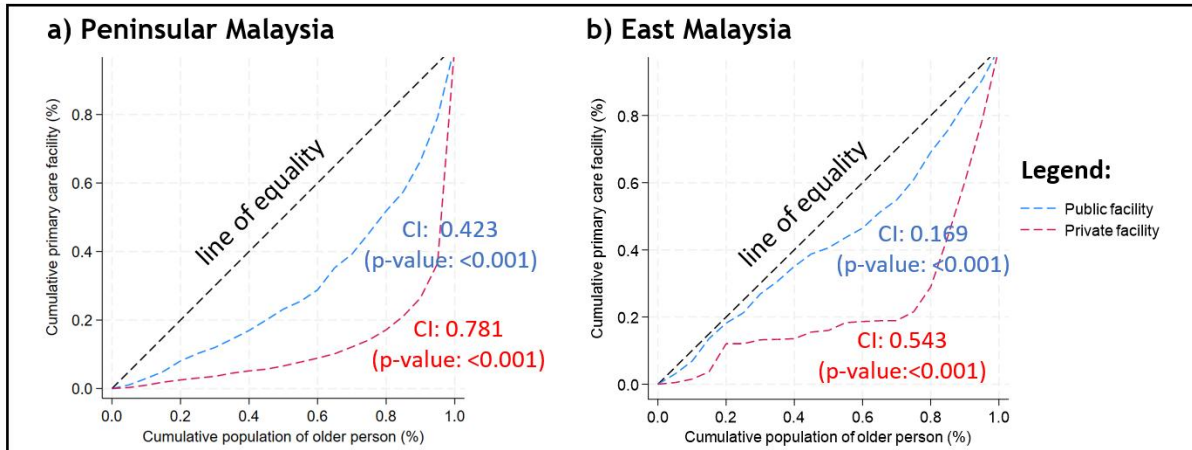


Figure 1. Lorenz curves and CIs depict the distribution of primary care facilities against older adults in (a) Peninsular Malaysia and (b) East Malaysia.

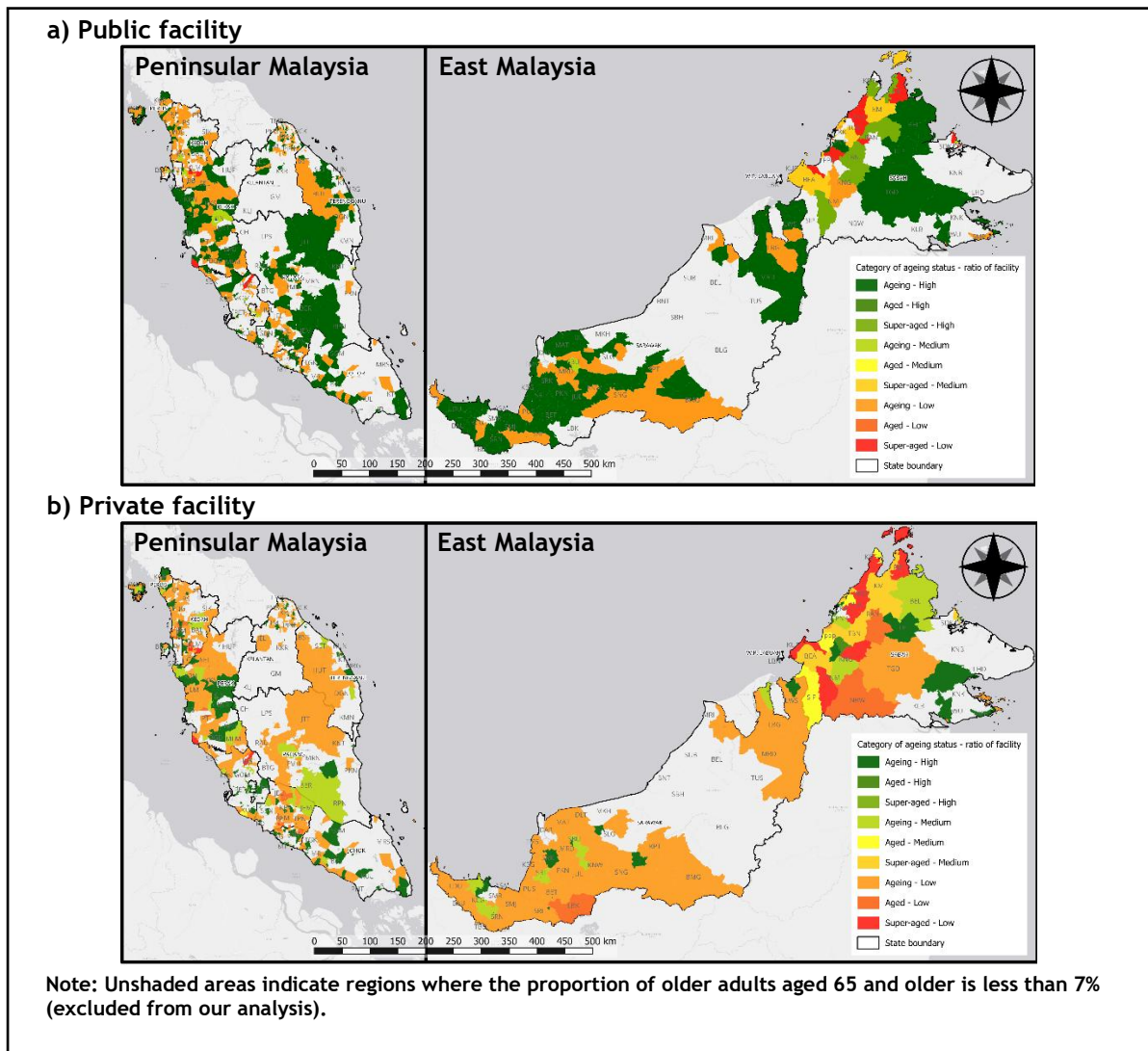


Figure 2. Bivariate choropleth map of primary care services availability per older adults by ageing status categories in Peninsular Malaysia and East Malaysia.

Conclusion

This study highlights significant geographical inequalities in the accessibility of primary care services for older adults in Malaysia. The low accessibility ratios in aged and super-aged areas warrant immediate attention. Strategic interventions in health services delivery planning are essential to ensure that ageing populations receive needed support and care. By leveraging digitalisation in healthcare accessibility analysis, this study identifies service gaps and provides insights to guide evidence-based policy and resource allocation.

References

1. Department of Statistics Malaysia (DOSM). Subnational Statistics DUN, released 2022 (<https://www.dosm.gov.my/portal-main/publication>, accessed 31 January 2025).
2. Private Medical Practice Control Section (CKAPS), Medical Practice Division, Ministry of Health Malaysia (<https://hq.moh.gov.my/medicalprac/statistik/>, accessed 31 January 2025).
3. Miksa B. What are the economic consequences of rapidly ageing populations? Cologny: World Economic Forum 2015 (<https://www.weforum.org/agenda/2015/08/what-are-the-economic-consequences-of-rapidly-ageing-populations/>, accessed 23 January 2025).
4. Jo O, Kruger E, Tennant M. GIS mapping of healthcare practices: do older adults have equitable access to dental and medical care in the UK? *Br Dent J*. 2021 Sep 22.
5. Thorpe, J.M., Thorpe, C.T., Kennelty, K.A. *et al*. Patterns of perceived barriers to medical care in older adults: a latent class analysis. *BMC Health Serv Res* 11, 181 (2011).

FHHMOP03 / 189

Optimising Colorectal Cancer Screening in Malaysia: Are Screening Efforts Aligned with Disease Burden? (2014-2021)

Diane Woei-Quan Chong¹, Vivek Jason Jayaraj², Fathullah Iqbal Ab Rahim³, Nurul Athirah Naserrudin¹, Sharifah Saffinas Syed Soffian⁴, Muhammad Fikri Azmi⁵, Eliana Ahmad⁵, Mohd Yusaini Mohd Yusri⁶, Ahmad Shanwani Mohamed Sidek⁷, Norfarizan Azmi⁸, Rosaida Md Said⁹, Muhammad Firdaus Md Salleh¹⁰, Norasiah Abu Bakar¹¹, Hamiza Shahar¹², Rima Marhayu Abdul Rashid¹³, Shazimah Abdul Samad¹³, Zanita Ahmad¹³, Mohd Safiee Ismail¹³, Adilah A. Bakar¹⁴, Nor Mashitah Hj Jobli¹⁴, Sukumaran Raman¹⁵, Nurulaisyah Hamzah¹⁵, Mohd Yasin Raja Abdullah¹, Sondi Sararaks¹⁶

¹ Centre for Health Services Research, Institute for Health Systems Research, National Institutes of Health, Ministry of Health Malaysia

² Digital Health Division, Ministry of Health Malaysia

³ Centre for Health Equity Research, Institute for Health Systems Research, National Institutes of Health, Ministry of Health Malaysia

⁴ Kedah State Health Department, Ministry of Health Malaysia

⁵ Disease Control Division, Ministry of Health Malaysia

⁶ Seremban 2 Health Clinic, Ministry of Health Malaysia

⁷ Department of General Surgery, Hospital Raja Perempuan Zainab II, Ministry of Health Malaysia

⁸ Department of General Surgery, Hospital Tuanku Ja'afar, Ministry of Health Malaysia

⁹ Department of Medicine, Hospital Serdang, Ministry of Health Malaysia

¹⁰ Department of Medicine, Hospital Sultanah Aminah, Ministry of Health Malaysia

¹¹ Department of Medicine, Hospital Raja Perempuan Zainab II, Ministry of Health Malaysia

¹² Department of Medicine, Hospital Tengku Ampuan Rahimah, Ministry of Health Malaysia

¹³ Family Health Development Division, Ministry of Health Malaysia

¹⁴ Medical Development Division, Ministry of Health Malaysia

¹⁵ National Cancer Institute, Ministry of Health Malaysia

¹⁶ Director's Office, Institute for Health Systems Research, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: chong.dwq@moh.gov.my

Summary

Colorectal cancer (CRC) remains a major public health concern in Malaysia, with 74.9% of cases diagnosed at late stages. Despite a national CRC screening programme, participation and follow-up rates vary across states, raising concerns about alignment with disease burden. This study applies hierarchical clustering to classify states based on screening performance and disease burden, using Kruskal-Wallis and Dunn's post-hoc tests to assess variations. Findings indicate under-screening in high-burden states, potential over-screening in lower-burden states, and varying colonoscopy follow-up. Process improvements should focus on increasing screening participation in high-burden areas, refining risk-based screening, and strengthening diagnostic follow-up to improve overall efficiency.

Keywords

Colorectal cancer, screening performance, cancer burden, hierarchical clustering, Malaysia

Introduction

Colorectal cancer (CRC) is one of the most common cancers in Malaysia, with 74.9% of cases diagnosed at late stages¹, highlighting the need for early detection through screening². Despite a national CRC screening programme, participation and follow-up rates vary across states, raising concerns about whether screening efforts align with disease burden³. Variability in screening uptake, immunochemical faecal occult blood test (iFOBT) positivity, and colonoscopy follow-up may reduce the effectiveness of early detection. Some states with higher CRC burden may be under-screened while others with lower burden may have disproportionately high screening rates, leading to potential inefficiencies in resource allocation. This study examines the alignment between CRC screening performance and disease burden by classifying Malaysian states into distinct clusters based on screening indicators and disease burden. The findings will identify screening variations to inform improvements in screening participation, follow-up adherence, and optimisation of screening strategies for early detection.

Materials and Methods

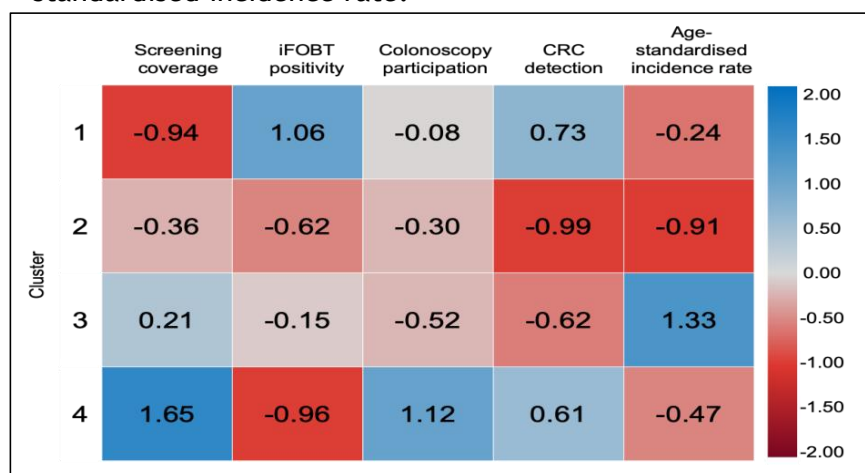
The study analysed secondary data from the Ministry of Health CRC screening programme and cancer registry to examine screening performance and disease burden from 2014 to 2021. Screening indicators included examination coverage, iFOBT positivity rate, colonoscopy participation, and CRC detection rate per 1,000 screened individuals. CRC burden was measured using age-standardised incidence rates (ASIR) per 100,000 individuals aged 50 to 75. All variables were standardised using z-scores, where positive values indicate above-average performance relative to the dataset mean, and negative values indicate below-average performance. Hierarchical clustering using Ward's method was applied to classify states into distinct screening performance and CRC burden clusters. Differences across clusters were examined using Kruskal-Wallis tests, followed by Dunn's post-hoc comparisons to identify significant inter-cluster variations. This approach identified variations in screening performance and CRC burden at the cluster level. Results were reported as mean z-scores for each cluster.

Results and Discussion

Four clusters were identified based on CRC screening performance and disease burden. Cluster 1 had below-average examination coverage ($z = -0.94$) but above-average iFOBT positivity ($z = 1.06$), indicating a higher proportion of screened individuals were at risk. Despite above-average CRC detection ($z = 0.73$), colonoscopy participation ($z = -0.08$) was slightly below average, suggesting follow-up gaps. ASIR was slightly below average ($z = -0.24$), possibly due to under-detection. Cluster 2 had below-average examination coverage ($z = -0.36$) and low iFOBT positivity ($z = -0.62$). Colonoscopy participation ($z = -0.30$) and CRC detection ($z = -0.99$) were also below average, with ASIR ($z = -0.91$) the lowest among clusters. These findings suggest either a lower true disease burden or insufficient screening, leading to missed cases. Cluster 3 had near-average examination coverage ($z = 0.21$) and iFOBT positivity ($z = -0.15$). However, colonoscopy participation ($z = -0.52$) and CRC detection ($z = -0.62$) were below average, despite the highest burden (ASIR = 1.33). This suggests that many cases were diagnosed outside the screening programme. Cluster 4 had high examination coverage ($z = 1.65$) and high colonoscopy participation ($z = 1.12$) but low iFOBT

positivity ($z = -0.96$). CRC detection ($z = 0.61$) was above average while ASIR ($z = -0.47$) was below average, suggesting possible over-screening in lower-risk populations. Kruskal-Wallis tests indicated significant differences between clusters for all screening and disease burden indicators ($p < 0.0001$). Dunn's post-hoc analysis demonstrated Cluster 1 had significantly lower screening but higher burden compared to Cluster 4 ($p < 0.0001$), reinforcing concerns about under-screening in high-risk populations. This study relies on state-level clustering, which may mask facility-level or district-level gaps in screening participation and follow-up adherence.

Figure 1: Heatmap of colorectal cancer screening and burden indicators across four clusters. The heatmap displays standardised z-scores for screening coverage, iFOBT positivity, colonoscopy participation, CRC detection, and age-standardised incidence rate.



Conclusion

This study highlights that screening efforts do not consistently align with disease burden. Expanding screening in high-burden, low-participation areas and improving colonoscopy adherence could enhance early CRC detection. Future efforts should focus on optimising screening thresholds to ensure effective risk-based targeting and resource-efficient screening implementation.

Acknowledgements

The authors would like to thank the Director-General of Health Malaysia for permission to publish this paper.

References

1. Ministry of Health Malaysia. Summary of Malaysia National Cancer Registry Report 2017-2021. 2024.
2. IARC Working Group on the Evaluation of Cancer-Preventive Interventions. Colorectal Cancer Screening. IARC Handbooks of Cancer Prevention. Lyon, France: International Agency for Research on Cancer, World Health Organization; 2019. 314 p. (IARC handbooks of cancer prevention).
3. Institute for Public Health, Ministry of Health Malaysia. National Health and Morbidity Survey (NHMS) 2023: Non-Communicable Diseases and Healthcare Demand: Technical Report. 2024

FHHMOP04 / 229

Gender Disparities in Adolescent Health Risks: A Cross-Sectional Study in Tumpat, Kelantan

Mohamad Hafiz Harun¹, Lailatul Nur Noor Azmi¹, Nabila Balqish Azahar², Aimi Fadilah Shariffuddin¹, Ahmad Firdaus Mohamed^{1, 3}, Hasneezah Hassan¹

¹ Tumpat District Health Office, Ministry of Health Malaysia,

² Pasir Pekan Health Clinic, Tumpat, Ministry of Health Malaysia,

³ Department of Community Medicine, School of Medical Sciences, Universiti Sains Malaysia Health Campus, Malaysia

Corresponding email: hafizmd@moh.gov.my

Summary

Adolescence is a crucial period for physical, mental, and behavioural health development. This study aims to analyse gender differences in health risks among adolescents screened in Tumpat District, Kelantan, from January to December 2024. A total of 2,252 adolescents were assessed for nutritional status, physical health, mental health, risky behaviours, and sexual/reproductive health. The findings show that females had significantly higher rates of mental health and sexual/reproductive issues, while males exhibited more risky behavioural tendencies. These results highlight the need for gender-sensitive public health interventions, including sexual/reproductive health education, mental health services, and behavioural risk reduction strategies.

Keywords

Adolescence, Gender Differences, Nutrition, Mental Health, Risky Behaviours

Introduction

Adolescence is a critical stage marked by significant physical, psychological, and social changes, making health screenings essential for identifying potential risks and informing targeted interventions. The Ministry of Health focuses on five key areas in adolescent screenings: physical health, mental health, sexual/reproductive health, nutritional status, and high-risk behaviours. Understanding gender-specific health behaviours is crucial, as previous studies have shown distinct patterns between males and females.¹ Females face higher rates of internalised distress, such as anxiety and depression, while males engage in more externalising behaviours, like substance use and risky activities.² Physical health complaints, particularly among females, are also rising³, while nutritional issues such as underweight, overweight, and obesity impact both genders.⁴ Sexual/reproductive health problems disproportionately affect females, especially in low-income settings.⁵ This study assesses gender-based health risks among adolescents in Tumpat District, Kelantan, using one year of health screening data to provide localised insights for public health strategies.

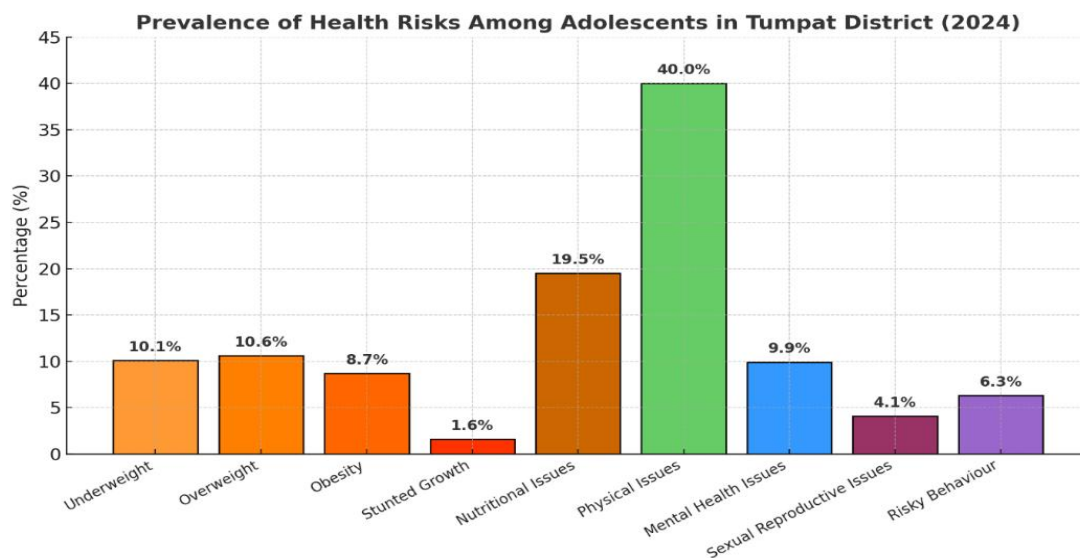
Materials and Methods

A cross-sectional study was conducted using secondary data from adolescent health screenings in Tumpat District between January and December 2024. Out of a total population of 38,527 adolescents in Tumpat, 2,252 (5.85%) participated in

adolescent health screenings, in line with Ministry of Health targets. All adolescents' health screening data were recorded in the PKR 101 registry, with detailed information captured using the BSSK/R/2008 Pind 1/2014 form. Parental consent was required before screenings, conducted opportunistically in health clinics and routinely in schools. Screenings included registration, anthropometric measurements, health assessments, and consultations. The data were categorised by prevalence of health risks, distribution of screenings according to health clinics, as well as by gender and health risk factors including nutritional status, physical health, mental health, sexual/reproductive health and risky behaviours. Descriptive and inferential analyses were performed using Microsoft Excel and SPSS version 26, with $p < 0.05$ considered statistically significant.

Results and Discussion

In Tumpat District, 2,252 adolescents (41.3% male, 58.7% female) were screened across 11 health clinics.



Note: The graph was created based on the components in BSSK form.

Figure 1: Prevalence of health risks among adolescents in Tumpat district (n=2,252).

Figure 1 depicts the most prevalent health issue was physical health problems (40.0%), followed by body weight issues (31.0%) and nutritional issues (19.5%). Body weight concerns were notable, with 10.6% of adolescents being overweight, 10.1% underweight, and 8.7% obese. Stunted growth affected a smaller proportion (1.6%). Additionally, 9.9% experienced sexual/reproductive health concerns, while 6.3% engaged in risky behaviours. A Chi-square analysis (Table 1) revealed significant gender differences in four health risk categories: underweight, mental health issues, sexual/reproductive health issues, and risky behaviours ($p < 0.05$).

Table 1: Gender differences in health risk categories among adolescents (n=2,252).

Risk Category	Male	Female	Total	χ^2 (df)	p-value
Underweight	117	110	227	3.87 (1)	0.049
Overweight	98	141	239	0.01 (1)	0.917
Obesity	82	115	197	0.00 (1)	1.000
Stunted Growth	16	19	35	0.01 (1)	0.935
Eating Disorders	196	244	440	0.53 (1)	0.467
Physical Health Issues	371	530	901	0.07 (1)	0.795
Mental Health Issues	62	160	222	8.92 (1)	0.003
Sexual and Reproductive Issues	24	69	93	4.68 (1)	0.031
Risky Behaviour	80	63	143	5.10 (1)	0.024

Note: χ^2 , chi-square; df, degree of freedom; p-value, statistically significant if $p < 0.05$

These findings highlight significant gender-based differences in adolescent health risks. Females exhibited higher rates of mental health and sexual/reproductive health issues, consistent with previous studies showing that female adolescents experience greater psychological distress and higher rates of sexual/reproductive health problems.^{2,5} In contrast, males demonstrated a higher prevalence of risky behaviours, aligning with research on adolescent risk-taking tendencies.² Additionally, nutritional risks differed by gender, with males showing a significantly higher prevalence of underweight, suggesting variations in dietary patterns and metabolic factors, similar to studies from Saudi Arabia.⁴ This study provides a comprehensive analysis of gender-based health disparities using actual screening data, offering valuable insights for targeted public health interventions, particularly for school-based programs and interventions within health clinics. However, the cross-sectional design limits causal inferences, and the findings are specific to Tumpat district, potentially reducing their generalisability to other regions.

Conclusion

This study underscores significant gender-based health disparities among adolescents in Tumpat District, particularly in mental health, sexual/reproductive health, risky behaviours, and nutritional risks. The findings emphasise the need for targeted interventions tailored to address these differences. Specifically, mental health support programmes should be strengthened for female adolescents, while behavioural risk reduction initiatives should focus on males. Additionally, comprehensive sexual education and customised nutritional programmes should be integrated into existing adolescent health services. These targeted approaches will help bridge gender disparities and improve overall adolescent well-being in the district.

Acknowledgement

The authors would like to express their heartfelt gratitude to the Director General of Health Malaysia for his permission to present this study, and to all who contributed, including the Tumpat District Health Office and the adolescent health clinic teams from the 11 health clinics in Tumpat, comprising medical officers, staff nurses, and medical assistants.

References

1. Campbell OLK, Bann D, Patalay P. The gender gap in adolescent mental health: A cross-national investigation of 566,829 adolescents across 73 countries. *SSM - Popul Health*. 2021;13:100742.
2. Beckwith S, Chandra-Mouli V, Blum RW. Trends in Adolescent Health: Successes and Challenges From 2010 to the Present. *J Adolesc Health*. 2024;75(Suppl 1):S9-S19.
3. Nilsen SA, Stormark KM, Heradstveit O, et al. Trends in physical health complaints among adolescents from 2014-2019: Considering screen time, social media use, and physical activity. *SSM - Population Health*. 2023;22:101394.
4. Hijji TM, Saleheen H, AlBuhairan FS. Underweight, body image, and weight loss measures among adolescents in Saudi Arabia: is it a fad or is there more going on? *Int J Pediatr Adolesc Med*. 2021;8(1):18-24
5. Mehta SD, Seeley J. Grand challenges in adolescent sexual and reproductive health. *Front Reprod Health*. 2020;2:2.

FHHMOP05 / 231

Development of an Image-based Health Promotion Material to Cultivate Healthy Child Media Habits among Malaysian Toddlers

Catherine Thamarai Arumugam¹, Nik Daliana Nik Farid¹, Mas Ayu Said²

¹ Centre for Population Health (CePH), Department of Social and Preventive Medicine, Faculty of Medicine Universiti Malaya, Kuala Lumpur, Malaysia

² Centre for Epidemiology and Evidence-Based Practice (CEEBP), Department of Social and Preventive Medicine, Faculty of Medicine, Universiti Malaya, Kuala Lumpur, Malaysia

Corresponding author's email: catherinethamarai@um.edu.my

Summary:

This study developed a health education material which would assist in promoting healthy child media habits to parents with children under five-years old during routine developmental assessment of toddlers in Malaysian health clinics. A single-paged education material was developed, cross-culturally adapted into Malay language, and content validated using the 'Patient Education Material Assessment Tool' (PEMAT) guidelines by seven subject matter experts. Findings yielded that the education material titled 'MEDIA', an acronym which denotes five practical strategies that parents can adapt shows good level of understandability and actionability - contributing towards efforts of creating a safe media environment for thriving children.

Keywords: *Screen time, Child Media Habit, Health Education, Health Promotion, Child Development*

Introduction: The advancement of digital technology has driven screen-based media to be an essential part of a child's life¹. However, early exposure to electronic devices and excessive screen time have shown to be disrupting young children's emotional regulation, and delay their developmental milestone attainment^{2,3}. Hence, it is vital to ensure that parents and caregivers are informed on practical ways of cultivating healthy child media habits among thriving children. This study aimed to develop and validate an education material which would serve as guidance for healthcare workers to lead an image-based communication which promotes healthy child media habits to parents with children under three-years old during routine developmental assessment of toddlers in Malaysian health clinics.

Materials and Methods: A single-paged health education material in the form of flyer was developed based on screen time guidelines and recommendations by World Health Organization and American Academy of Paediatrics⁴ which was then cross-culturally adapted into *Bahasa Melayu* - the national language of Malaysia and validated using the 'Patient Education Material Assessment Tool' (PEMAT) guidelines. A total of seven experts from the fields of Public Health Medicine, Developmental Paediatrics, Family Medicine, Educational Psychology, Social Behavioural Science, and Health Communication were invited to validate the education material which contains five components, illustrated by a graphic designer. The flyer named "MEDIA" is an acronym which denotes five practical strategies that parents can adapt in improving their children's media habit -

namely screen time recommendation, usage of screen-based media during meals or before bedtime, alternative screen-free activities and importance of parent-child interaction and positive stimulation.

Results and Discussion: For PEMAT's understandability component, the scoring by subject matter experts ranged between 73.3% to 100.0% (average score 89.7%), whereas for actionability the scoring ranged between 60.0% to 100.0% (average score 88.6%). Feedback given on sociocultural relevance and suitability of the material for local context were also taken into consideration before finalising the flyer. The health education material, "MEDIA" is an excellent tool for health promotion in the field of technology and toddlers, in line with findings from past literature which has shown adding pictures to written language increases focus, comprehension, retention of information and adherence towards learning gained through the material⁵.

Conclusion: This study, a precedence of a research work in which the effectiveness of the flyer in improving home media environment will be assessed is believed to assist health promotion strategies to improve child media habits and pave the way for the young ones to thrive in a safe media environment.

Acknowledgment

Muhammad Haizril Arif bin Md Mokhtar, Haizrina Anis binti Md Mokhtar

References:

1. Moser A, Zimmermann L, Dickerson K, et al. They can interact, but can they learn? Toddlers' transfer learning from touchscreens and television. *Journal of Experimental Child Psychology*. 2015;137:137-55.
2. Skalická V, Wold Hygen B, Stenseng F, Kårstad SB, Wichstrøm L. Screen time and the development of emotion understanding from age 4 to age 8: A community study. *Br J Dev Psychol*. 2019;37(3):427-43.
3. Radesky JS, Peacock-Chambers E, Zuckerman B, et al. Use of Mobile Technology to Calm Upset Children. *JAMA Pediatrics*. 2016;170(4):397.
4. Media and Young Minds. *Pediatrics*. 2016;138(5).
5. Houts PS, Doak CC, Doak LG, et al. The role of pictures in improving health communication: a review of research on attention, comprehension, recall, and adherence. *Patient Education and Counseling*. 2006;61(2):173-90.

FHHMOP06 / 247

Title: Rheumatic Heart Disease Screening Among School Children at Primary Care Level in Tuaran: Task-Shifting Strategy using Hand-held Echocardiography and Risk Factor Analysis

Hazeqa Salleh¹, Nasieha Saquenah binti Ribin²

¹ Tuaran District Health Office, Sabah State Health Department

² Tuaran Mother and Child Health Clinic, Ministry of Health Malaysia

Corresponding's author email: hazeqa@moh.gov.my

Summary

This cross-sectional study assessed the use of hand-held echocardiography by trained non-experts to screen for rheumatic heart disease (RHD) among 149 school children in Tuaran, Sabah. Cardiologists confirmed 35 cases (23.5%) of borderline RHD. Most affected children were from low-income (85.7%) and overcrowded households (88.6%). No statistically significant risk factors were identified. The findings support the feasibility of task-shifting RHD screening to non-expert staff in primary care. However, further validation of image quality and accuracy is needed. This strategy shows promise for expanding screening in low-resource settings, provided adequate training and oversight are ensured.

Keywords

Rheumatic heart disease, hand-held echocardiography, task-shifting strategy, risk factors, school children.

Introduction

School-based echocardiographic screening programme was a recommended approach in endemic areas to detect RHD in asymptomatic children^{1,2}. Echocardiography is safer and more accurate than clinical auscultation³, yet its implementation at scale is challenged by the limited number of trained personnel⁴. Task-shifting strategies offer a practical alternative, enabling trained non-experts to conduct screenings⁵. This study had two objectives which were to describe and assess the outcomes of RHD screening conducted by non-expert operators using hand-held echocardiography, and to evaluate the sociodemographic, environmental, and behavioural risk factors associated with RHD in school-aged children in Tuaran district.

Materials and Methods

A cross-sectional study was conducted from November 2023 to April 2024 among second-grade students (aged 10) from four selected public primary schools in Tuaran district, Sabah. Schools were selected based on accessibility and approval by the Tuaran District Health Education Unit.

Screening Procedure: Hand-held echocardiography was used for screening by trained medical assistants. A simplified protocol was followed, based on the 2012 World Heart Federation (WHF) criteria to confirm RHD status.

Data Collection and Analysis: Structured questionnaires were used to collect sociodemographic, environmental, and behavioural data. Descriptive statistics were used to summarise participant characteristics. Associations between risk

factors and RHD status were analysed using chi-square tests and unpaired t-tests, with p-values <0.05 considered statistically significant. SPSS software was used for all analyses.

Results and Discussion

Out of 149 students screened, 35 (23.5%) were diagnosed with borderline RHD based on WHF criteria. A high proportion of these cases were from lower-income (B40) households (85.7%) and lived in overcrowded dwellings (88.6%). Other characteristics which included gender, ethnicity, maternal education, water source, housing type, dental hygiene, frequency of sore throat, and family history showed no significant association with RHD findings. Outcome of non-expert screening indicated that the use of hand-held echocardiography by trained medical assistants successfully facilitated early identification of RHD cases. Positive scans were confirmed by cardiologists, demonstrating the feasibility of task-shifting in resource-limited settings. While this approach allowed broader coverage, the study did not evaluate inter-rater agreement or diagnostic accuracy in terms of sensitivity and specificity.

These findings underscore the potential for hand-held echocardiography, operated by non-specialists, to improve access to RHD screening. The declining cost and increasing portability of such tools support wider adoption. However, rigorous training and quality assurance mechanisms remain essential.

Table 1: Sociodemographic characteristics of participants

	All, n=149 (%)	Cases of RHD n= 35(%)	No RHD n=114 (%)
Gender			
Male	81(54.4)	23 (65.7)	58(50.8)
Female	68(45.6)	12(34.3)	56(49.2)
Ethnicity			
Bajau	57(38.3)	13(37.1)	44(38.6)
Dusun	48(32.2)	12(34.4)	36(31.6)
Kadazan	11(7.4)	3(8.6)	8(7.0)
Malay	9(6.0)	0	9(7.9)
Brunei	7(4.7)	3(8.6)	4(3.5)
Others	17(11.4)	4(11.4)	13(11.4)
Mother's level of education			
No schooling	6(4.0)	1(2.9)	5(4.4)
Primary	8(5.4)	3(8.6)	5(4.4)
Secondary	101(67.8)	25(71.4)	76(66.7)
Tertiary	34(22.8)	5(17.1)	28(24.6)
Number of people per dwelling unit			
≤3	7(4.7)	4(2.9)	3(2.6)
4-10	137(91.9)	30(85.7)	107(93.9)
>10	5(3.4)	1(2.9)	4(3.5)
Level of income			
B40	123(82.6)	30(85.7)	94(82.5)
M40	22(14.8)	3(8.6)	17(14.9)
T20	4(2.7)	2(5.7)	3(2.6)

Table 2: Environmental, behavioural, socioeconomic, and medical risk factors for RHD

Factors	Cases of RHD n= 35 (%)	Control n= 114(%)	Odds Ratio	p-value
Source of drinking water				
GFS	0	3(2.6)	-	-
Pipe	34(97.1)	108(94.7)	3.430×10^{-8}	0.994
Well	0	2(1.8)		1.000
Nil	1(2.9)	1(0.9)	0.826 1.559×10^7	0.998
Type of house				
Brick	20(57.1)	78(68.4)	1.597×10^8	0.996
Wood	15(42.9)	36(31.6)	9.587×10^7	0.996
Frequency of brushing teeth per day				
1-2 times per day	17(48.6)	49(43.0)	-	-
>2 times per day	15(42.9)	56(49.1)	0.923	0.859
Sometimes	4(11.4)	9(7.9)	1.740	0.526
Brushing habit after meal				
No	22(62.9)	53(46.5)	-	-
Yes	13(37.1)	61(53.5)	2.190	0.080
Using toothpaste while brushing teeth				
No	1(2.9)	1(0.9)	-	-
Yes	34(97.1)	113(99.1)	2.644×10^7	0.998
Frequency of sore throat				
>2 times per year	11(31.4)	45(39.5)	-	-
Nil	8(22.9)	22(0.19)	0.631	0.433
Weekly	1(2.9)	0	3.600×10^{-9}	0.996
Monthly	2(5.7)	10(8.8)		0.901
Annually	13(37.1)	37(32.5)	1.116 0.550	0.222
Family history of heart disease				
No	32(91.4)	105(92.1)	-	-
Yes	3(8.6)	9(7.9)	0.901	0.885

Table 3: Type of valvular lesion

Type of lesion	Number of cases
Mild MR	2
Mild AR	1
Mild TR	1
Trivial MR	25
Trivial AR	2
Small ASD	1
Mild MR, Mild TR	1
Mild MR, Trivial TR	1
Trivial MR, Trivial TR	1

Conclusion

Hand-held echocardiography by trained non-experts is a practical tool for RHD screening in schools. It shows promise for use in low-resource settings but requires further validation and improved training to ensure diagnostic quality and consistency. Limitations were small sample size limits statistical power, lack of diagnostic accuracy measures (e.g., sensitivity, specificity), and no evaluation of inter-operator consistency or image quality metrics. Future research should validate screening accuracy through direct comparison with specialist-led assessments and explore longitudinal outcomes following early RHD detection

References

1. Chillo P, Mutagaywa R, Nkya D, et al. Sub-clinical rheumatic heart disease (RHD) detected by hand-held echocardiogram in children participating in a school-based RHD prevention program in Tanzania. *BMC Cardiovascular Disorders*. 2023;23(1):155.
2. World Health Organization. Rheumatic fever and rheumatic heart disease: report of a WHO expert consultation, Geneva, 29 October-1 November, 2001. World Health Organization; 2004 Feb 4.
3. Roberts KV, Brown AD, Maguire GP, et al. Utility of auscultatory screening for detecting rheumatic heart disease in high-risk children in Australia's Northern Territory. *Medical Journal of Australia*. 2013;199(3):196-9.
4. Dougherty S, Khorsandi M, Herbst P. Rheumatic heart disease screening: current concepts and challenges. *Annals of pediatric cardiology*. 2017;10(1):39-49.
5. World Health Organization. Scaling up, saving lives: task force for scaling up education and training for health workers, Global Health Workforce Alliance. In: Scaling up, saving lives: task force for scaling up education and training for health workers, Global Health Workforce Alliance 2008 (pp. ix-113).

FHHMOP07 / 268

Kiambang Merah: Innovating Menstrual Care through AI and Digitalisation in Social Entrepreneurship for Public Health

Nor Faiza Mohd. Tohit¹, Siti Athirah Zafirah Abd Rashid¹, Wan Farizatul Shima binti Wan Ahmad Fakuradzi¹, Nur Adnin Ahmad Zaidi¹

Community Medicine, Faculty of Medicine and Defence Health, National Defence University of Malaysia, Kuala Lumpur, Malaysia.

Corresponding author's email: faizatohit@upnm.edu.my

Summary

Kiambang Merah is a pioneering social entrepreneurship initiative that addresses period poverty through the production of reusable menstrual pads, developed via a collaborative model involving a university, an NGO, and low-income communities. This innovative approach not only provides a sustainable solution to menstrual hygiene management but also empowers women and girls by enhancing access to education and health resources. By integrating AI and digitalisation into its operations—such as online classes, logo design, literature review for framework development, programme evaluation, and information dissemination—Kiambang Merah aims to optimise production processes and engage with stakeholders more effectively. This abstract outlines the project's methodology, outcomes, and its implications for public health in the new era.

Keywords

Period Poverty, Social Entrepreneurship, Menstrual Health, AI, Digitalisation.

Introduction

Period poverty remains a significant public health challenge, particularly in low-income communities where access to menstrual hygiene products is limited¹. In response to this pressing issue, Kiambang Merah was established as a tripartite collaboration between a university, a non-governmental organisation (NGO), and local communities. This initiative aims to produce affordable and reusable menstrual pads while fostering social entrepreneurship and community empowerment². This project leverages artificial intelligence (AI) and digitalisation to enhance production efficiency, optimise supply chains, and increase awareness about menstrual health. By incorporating online classes for skill development, creating a compelling logo to establish brand identity, and utilising literature reviews to inform the programme framework, this abstract discusses the project's innovative approach and its potential to transform public health outcomes through sustainable practices³.

Materials and Methods

The Kiambang Merah initiative employed a comprehensive methodology that included community engagement, product development, and the integration of digital technologies. Initially, focus group discussions were conducted with local women to understand their needs and challenges related to menstrual hygiene. Subsequently, prototypes of reusable menstrual pads were developed in collaboration with university researchers, ensuring they were both functional and

culturally appropriate. AI-driven tools were employed to streamline the production process, predict demand, and manage inventory effectively.

Digitalisation played a key role in various aspects of the project. Online classes were established to provide training for community members on production techniques and menstrual health education. The logo design process involved local artists, fostering community ownership and brand recognition. A thorough literature review informed the framework for the initiative, ensuring evidence-based practices were at the forefront of programme development. Continuous evaluation of the programme's effectiveness allowed for timely improvements, while digital platforms were utilised for marketing and the dissemination of information, reaching a broader audience and facilitating community training sessions on menstrual health and hygiene. Data collection methods included surveys, interviews, and production metrics to assess the initiative's impact.

Results and Discussion

The implementation of the Kiambang Merah project has yielded notable results in addressing period poverty and enhancing public health. Within the first year, approximately 1,000 reusable menstrual pads were produced and distributed to women and girls in the target community, significantly improving access to menstrual hygiene products. Surveys conducted post-distribution indicated that 85% of users reported increased comfort and confidence during their menstrual cycles, while 75% noted an improvement in their ability to attend school or work. The utilisation of AI in production and inventory management led to a 30% reduction in costs, allowing for the pricing of pads at a subsidised rate accessible to the community.

Moreover, the integration of online classes has empowered community members with valuable skills, fostering economic independence. The digitalisation of educational materials and outreach programmes resulted in increased awareness about menstrual health, with attendance at community workshops rising by 60%. The creation of a distinctive logo contributed to brand recognition and fostered community pride. The incorporation of technology not only facilitated product distribution but also empowered women to become advocates for menstrual health in their communities⁴. This project exemplifies how social entrepreneurship, combined with AI and digital technologies, can create sustainable solutions to public health challenges, fostering empowerment and resilience among underserved populations⁵.

Conclusion

Kiambang Merah represents a significant step towards addressing period poverty through innovative social entrepreneurship. By harnessing AI and digitalisation, the initiative not only improves menstrual health but also contributes to broader public health outcomes in low-income communities.



Figure 1: Health Education Material, MEDIA

References

1. Rossouw L, Ross H. Understanding Period Poverty: Socio-Economic Inequalities in Menstrual Hygiene Management in Eight Low- and Middle-Income Countries. *International Journal of Environmental Research and Public Health*. 2021;18(5):2571.
2. Tohit NF, Haque M. Breaking the cycle: addressing period poverty as a critical public health challenge and its relation to sustainable development goals. *Cureus*. 2024;16(6).
3. Jaafar H, Ismail SY, Azzeri A. Period poverty: a neglected public health issue. *Korean journal of family medicine*. 2023;44(4):183.
4. Tohit NF, Abd Rashid SA, Zaidi NA, et al. Social Entrepreneurship Initiatives Addressing Period Poverty: Mapping Strategies and Outcomes. *Bangladesh Journal of Medical Science*. 2025;24(1):33-50.
5. Werner MD, Punzi MC, Turkenburg AJ. Period power: Organizational stigma, multimodality, and social entrepreneurship in the menstrual products industry. *Journal of Management Studies*. 2024;61(5):2137-80.

FHHMOP08 / 277

Establishing a Cardiac Arrest Registry to Improve Out-of-Hospital Cardiac Arrest (OHCA) Outcomes in Malaysia: A Step Towards Data-Driven Emergency Care

Mohd Shahri Bahari¹, Leong Yuen Chin², Farhana Aminuddin¹, Sivaraj Raman¹, Mohd Shaiful Jefri Nor Sham Kunusagaran¹, Nur Amalina Zaimi¹, Tan Yui Ping¹, Ee Vien Low¹, Marhaini Mostapha¹, Nor Zam Azihan Mohd Hassan¹

¹ *Institute for Health Systems Research, National Institutes of Health, Ministry of Health Malaysia*

² *Emergency Department, Hospital Sungai Buloh, Ministry of Health Malaysia*

Corresponding author's email: mohdshahri.b@moh.gov.my

Summary

Out-of-hospital cardiac arrest (OHCA) remains a major public health challenge with low survival rates globally, particularly in low- and middle-income countries. Establishing a national OHCA registry following the Utstein template is vital for improving outcomes. This paper outlines the development of an OHCA registry in Penang, Malaysia, aiming to collect systematic and standardised data to evaluate emergency response, identify gaps, and support evidence-based policy. Benchmarking against the global OHCA registry and successful international efforts, this initiative sets the groundwork for enhancing cardiac arrest response systems through data-driven strategies in line with international best practices.

Keywords

Out-of-hospital cardiac arrest, registry, emergency care, Utstein Style, Malaysia

Introduction

Out-of-hospital cardiac arrest (OHCA) represents a significant global health burden, with marked disparities in incidence, prehospital response, and survival outcomes between high-income and low- and middle-income countries (LMICs)¹. In many LMICs, the absence of systematic data collection hampers efforts to evaluate emergency medical services (EMS) performance and implement targeted interventions. Robust OHCA registries, guided by the Utstein reporting template², enable standardised data collection and facilitate meaningful comparisons across regions and over time. Such registries serve as essential tools for assessing the effectiveness of key interventions, including bystander cardiopulmonary resuscitation, early defibrillation, and EMS response times. Furthermore, they inform continuous quality improvement initiatives and support health policy planning based on real-world evidence. This abstract presents the establishment of a regional OHCA registry in Penang, Malaysia, aimed at capturing epidemiological and outcome data to strengthen prehospital care and resource allocation. The initiative aligns with global efforts to enhance cardiac arrest management through structured, data-driven approaches.

Materials and Methods

The Penang OHCA registry is being developed as a prospective, population-based observational system capturing all cases of OHCA reported through emergency call received by Malaysian Emergency Response Services 999 (MERS 999) in the state. Data are collected using a standardised form based on the Utstein template, covering demographics, event characteristics, bystander response, EMS interventions, and outcomes including return of spontaneous circulation (ROSC) and survival to hospital discharge. Collaboration with public EMS providers and hospitals enables linkage of prehospital and in-hospital data. Training sessions were conducted for EMS personnel and research assistants to ensure accurate and consistent data entry. Data collection began in early 2023 and includes retrospective case identification for baseline trend analysis. The registry will also integrate geospatial mapping of incident locations and defibrillator access to assess system responsiveness and identify areas for improvement.

Results and Discussion

A total of 5,052 out-of-hospital cardiac arrest (OHCA) cases were documented (Table 1). The mean age was 70.4 years (SD ± 16.39), with a predominance of male patients (54.6%). Ethnic distribution reflected regional demographics: Chinese (52.1%), Malay (32.5%), Indian (9.9%), and other ethnicities (5.5%). The majority of OHCA cases (85.5%) occurred within home or residential settings, consistent with international data^{3,4}. This information will be valuable in guiding the development of CPR awareness campaigns, as well as in planning AED deployment and CPR training at the study sites. Only 36.6% of cardiac arrests were witnessed by bystanders, with a further 2.4% observed by emergency medical services (EMS). A substantial proportion, accounting for 27.8%, were unwitnessed events. These figures reflect a significant gap in community recognition and response, highlighting the need for broader public education on cardiac arrest recognition and resuscitation, including dispatcher-assisted CPR and first responder engagement. Automated External Defibrillator (AED) usage was documented in only 1.6% of cases. This trend is consistent across several other Asian countries, despite numerous public awareness campaigns addressing cardiac arrest³. The outcome data are concerning: 99.4% of patients did not survive to hospital discharge, with only 0.3% recorded as alive post-event. These outcomes reflect the persistent challenges in OHCA management within low- and middle-income settings, including low rates of bystander CPR, limited public AED access, and prolonged EMS response times. These findings emphasise the urgent need for structured emergency response strategies. The implementation of the Penang OHCA registry represents a foundational effort to systematically monitor and improve prehospital cardiac arrest care. Through ongoing data collection and analysis, this registry will facilitate the evaluation of interventions, guide resource allocation, and support future policy aimed at enhancing OHCA survival rates in Malaysia.

Conclusion

The establishment of a regional OHCA registry in Penang marks an essential step in improving cardiac arrest outcomes through systematic data collection. Aligned with global standards and the Utstein template, this initiative supports evidence-based emergency care planning and lays the foundation for a national cardiac arrest surveillance system in Malaysia.

Table: Patient demographics, out-of-hospital cardiac arrest characteristics and outcomes for all cases, (N=5052)

Characteristic			
Age (n=5024)	Mean (SD)	70.4	±16.4
Gender (%)			%
	Male	2759	54.6
Race (%)			%
	Chinese	2632	52.1
	Malay	1642	32.5
	Indian	499	9.9
	Foreigner	244	4.8
	Unknown	35	0.7
Location type (%)			%
	Home/residence	4317	85.5
	Assisted living/nursing home	376	7.4
	Street/highway	156	3.1
	Industrial/workplace	82	1.6
	Others	101	2
	Unknown	20	6
Arrest witness by (%)			%
	Bystander witnessed	1850	36.6
	EMS witnessed	123	2.4
	Unwitnessed	1404	27.8
	Unknown	1675	33.2
Usage AED (%)			%
	AED not used	4607	91.2
	AED used	78	1.6
	Unknown	367	7.3
Outcome (%)			%
	Death	5022	99.4
	Alive	14	0.3
	Unknown	16	0.3

References

1. Kiguchi T, Okubo M, Nishiyama C, et al. Out-of-hospital cardiac arrest across the world: First report from the international liaison committee on resuscitation (ILCOR). *Resuscitation* 2020;**152**:39-49.
2. Bray JE, Grasner JT, Nolan JP, et al. International Liaison Committee on Resuscitation. Cardiac Arrest and Cardiopulmonary Resuscitation Outcome Reports: 2024 Update of the Utstein Out-of-Hospital Cardiac Arrest Registry Template. *Circulation*. 2024;**150**(9):e203-e223.
3. Ong ME, Shin SD, Tanaka H, et al. Pan-Asian Resuscitation Outcomes Study (PAROS): rationale, methodology, and implementation. *Acad Emerg Med*. 2011 Aug;**18**(8):890-7.
4. Xie X, Zheng J, Zheng W, et al. BASIC-OHCA Coordinators and Investigators. Efforts to Improve Survival Outcomes of Out-of-Hospital Cardiac Arrest in China: BASIC-OHCA. *Circ Cardiovasc Qual Outcomes*. 2023;**16**(2):e008856.

FHHMOP09 / 289

Living in an Obesogenic Environment: Voices of Women of Reproductive Age - A Qualitative Exploration

Nurul Farehah Shahrir^{1,2}, Noor Aman Hamid², Nur Nabila Abd Rahim¹, Zaiton Daud³, Siti Harirotul Hamrok Asis⁴, Rohana Abdul Jalil²

¹ Environmental Health Research, Institute for Medical Research, National Institutes of Health, Ministry of Health Malaysia

² Department of Community Medicine, School of Medical Sciences, Universiti Sains Malaysia

³ Nutrition Division, Ministry of Health Malaysia

⁴ Family Health Unit, Selangor State Health Department, Ministry of Health Malaysia

Corresponding author's email: farehah.shahrir@moh.gov.my

Summary

Obesity rates are rising, particularly among women of reproductive age. This qualitative study, part of a larger mixed-method study in Selangor, employed a phenomenological approach aimed to explore the lived experiences of overweight and obese reproductive-age women. Purposive sampling was conducted, and 20 respondents were recruited for semi-structured, in-depth phone interviews. Data were analysed using thematic analysis, revealing five key themes: (1) unhealthy food environments, (2) limited access to healthy foods, (3) circumstances promoting sedentary lifestyles, (4) marketing impact, and (5) sociocultural influences. Addressing these factors requires upstream interventions to curb the rise of obesity among women of reproductive age.

Keywords

Obesogenic environment, women's health, reproductive age, qualitative study, obesity determinants

Introduction

Globally, obesity has tripled since 1975, with over 1.9 billion adults overweight and one-third obese¹. Obesity rates are higher in women, with peak prevalence shifting to younger individuals. In overweight and obese reproductive-age women, obesity poses risks to fertility, pregnancy outcomes, and long-term health. An obesogenic environment—influenced by social, cultural, economic, and physical factors—drives excessive caloric intake and sedentary lifestyles². This study explores the lived experiences of overweight and obese reproductive-age women regarding obesogenic environment influences on their weight-related behaviours.

Materials and Methods

This qualitative study, part of a mixed-method study on suboptimal gestational weight gain (GWG) in Selangor, employed a phenomenological approach. Of 475 recruited participants, 20 suboptimal GWG women were purposively selected for in-depth phone interviews, ensuring diversity in age, gravidity, residence, education, and employment. Data were analysed using Braun and Clarke's six-step thematic analysis, with codes developed inductively and refined iteratively. A semi-structured interview guide was used, and sampling continued until data saturation. Rigor was ensured through expert supervision, prolonged engagement,

debriefing, and an audit trail. Maximum variation sampling enhanced transferability, while dependability was ensured through careful transcription. Ethical approval was obtained from Universiti Sains Malaysia (USM/JEPeM/19110812) and the Medical Research & Ethics Committee (MREC), Ministry of Health Malaysia (NMRR-19-3283-51839 [IIR]).

Results and Discussion

A total of twenty respondents aged 21 to 33 participated in this study. Almost half (40%) had secondary education, and 55% were employed. The majority (95%) were overweight or obese. Five main themes emerged from the qualitative data in Table 1.

Table 1: Themes and Categories from Qualitative Inquiries Among Reproductive-Age Women

Theme	Categories	Quotes
Food environment encourages unhealthy choices	• Easily available unhealthy food in residential and workplace areas • Abundance and proximity of cheap, high-calorie food stalls • High density of fast-food outlets • Reliance on convenience stores	<i>"It's easy to get. My school is surrounded by a fast-food restaurant, a supermarket, and lots of food stalls. I buy ABC, cendol, and more." (R5)</i>
Struggles with affording healthy foods	• High prices of healthy food • Limited access to fresh produce • Compromised food quality	<i>"Fruits are expensive; once I buy them, RM20 is spent, and in one or two days, they're finished. Wholemeal bread is also expensive." (R2)</i>
Circumstances promoting a sedentary lifestyle	• Impact of the COVID-19 pandemic on lifestyle • Lack of time, exhaustion from work, and poor work-life balance	<i>"I have no time to exercise. I leave for work at 7 AM and only get back at 10 PM because of the traffic jam. I'm too tired. I wake up, go to work, come home, and sleep—that's all I do." (R4)</i>
The impact of marketing and promotion	• Cheap promotions and bulk purchasing • Enticing unhealthy food advertisements • Increased reliance on food delivery	<i>"We have a WhatsApp group for food orders—RM1 delivery. The promos look delicious, and the more we buy, the cheaper it gets, like fast food deals!" (R12)</i>
Sociocultural and social environmental influence on eating habits	• Social network preference for unhealthy foods • Eating together promotes overeating	<i>"We enjoy eating together, often ordering savouries, cakes, and sweets. Our boss sometimes treats us with kuih and snacks." (R8)</i>

The obesogenic environment is shaped by food availability, pricing, and physical activity opportunities. The low cost of unhealthy, calorie-dense foods compared to fresh, nutritious options creates a barrier to healthy eating, especially for lower-income women³. Many rely on cheaper, processed foods due to financial constraints. The high density of fast-food outlets in workplaces and residential areas reinforces poor dietary habits⁴. Long working hours and demanding schedules limit physical activity, fostering sedentary lifestyles⁵. Limited time and energy after work discourage exercise, contributing to weight gain. A similar situation occurred during the movement control order (MCO) during the COVID-19 pandemic.

Conclusion

Five themes explain the obesogenic environment of overweight or obese women: unhealthy food environment, limited access to healthy foods, circumstances promoting a sedentary lifestyle, marketing impact, and sociocultural influence. Addressing these issues requires an upstream approach in reshaping the food environment and workplace culture to halt the obesity upsurge and its related complications.

References

1. Boutari C, Mantzoros CS. A 2022 update on the epidemiology of obesity and a call to action: as its twin COVID-19 pandemic appears to be receding, the obesity and dysmetabolism pandemic continues to rage on. *Metabolism: clinical and experimental*. 2022;**133**:155217.
2. Lakerveld J, Mackenbach J. The Upstream Determinants of Adult Obesity. *Obesity Facts*. 2017;**10**(3):216-22.
3. Seguin R, Connor L. Understanding barriers and facilitators to healthy eating and active living in rural communities. 2014;**2014**:146502.
4. van Erpecum C-PL, van Zon SKR, Bültmann U, et al. The association between fast-food outlet proximity and density and Body Mass Index: Findings from 147,027 Lifelines Cohort Study participants. *Prev Med*. 2022;**155**:106915.
5. Landais LL, Jelsma JGM, Dotinga IR, et al. Office workers' perspectives on physical activity and sedentary behaviour: a qualitative study. *BMC Public Health*. 2022;**22**(1):621.

FHHMOP10 / 295

From Policy to Delivery Rooms: Cascade of High-Risk Pregnancy Dynamics and Maternal Outcomes in Ningxia, Northwestern China

Yang Xiali^{1,2}, Ning Yanhua³, Tian Xiaojuan¹, He Ying¹, Nadzratulaiman Wan Nordin⁴, Xin Wee Chen²

¹ Department of Maternal and Infant Nursing, School of Nursing, Ningxia Medical University

Shengli South Street, Xingqing District, Yinchuan, Ningxia.

² Department of Public Health Medicine, Faculty of Medicine, Universiti Teknologi MARA, Sungai Buloh Campus, 47000 Sungai Buloh, Selangor.

³ Department of Community Nursing, School of Nursing, Ningxia Medical University, Shengli South Street, Xingqing District, Yinchuan, Ningxia.

⁴ Department of Obstetrics and Gynaecology, Faculty of Medicine, Universiti Teknologi MARA, Sungai Buloh Campus, 47000 Sungai Buloh, Selangor.

Corresponding author's email: drchenxw@uitm.edu.my

Summary

Following China's relaxed birth policy, advanced maternal age pregnancies have risen, yet high-risk pregnancy patterns in Ningxia, Northwestern China, remain understudied. This study investigated high-risk pregnancy prevalence and its associated adverse outcomes. This observational study assessed 1,120 women using a modified Nesbitt checklist and hospital records. Nearly half of the participants (556/1120; 49.6%) were labelled as high-risk at booking, demonstrating significantly elevated odds of adverse outcomes: cesarean delivery (aOR=8.46), preterm birth (aOR=4.75), low birthweight (aOR=4.92), and postpartum haemorrhage (aOR=3.56). These findings emphasise the critical need for implementing early risk assessment of high-risk pregnancies and subsequent tailored antenatal management strategies in clinical practice.

Keywords

High-risk pregnancy, postpartum haemorrhage, preterm birth, fetal weight

Introduction

A rising trend of pregnant women with advanced maternal age was observed following the relaxation of China's birth policy¹, yet limited studies exploring the high-risk pregnancy situation, especially in Ningxia, Northwestern China. We aimed to determine the relationship between high-risk pregnancy assessed at first antenatal appointment (booking) and adverse maternal and neonatal outcomes among the Ningxia population.

Materials and Methods

A cross-sectional study was conducted at the postnatal ward, Ningxia Medical University General Hospital, during May-July 2022. Participants' information at booking was obtained to determine their pregnancy risk using a modified Nesbitt checklist². Adverse outcomes were abstracted from the hospital medical records. Four backward multiple logistic regression models were developed to model the relationship for the various adverse outcomes, presented as adjusted odds ratios

(aOR) along with 95% confidence intervals (CI). Multicollinearity and interaction terms were checked.

Results and Discussion

Overall, 556 (49.6%) women had high-risk pregnancies. Table 1 revealed significant sociodemographic disparities between high-risk and non-high-risk pregnancies, with urban residence, higher education, and income $\geq$ RM 2,400 being more prevalent in high-risk groups. Table 2 demonstrates significantly higher proportions of adverse outcomes in high-risk compared to non-high-risk pregnancies. Multivariable analysis (Table 3) confirmed significant independent associations between high-risk status and adverse outcomes when the sociodemographic characteristics were adjusted, with the highest odds for cesarean section (aOR=8.462, 95% CI 6.068-11.799). These findings highlight the need for enhanced clinical monitoring and tailored management strategies for high-risk pregnancies to mitigate adverse perinatal outcomes (3,4).

Table 1 : Demographic and Socioeconomic Characteristics of Pregnant Women by Risk Category in Ningxia (n=1120)

Variables	Overall n (%)	High risk n (%)	Non-high risk n (%)
Residential area			
Urban	758 (67.7)	342 (61.5)	416 (73.8)
Rural	362 (32.3)	214 (38.5)	148 (26.2)
Educational level			
Primary and secondary	598 (53.4)	270 (45.2)	328 (54.8)
Tertiary	522 (46.6)	286 (54.8)	236 (45.2)
Household income level			
<RM 2,400	404 (36.1)	165 (29.7)	239 (42.4)
$\geq$ RM 2,400	716 (63.9)	391 (70.3)	325 (57.6)
Healthcare distance from home			
<30min	666 (59.5)	234 (42.1)	432 (76.6)
30min-60min	305 (27.2)	188 (33.8)	117 (20.7)
>60min	149 (13.3)	134 (24.1)	15 (2.7)
Number of antenatal examinations			
$\geq$ 4 times	102 (91.2)	487 (87.6)	534 (94.7)
<4 times	99 (8.8)	69 (12.4)	30 (5.3)
Presence of long-distance marriage			
Yes	276 (24.6)	209 (75.7)	67 (24.3)
No	844 (75.4)	347 (41.1)	497 (58.9)

Table 2: Multiple Logistic Regression analysis modelling the associations between the high-risk pregnancies with maternal and neonatal outcomes (n=1120)

	Outcome (Yes) n (%)	Outcome (No) n (%)	Crude OR (95% CI)	Adjusted OR (95% CI)
Model 1	Postpartum hemorrhage	No postpartum hemorrhage		
High risk	37 (74.0)	518 (48.4)	3.033 (1.594-5.770)	3.562 ^a (1.776-7.145)
Non-high-risk	13 (26.0)	552 (51.6)		
Model 2	Cesarean section	Vaginal delivery		
High risk	362 (72.0)	193 (31.3)	5.627 (4.345-7.287)	8.462 ^b (6.068-11.799)
Non-high-risk	141 (28.0)	424 (68.7)		
Model 3	Preterm birth	Term birth		
High risk	95 (75.4)	460 (46.3)	3.558 (2.328-5.437)	4.747 ^c (3.009-7.491)
Non-high-risk	31 (24.6)	534 (53.7)		
Model 4	Low birth weight	Normal birth weight		
High risk	76 (80.9)	479 (46.7)	4.813 (2.838-8.162)	4.920 ^d (2.792-8.670)
Non-high-risk	18 (19.1)	546 (53.3)		

^a Adjusted by education level, number of antenatal examinations, presence of long-distance marriage, residential area, and healthcare distance from home.

^b Adjusted by education level, presence of long-distance marriage, residential area, and healthcare distance from home.

^c Adjusted by healthcare distance from home.

^d Adjusted by presence of long-distance marriage, residential area, and healthcare distance from home.

Conclusion

Nearly 50% of pregnancies in Ningxia, Northwestern China, are detected as high-risk at booking, and this status was consistently associated with adverse maternal and neonatal outcomes. These findings reinforced timely screening of high-risk pregnancies and risk-stratification strategies to optimise maternal-fetal health outcomes in Northwestern China⁵.

References

1. Shan D, Qiu PY, Wu YX, et al. Pregnancy Outcomes in Women of Advanced Maternal Age: a Retrospective Cohort Study from China. *Sci Rep*. 2018;**8**(1):12239.
2. Lu H, An LB. Obstetrics and Gynecology Nursing. 6th ed. People's Medical Publishing House; 2017.
3. Correa-de-Araujo R, Yoon SSS. Clinical Outcomes in High-Risk Pregnancies Due to Advanced Maternal Age. *J Womens Health (Larchmt)*. 2021;**30**(2):160-167.
4. Cajamarca-Baron J, Sanmiguel-Reyes C, Bedoya-Loaiza JE, et al. Maternal and fetal outcomes in Latin American SLE pregnancies: A systematic review and meta-analysis. *Autoimmun Rev*. 2025;**24**(4):103744.
5. Liu J, Jing W, Liu M. Risk management of pregnant women and the associated low maternal mortality from 2008-2017 in China: a national longitude study. *BMC Health Serv Res*. 2022;**22**(1):335.

FHHMOP11 / 310

Intimate Partner Violence and Child Maltreatment in Sarawak: Predictive Factors Among Men

Siti Romahani Rahman¹, Md Mizanur Rahman²

¹ *Pejabat Kesihatan Daerah Temerloh*

² *Department of Community Medicine and Public Health, Faculty of Medicine and Health Sciences, Universiti Malaysia Sarawak*

Corresponding author's email: romahanirahman@moh.gov.my

Summary

This study explored the prevalence and predictors of intimate partner violence (IPV) perpetration, IPV victimisation, and child maltreatment perpetration among 800 married men in Sarawak. Data were analysed via path analysis using a cross-sectional design with multistage-cluster sampling. There was an 11.4% overlapping prevalence of IPV perpetration, IPV victimisation, and child maltreatment perpetration. Key predictors include adverse childhood experiences (ACE), attitudes toward violence, anxiety attachment style and gender equality. The study highlights the need for multi-sectoral collaboration and targeted interventions to address men's dual roles in family violence.

Keywords

Intimate partner violence, child maltreatment, Adverse childhood experiences, attitudes toward violence, Sarawak

Introduction

Child maltreatment refers to the abuse and neglect of individuals under the age of 18, which can include physical, emotional, and sexual abuse. IPV involves harmful behaviours, including physical, sexual, or psychological violence, that occur within an intimate relationship ¹. Various efforts have been made to identify the predictors of these forms of violence, aiming to inform effective prevention strategies. However, existing research mostly focused on predictors from the victims' perspective, resulting in limited knowledge about the perpetrator's role and background. Therefore, this study explored the perspective of men, focusing on their involvement as perpetrators of IPV and child maltreatment, and also as victims of IPV. We aimed to determine the prevalence and identify the predictors of IPV perpetration, IPV victimisation, and child maltreatment perpetration in Sarawak.

Materials and Methods

This cross-sectional study was conducted in 10 districts across Sarawak, targeting married men as the study population. Men with no children and not living with their wives at the time of the study were excluded to ensure the relevance of the family-related violence assessment. The sample size was determined using a cluster sampling. 800 eligible respondents were recruited through multistage cluster sampling. Data collection was carried out through face-to-face interviews using a structured and validated questionnaire. The variables measured were ACE, perceptions of gender equality and inequality, anxiety and avoidant attachment

styles, and attitudes toward violence. The dependent variable was a composite variable derived from self-reported incidents of IPV perpetration, IPV victimisation, and child maltreatment perpetration within the previous 12 months. Statistical analysis involved descriptive, bivariate, and multivariate analysis, including path analysis. Ethical approval was obtained from Universiti Malaysia Sarawak.

Results and Discussion

There was an overlapping prevalence between IPV perpetration, IPV victimisation, and child maltreatment perpetration by 11.4%. Around 4.0% of men were perpetrators of IPV and child maltreatment, 1.1% were IPV victims and perpetrators, and 6.0% admitted to perpetrating child maltreatment and IPV victims (Figure 1). These overlapping prevalences showed a strong patriarchal family structure with a hierarchical family dynamic and the establishment of control over family members². The significant direct pathway to perpetration and victimisation includes gender equality (-0.129, 95% CI: -0.190,-0.068, $p = 0.000$), ACE (0.104, 95% CI: 0.037,0.169, $p = 0.005$), attitude (0.066, 95% CI: 0.004,0.127, $p = 0.037$), and gender inequality (0.064, 95% CI: 0.005,0.122, $p = 0.037$) (Table 1). Our findings were consistent with the intergenerational cycle of violence, wherein individuals who have experienced ACE are more predisposed to perpetuate similar behaviour towards their partners and offspring. This intergenerational transmission may occur through various mechanisms, including social learning, modelling parental behaviours, and the internalisation of early attachment experiences³. Men who advocate for gender equality are less inclined to engage in violent behaviour compared to those who support gender inequality. Indeed, violence against women is widely recognised as a consequence of unequal power dynamics, rigid gender norms, and the ascription of lower social status to women⁴. A full mediation emerged between ACE and anxiety in the occurrence of violence (0.011, 95% CI: 0.003,0.024, $p = 0.045$) (Table 1). Men with anxiety attachment tend to exhibit heightened emotional reactivity and difficulties in regulating emotions, which impacts relational and parental functioning⁵.

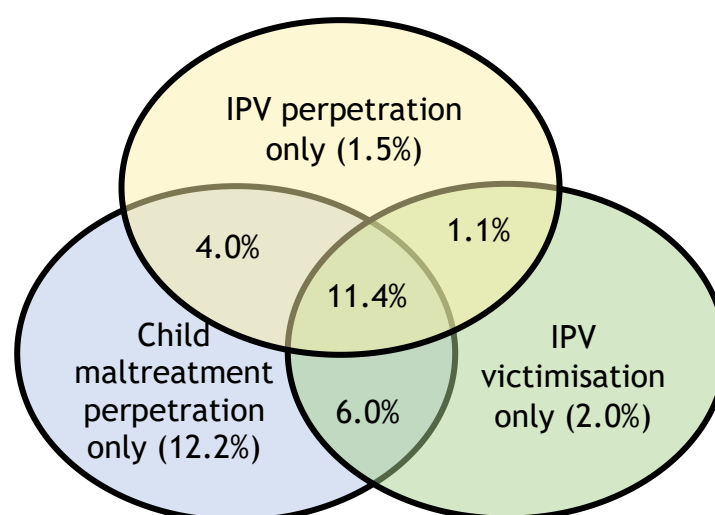


Figure 1: Prevalence of IPV perpetration, IPV victimisation, and child maltreatment perpetration

Table 1: Path analysis of predictors of IPV Perpetration, IPV victimisation, and child maltreatment perpetration

Variables	Estimate	SD	95% CI (LL, UL)	p-value
Direct effects				
ACE > Violence	.104	.040	.037,.171	.005**
Gender equality > Violence	-.129	.037	-.186,-.067	.000***
Anxiety > Violence	-.026	.034	-.080,.031	.217
Avoidant > Violence	-.052	.034	-.111,.002	.061
Gender inequality > Violence	.064	.036	.001,.005	.037*
Attitudes > Violence	.066	.037	.004,.127	.037*
Total indirect effects				
Attitude > ACE > Violence	.006	.005	.000,.018	.114
Anxiety > ACE > Violence	.011	.006	.003,.024	.045*
Avoidant > ACE > Violence	-.003	.005	-.013,.003	.283
Gender inequality > ACE > Violence	-.004	.005	-.015,.001	.198
Total effects				
Anxiety >> Violence	-.016	.035	-.071,.043	.324
Avoidant >> Violence	-.056	.035	-.114,.001	.054
Gender inequality >> Violence	.059	.036	-.000,.119	.051
Attitudes >> Violence	.072	.038	.010,.134	.028*

*p<0.05, **p<0.01, ***p<0.001

Conclusion

This study highlighted crucial aspects of IPV and child maltreatment, including their overlapping prevalence and the key factors that contribute to these issues. Our findings emphasise the interconnected nature of this violence, revealing how they often coexist and reinforcing the need for early intervention and comprehensive prevention strategies to break the cycle of violence across generations.

References

1. World Health Organization. Child Maltreatment: WHO; 2014 [cited 2022 9th November]. Available from: <https://apps.who.int/violence-info/child-maltreatment>.
2. Guedes A, Bott S, Garcia-Moreno C, Colombini M. Bridging the gaps: a global review of intersections of violence against women and violence against children. *Global Health Action*. 2016;**9**(1):31516.
3. Buisman RSM, et al. Intergenerational transmission of child maltreatment using a multi-informant multi-generation family design. *PLOS ONE*. 2020;**15**(3):e0225839.
4. United Nations. Declaration on the Elimination of Violence against Women 1993: United Nations Human Rights; 2024 [Available from: <https://www.ohchr.org/en/instruments-mechanisms/instruments/declaration-elimination-violence-against-women>].
5. Camilla, Chan Ko Ling, Ip Patrick. Insecure Adult Attachment and Child Maltreatment: A Meta-Analysis. *Trauma, Violence, & Abuse*. 2019;**20**(5):706-19.

FHHMOP12 / 313

Patients' Perspectives on Good Quality of Care for Managing Diabetes, Hypertension and Dyslipidaemia: A Nominal Group Technique Approach

Mohamad Zulfikrie Abas¹, Norshahiratul Atiqah Mohd Zaidi¹, Lee Pei Jia¹, Wan Kim Sui², Azah Abdul Samad³, Chan Huan Keat⁴, Sheamini Sivasampu^{1,5}, Ang Swee Hung¹

¹ Institute for Clinical Research, National Institutes of Health, Ministry of Health Malaysia

² Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

³ Primer Health Branch, Family Health Development Division, Ministry of Health Malaysia

⁴ Clinical Research Centre, Alor Setar Hospital, Ministry of Health Malaysia

⁵ National Public Health Laboratory, Ministry of Health Malaysia

Corresponding author's email: zulfikrie@moh.gov.my

Summary

This qualitative study explored patients' perspectives on what defines good quality of care for diabetes, hypertension, and dyslipidaemia in Malaysian primary health care (PHC). Using the Nominal Group Technique (NGT), five sessions were conducted with 36 patients across two public clinics. Three themes emerged as top priorities: "Treatment and Medication", focusing on consistent access and adherence; "Lifestyle Management", highlighting the need for support in diet and physical activity; and "Empowering Health Awareness and Literacy", emphasising clear communication and understanding of one's health. These patient-driven insights offer valuable guidance for improving the management of these diseases in PHC settings, especially in Malaysia.

Keywords

Patient perspectives, Quality of care, Diabetes, Hypertension, Dyslipidaemia

Introduction

The high prevalence of diabetes, hypertension, and dyslipidaemia in Malaysia poses a significant public health challenge¹, particularly within the PHC setting. Effective management of these chronic conditions requires not only evidence-based clinical care but also a clear understanding of patients' expectations and experiences². Patient-centred insights are crucial for tailoring services that meet real-world needs and improving long-term health outcomes. This study was conducted as part of MyABCMap project, a broader research initiative aimed at improving chronic disease management in Malaysian PHC. It explored patients' perspectives on what defines good quality of care for diabetes, hypertension, and dyslipidaemia management within this context.

Materials and Methods

This qualitative study used the NGT approach to explore patients' perspectives on good quality of care for diabetes, hypertension, and dyslipidaemia. Five sessions were held at two public primary clinics in Selangor—one urban, the other suburban. Patients with at least one of the three conditions were approached randomly at the clinics and invited to participate. Each group comprised six to eight participants. Sessions were facilitated by a trained moderator with support from

three assistants. Discussions were conducted in both Malay and English, based on participants preference, and audio-recorded. Participants first generated ideas individually, followed by a structured “round-robin” where each took turns sharing one idea at a time, continuing until no new ideas emerged, indicating saturation. The list of ideas was displayed, and participants were given three to five votes to anonymously rank the most important ideas. Data were analysed using reflexive thematic analysis³. Initial coding was performed by one researcher, and emerging themes were refined and finalised through team consensus⁴.

Results and Discussion

A total of 36 participants took part in five NGT sessions. Most participants (75.0%) were aged 60 years and above, and over half were male (58.3%). The majority were Malay (69.4%) and had at least secondary education (88.9%) (Table 1).

Table 1: Sociodemographic characteristics of the participants

	Session 1 (n=7)	Session 2 (n=8)	Session 3 (n=6)	Session 4 (n=8)	Session 5 (n=7)	Overall (N=36)
Age (<60 years)	28.6%	25.0%	33.3%	12.5%	28.6%	25.0%
Gender (male)	57.1%	37.5%	83.3%	50.0%	71.4%	58.3%
Ethnicity						
Malay	85.7%	50.0%	100.0%	50.0%	71.4%	69.4%
Chinese	14.3%	12.5%	-	37.5%	14.3%	16.7%
Indian	-	37.5%	-	12.5%	14.3%	13.9%
Education Level						
No formal	-	-	-	-	14.3%	2.8%
Primary	14.3%	-	-	12.5%	-	8.3%
Secondary	28.6%	62.5%	16.7%	87.5%	71.4%	55.6%
Tertiary	57.1%	37.5%	83.3%	-	14.3%	33.3%

Across the sessions, participants generated and prioritised various ideas about good quality of care, which were synthesised into seven main themes (Table 2). The overall most prioritised theme was “Treatment and Medication” (28.4%). This theme centred on two key concerns. Firstly, the availability and quality of medication, including consistent supply, timely access, and confidence in the effectiveness of prescribed medicines. Secondly, treatment adherence and compliance, where participants emphasised the importance of taking medications according to the correct dosage and timing, complying with regular treatment schedules, and following doctors’ instructions. “Lifestyle Management” (26.4%) was also highly prioritised, with participants highlighting aspects such as healthy diet, physical activity, and lifestyle changes. “Empowering Health Awareness and Literacy” (19.6%) reflected participants’ emphasis on the need for clear information and understanding of their health conditions and treatment. This study highlights that for these patients, good quality care hinges on consistent access to medication, structured lifestyle support, and improved health literacy. Patients emphasised the importance of reliable treatment and called for ongoing guidance in managing their lifestyle. They also expressed a strong desire to better understand their conditions and engage in shared decision-making with healthcare providers. The NGT approach effectively captured these patient priorities.

Although the study generalisability was limited by a small sample size and recruitment from a single state, this is consistent with the qualitative aim of gaining rich, contextual insights. A key strength of this study is its policy-driven focus, offering valuable input to inform more patient-centred care in Malaysia's PHC system.

Table 2: Percentage of votes for themes across NGT sessions

	Session 1	Session 2	Session 3	Session 4	Session 5	Overall
Affordability	-	15.0%	-	-	-	4.0%
Clinical information system	-	5.0%	10.0%	-	-	3.4%
Clinical service delivery design	12.1%	12.5%	16.7%	16.7%	0.0%	12.2%
Empowering health awareness and literacy	-	20.0%	46.7%	29.2%	0.0%	19.6%
Lifestyle management	18.2%	15.0%	13.3%	33.3%	71.4%	26.3%
Quality of doctors	27.3%	-	-	-	-	6.1%
Treatment and medication	42.4%	32.5%	13.3%	20.8%	28.6%	28.4%

Conclusion

This study explored how patients with diabetes, hypertension, and dyslipidaemia define good quality of care in managing the diseases within PHC context. Their priorities were consistent treatment access and adherence, lifestyle support, and health understanding. These insights provide a patient-informed foundation for shaping quality improvement efforts that are more aligned with real-world expectations in primary health care.

References

1. Institute for Public Health. National Health and Morbidity Survey (NHMS) 2023: Non-Communicable Diseases and Healthcare Demand: Technical Report. 2024.
2. Barnett HA. The patient perspective of quality care: A literature review. *The George Wash Univ Undergrad Rev*. 2019;2:1-X.
3. Byrne D. A worked example of Braun and Clarke's approach to reflexive thematic analysis. *Quality & quantity*. 2022 Jun;56(3):1391-412.
4. McMillan SS, Kelly F, Sav A, Kendall E, King MA, Whitty JA, Wheeler AJ. Using the nominal group technique: how to analyse across multiple groups. *Health Serv Outcomes Res Methodol*. 2014 Sep;14:92-108.

FHHMOP13 / 319

Development of Public Health Law in Malaysia

Justen Han Wei Wong¹, Tahir Aris², Ismuni Bohari³, Mohd Zamre Mohd Zahir⁴

¹ Putrajaya Health Office, Federal Territory of Kuala Lumpur and Putrajaya Health Department, Ministry of Health Malaysia, Putrajaya, Malaysia

² Institute for Medical Research, Ministry of Health, Setia Alam, Malaysia

³ Kedah State Health Department, Ministry of Health, Alor Star, Malaysia

⁴ Faculty of Law, Universiti Kebangsaan Malaysia, Bangi, Malaysia

Corresponding author email: dr.justen@moh.gov.my

Summary

This paper is a novel policy review of the legal framework within which public health in Malaysia operates. The paper discusses policy implications of the imposition of public health laws on the people from the inception of said laws up to current applications. Public health law aims to achieve the highest possible level of physical and mental health in the population, in accordance with social justice values. In Malaysia, the enforcement of public health laws is primarily carried out by public health agencies, with a focus on functions including communicable disease control, food safety, tobacco control, water quality, and occupational safety. These laws, evolving from colonial times, are crucial for preventing diseases and promoting health equity. This presentation explores the development, enforcement, and efficacy of public health laws in Malaysia, highlighting the necessity of a community-engaged, whole-of-government approach to safeguard public health.

Keywords

Public health law; health policy; legal framework, COVID-19 response; Malaysia

Introduction

Public health law comprises the state's legal powers and duties, in collaboration with various partners, to ensure conditions for people's health by addressing and mitigating health risks while respecting individual rights¹. It aims to achieve the highest possible level of physical and mental health in the population, consistent with social justice values². The development of public health law is an incremental process, evolving over time through new laws built on previous ones. In Malaysia, public health laws often involve compounding of offenses as a first step, with subsequent offenses handled by the courts. Public health agencies are key in enforcing these laws. These laws and their enforcement have developed from colonial times, evolving into a major strategy for maintaining public health in Malaysia.

Materials and Methods

This study adopts a Historical Institutionalism approach, which emphasises the role of formal and informal institutions and critical junctures in shaping long-term public health law policy. Accordingly, the selection of sources prioritised materials that could illuminate institutional development over time, and policy continuity and change. Sources were selected to trace the development and implementation of public health laws across key historical periods. These included: legislative texts

(to identify institutional decisions and legal codification), and government reports (to understand administrative responses and problem framing). Themes of equity and justice were interpreted contextually – for instance, in early public health laws, justice often centred on social order and sanitation, while later laws began to frame equity more in terms of universal access and social rights. The analysis traced these shifts, highlighting how institutional values reflected broader ideological changes. Rather than assuming fixed definitions, the study examined how institutions operationalised these values differently across historical periods – for example, from disease control in the 19th century to broader commitments to health access and rights in the current era. The methodology involves a descriptive review and analysis of the evolution of public health law in Malaysia, tracing its development from the colonial era to the present day. The analysis includes a review of key legislation, enforcement practices, and the role of various stakeholders, such as government agencies, healthcare providers, and the community, in shaping public health outcomes.

Results and Discussion

The earliest efforts for public health laws in Malaysia primarily centred on establishing basic sanitation infrastructure and controlling the spread of diseases. During this period, focus was given to improving water supplies and establishing sanitary boards in urban areas to manage public sanitation, regulate markets, and ensure proper disposal of refuse³. Over time, the scope of public health laws has broadened significantly to address a more comprehensive range of public health issues, including both communicable and non-communicable diseases, environmental health concerns, and the regulation of medical and pharmaceutical practices. Enforcement of public health laws in Malaysia is primarily the responsibility of the Ministry of Health, which oversees the implementation of various legislations and regulations. This involves a multi-faceted approach that includes support and collaboration from other government agencies and local authorities, such as city councils and the Ministry of Housing and Local Government. The enforcement process encompasses a range of actions, from the compounding of offenses for minor violations to conducting inspections of premises and initiating legal actions for more serious or repeated non-compliance. The effectiveness of public health laws is contingent on several interconnected factors. These include the level of public awareness and understanding of the laws, the capacity and resources available for enforcement, and the extent of interagency collaboration and coordination. Crucially, community engagement and education play a vital role in promoting compliance, fostering a sense of shared responsibility, and ensuring that public health laws are perceived by the population as fair, reasonable, and necessary for the collective well-being. The COVID-19 pandemic served as a stark reminder of the critical importance of public health law in responding to and mitigating the impact of large-scale health crises. The implementation of various measures, such as movement restrictions, mask mandates, and vaccination programs, demonstrated the power of public health law in controlling the spread of infectious diseases. However, the pandemic also exposed inherent challenges, including the need for clear and effective communication strategies, the difficulties in securing public acceptance of restrictive measures, and the ongoing need to carefully balance public health imperatives with the protection of individual rights and liberties.

Conclusion

Public health law is vital for safeguarding the health and well-being of the population in Malaysia. To ensure its effectiveness, it is essential to adopt a holistic approach that includes robust enforcement, public education, and community engagement. Continuous improvement of public health laws and their enforcement mechanisms is necessary to address evolving health challenges and promote a healthier society.

References

1. Low WY, Binns C. Editorial: public health laws and ethics. *Asia Pac J Public Health* 2012; **24**(5):848-9. doi:10.1177/1010539512462498
2. Gostin LO. A theory and definition of public health law. In: Gostin LO, editor. *Public health law: power, duty, restraint*. Berkeley: University of California Press; 2000. p. 3-41. Available from: <https://content.ucpress.edu/chapters/11023.ch01.pdf>
3. Tate MD. On the threshold: health and medicine at the turn of the century. In: *History of medicine in Malaysia - the foundation years*. Kuala Lumpur: Academy of Medicine Malaysia; 2005. p. 36-48.

FHHMOP14 / 329

Use of Generative Artificial Intelligence among Medical Doctors in Sarawak: An Application of the Theory of Planned Behaviour

Wong Siaw Hui¹, Noorzilawati binti Sahak¹, Md Mizanur Rahman¹

¹ *Department of Community Medicine and Public Health, Faculty of Medicine and Health Sciences, Universiti Malaysia Sarawak*

Corresponding author's email: wongsiawhui1990@gmail.com

Summary

Generative Artificial Intelligence (GenAI) is emerging as a transformative tool in Malaysia's healthcare sector, with applications ranging from diagnostics to patient care optimisation. Applying the Theory of Planned Behaviour (TPB) to analyse its adoption among medical doctors reveals key drivers and barriers. Data was collected using purposive sampling, among 306 medical doctors in primary health care setting across Sarawak, using self-administered questionnaire. Structural Equation Modelling (SEM) based on TPB revealed that attitude and perceived behavioural control (PBC) significantly predicted intention to use GenAI, while both intention and PBC had direct effect on actual use of GenAI.

Keywords

Generative Artificial Intelligence (GenAI), medical doctors, barriers, drivers, Theory of Planned Behaviour (TPB)

Introduction

Generative Artificial Intelligence (GenAI) is emerging as a transformative tool in Malaysia's healthcare sector, with applications ranging from diagnostics to patient care optimisation. Its integration into primary health care holds promise of enhancing diagnostic accuracy, streamlining clinical workflows, and improving overall patient outcomes¹. However, the successful integration of AI technologies largely depends on the acceptance and adoption by healthcare professionals, particularly medical doctors who are central to clinical decision-making². This study focuses on Sarawak, a geographically diverse state in Malaysia, to examine the adoption of GenAI among medical doctors in primary health care settings. Applying the Theory of Planned Behaviour (TPB) to analyse its adoption among medical doctors reveals key drivers and barriers which are crucial for developing effective strategies to promote the seamless and beneficial integration of AI in primary health care, which can improve the quality and accessibility of primary health care services within Sarawak.

Materials and Methods

This quantitative, cross sectional study was done using purposive sampling. All medical doctors working in primary health care in Sarawak, either in government or private practice, who had experience of more than one year, and consented were included in the study. Data was collected using self-administered questionnaires distributed to medical doctors working in primary health care clinics across Sarawak. The questionnaire instrument was designed to assess factors influencing AI adoption, drawing upon TPB to measure attitudes, subjective

norms, perceived behavioural control towards intention and use of GenAI³. A total of 306 medical doctors consented and responded to the questionnaire fully. Descriptive analysis was done using SPSS version 29. Structural equation modelling was done using Smart PLS 4.

Results and Discussion

Table 1 presents sociodemographic characteristics of the respondents. 306 medical doctors responded to the questionnaire. The mean age (SD) of respondents was 33.3 (5.43) years and mean working experience (SD) was 4.9 (4.7) years.

Table 1: Sociodemographic characteristics of respondents (n=306)

Characteristics	
Age in years, Mean(SD)	33.3 (5.43)
Gender, N(%)	
Male	123 (40.2%)
Female	183 (59.8%)
Ethnicity, N(%)	
Malay	137 (44.8%)
Chinese	105 (34.3%)
Indian	18 (5.9%)
Iban	17 (5.6%)
Bidayuh	15 (4.9%)
Melanau	8 (2.6%)
Others	6 (1.9%)
Current Post	
Specialist	10 (3.3%)
Medical Officer	261 (85.3%)
General Practitioner (GP)	35 (11.4%)
Type of Clinic	
Health Clinic	221 (72.2%)
Maternal and Child Health Clinic	22 (7.2%)
Community Clinic	13 (4.2%)
Rural Clinic	15 (4.9%)
Private Clinic	35 (11.4%)
Years of Working Experience, Mean (SD)	4.91 (4.7)

Figure 1 depicts the structural equation model (SEM) based on TPB for the adoption of GenAI. Table 2 summarises the path coefficients, standard errors, t-statistics, and p-values for the relationships specified in the structural model. The structural equation modelling (SEM) analysis showed that attitude ($\beta = 0.793$, $p < 0.001$) and PBC ($\beta = 0.172$, $p = 0.002$) showed a statistically significant and positive association with intention to use GenAI. In contrast, subjective norm did not show a significant relationship with intention ($\beta = -0.007$, $p = 0.456$). This differs with some prior TPB-based research where subjective norm played a notable role(4). Both intention ($\beta = 0.137$, $p = 0.019$) and PBC ($\beta = 0.436$, $p < 0.001$) were significantly related to actual use of GenAI. The stronger association of PBC with actual use compared to intention, highlights the critical role of doctors' confidence in their ability to use GenAI effectively. This suggests that even if

intention is present, without a sufficient level of perceived control, actual adoption may be limited.

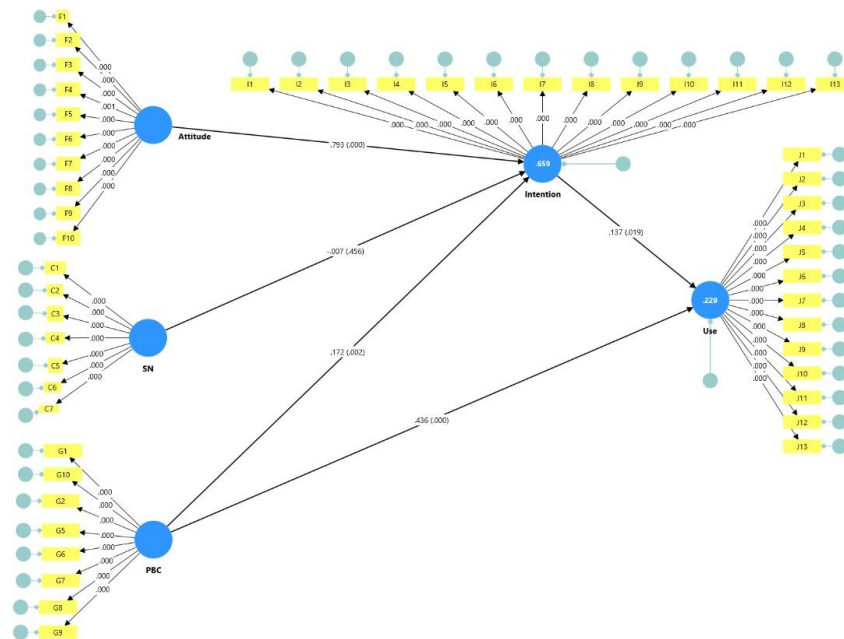


Figure 1: A structural equation model of adoption of GenAI based on TPB

Table 2: Path coefficient among variables and use of GenAI

Model Paths	B	SE	T	P values
Attitude Intention	.793	.037	21.540	.000*
SN Intention	-.007	.067	.111	.456
PBC Intention	.172	.058	2.934	.002*
Intention Use	.137	.066	2.070	.019*
PBC Use	.436	.065	6.691	.000*

Note: B =Beta Coefficient, SE=Standard Error, T= t-statistics, P values=Probability (P) value, SN: Subjective Norm, PBC: Perceived Behavioural Control

*Relationships are significant at $p < 0.001$

Conclusion

This study highlights that attitude and PBC are key determinants of GenAI adoption among medical doctors in Sarawak, while the subjective norm plays a minimal role. Interventions aiming to promote GenAI use should prioritise enhancing positive attitudes and empowering users with greater perceived control over the technology.

References

1. Abbasgholizadeh Rahimi S, Légaré F, Sharma G, et al. Application of artificial intelligence in community-based primary health care: systematic scoping review and critical appraisal. *J Med Internet Res* 2021;**23**(9):e29839.
2. S SK, S A, C KT, et al. Behavioural intentions to adopt artificial intelligence in healthcare: exploring the perception of healthcare professionals. *J Technol Behav Sci* 2025.
3. Ajzen I. The theory of planned behavior. *Organ Behav Hum Decis Process* 1991;**50**(2):179-211.
4. Li X, Jiang MY, Jong MS, et al. Understanding medical students' perceptions of and behavioral intentions toward learning artificial intelligence: a survey study. *Int J Environ Res Public Health* 2022;**19**(14).

FHHMOP15 / 362

From Buku Rekod to Mobile: Hajj Health Reimagined

Iesza Raihan Ali ¹, Sarah Idayu Mohd Abd Latiff ¹, Vivek Jason Jayaraj ¹, Salmiah Baharudin ², Muhammad Shafiq Samsudin³, Khairulaizat Mahdin ⁴, Maheshwara Rao Appannan ¹

¹ Digital Health Division, Ministry of Health Malaysia

² Disease Control Division, Ministry of Health Malaysia

³ Lembaga Tabung Haji Malaysia

⁴ Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: iesza@moh.gov.my

Summary

The MySejahtera Hajj Health Record Management module, launched during the 2023 Hajj season, digitised the traditional *Buku Rekod Rawatan Jemaah Haji* (BRRJH) to streamline pre-departure health examination. Developed by Digital Health Division (DHD) in collaboration with the Disease Control Division (DCD) and Lembaga Tabung Haji (*TH*), the system aims to improve data collection, visualisation, and decision-making, reducing health complications. Currently, most pilgrims already have health records on their smartphones. This initiative showcases the benefits of integrated digital health systems in large-scale, high-mobility settings and offers a scalable model for global adoption.

Keywords

Hajj Pilgrim, Health Management, Digitalization, MySejahtera, Lembaga Tabung Haji

Introduction

The annual Hajj pilgrimage to Makkah, involving millions of Muslims worldwide, presents distinct public health challenges^{1,2}. In Malaysia, pre-departure health examinations are a critical component of Hajj health management, aimed at identifying and mitigating medical conditions that may be exacerbated during the physically demanding pilgrimage¹. The traditional BRRJH faced challenges including risk of data loss, potential falsification, inefficient manual processes and lack of continuity in medical records. We aimed to develop the Hajj Health Record Management module by adapting the existing MySejahtera platform following the Hajj Health Examination Guidelines.

Materials and Methods

This case study describes the development and implementation of a digital Hajj health management system for Malaysian pilgrims using the Ministry of Health's MySejahtera platform. A multidisciplinary team collaborated with key stakeholders, including the DCD and *TH*, to gather system requirements, review work processes, and standardise the Hajj Health Examination Guidelines and screening questionnaire. System development included architectural planning, expert consultations, and stakeholder briefings, resulting in a functioning platform within five months. Existing MyVAS infrastructure enabled seamless health record input at healthcare facilities, accessible by both providers and pilgrims via MySejahtera.

Integration with *TH*'s SIHAT system was completed in June 2023. Post-implementation monitoring and evaluation informed key enhancements for the 2024 cycle, including a decision support system, International Patient Summary (IPS) adoption, and improved data integration. Nationwide implementation was supported by virtual and physical training, FAQs, helpdesk services, and state-level briefings to ensure effective system adoption.

Results and Discussion

The implementation of the MySejahtera Hajj Health Record Management module in 2023 enabled near real-time health data monitoring at the healthcare facility level. A comparison between digital records and the total number of Hajj pilgrims from *TH* showed a reduction in missing health records from 21.5% in 2023 to 10.3% in 2024, indicating improved system usage and adoption also greater trust in the digital pre-departure health examination process. Pilgrims received their health examination outcomes directly via the MySejahtera application, improving accessibility and operational efficiency. The module also featured a guided risk stratification algorithm to assist health providers in classifying pilgrims' fitness for Hajj based on clinical criteria. The digital module improved data completeness, reduced manual entry errors, and allowed seamless interoperability with *TH*'s SIHAT system. MOH Medical teams in Saudi Arabia accessed pre-departure records remotely. In 2024, International Patient Summary (IPS) integration allowed pilgrims to share their health information with Saudi healthcare providers, strengthening cross-border health coordination. The usage increments over 2 years have led to the MySejahtera Hajj Health Record Management module going fully digital nationwide in 2025. This implementation is not without challenges. Limited workforce and digital literacy among healthcare providers conducting pre-departure health examinations affected the quality of health record input into the digital platform. The absence of structured feedback from users hindered system refinement. However, the digitalisation of this healthcare process continues to reduce the physical movement of pilgrims to *TH*'s counter for collecting and submitting BRRJH³. The digitalisation process also reduced costs and system development time. The system enhanced operational efficiency by streamlining health screenings and risk classifications, while allowing pilgrims easy access to their health records. Importantly, the availability of real-time health data supported more accurate, evidence-based decision-making in managing public health for large-scale, high-mobility populations.

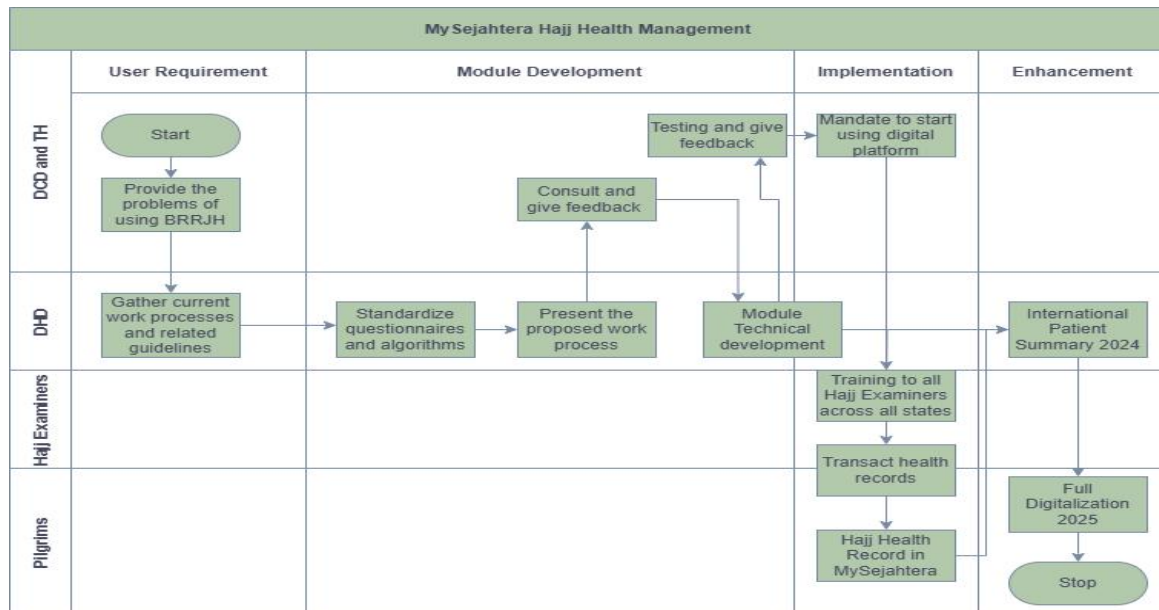


Figure 1: Methodology and Implementation of MySejahtera Hajj Health Management

Conclusion

The MySejahtera Hajj Health module enhanced pre-departure health examination by improving data accuracy, accessibility, and risk categorization. Despite challenges like hybrid implementation and limited feedback, it demonstrated strong scalability, interoperability, and real-time monitoring—offering a successful model for digital health transformation in large-scale, high-mobility public health settings.

References

1. Ramli R, Hanafi NS, Hussein N, et al. Hajj health examination for pilgrims with asthma in Malaysia: an ethnographic study. *J Glob Health* 2022; **12**:04023.
2. Aldossari M, Aljoudi A, Celentano D. Health issues in the Hajj pilgrimage: a literature review. *East Mediterr Health J* 2019; **25**(10):744-53.
3. Tabung Haji. *Digitalisasi buku rawatan memudahkan jemaah haji* [Internet]. [cited 2025 Apr 21]. Available from: <https://www.tabunghaji.gov.my/ms/kenyataan-akhbar/sel-12172024-1200/digitalisasi-buku-rawatan-mudahkan-jemaah-haji>

FHHMOP16 / 354

The Historical Launch of Virtual Clinic Services at Health Clinics in Ministry of Health Malaysia

Kawselyah Juval ¹, Nazrila Hairizan Nasir ², Isabel Chung Yin Hooi ³

¹ Klang Health District, Selangor State Health Department, Ministry of Health Malaysia

² Family Health Development Division, Ministry of Health Malaysia .

³ Institute Clinical Research, National Institute of Ministry of Health Malaysia

Corresponding author's email: kawselyah@moh.gov.my

Summary

The Virtual Clinic service, launched by the Ministry of Health Malaysia on 14 August 2019 which has a significant historic step in digital healthcare. Piloted in five clinics using Skype for Business with MAMPU's support, it aimed to assess client acceptability and provider feasibility. It evidenced the magnitude of utilisation during COVID-19. Most users were aged 30-49, from higher education and government sectors. With 77.6% successful consultations, it addressed socioeconomic barriers, reduced travel, and improved access. The initiative was well-received, promoting continuity of care and reducing in-person clinic visits.

Keywords

Virtual clinic, telemedicine, telehealth, e-consultations , virtual consultations

Introduction

Digitalisation has become a vital enabler in transforming the delivery of healthcare services. In response, the Ministry of Health (MoH) Malaysia launched its first Virtual Clinic (VC) service on 14 August 2019, as part of the National Health Reform Agenda. In collaboration with MAMPU, the initiative adopted Skype for Business as its platform, efficiently utilising existing resources without incurring any additional costs. Implemented as a one-year Proof of Concept, in five selected health clinics and it demonstrated aiming to increase access, reduce congestion, and minimise clinic visits. The services targeted to follow up stable clients for consultations. Despite initial challenges, strong leadership and stakeholder support enabled success. The VC implementation aligns with WHO's 2018 Digital Health resolution and Malaysia's Telemedicine Act 1997. During COVID-19, VC services expanded from non-communicable diseases (NCDs) to maternal and child health, helping reduce transmission risks. The initiative demonstrated positive acceptance among clients and providers, offering socio-economic benefits and has increased healthcare access.

Materials and Methods

The Virtual Clinic (VC) service was conducted as Proof of Concept for a period of one year from 14 August 2019 to 13 August 2020. A guideline was developed as a guide to equip healthcare providers with the necessary skills, for medicolegal aspects and clinical practice standards. Planning began in March 2019, followed by clinic selection based on ICT readiness, staff training, and adoption of Skype for Business. A RM50,000 budget covered essential equipment and minor renovations for five selected clinics. VC consultations were offered to stable follow up clients

with non-communicable diseases (NCDs), requiring clients to meet specific ICT and clinical criteria. The teams included Family Medicine Specialist, doctors, pharmacists, paramedics, and IT staff. Monthly data reports were collected from all five clinics. Secondary data was analysed for the utilisation trends, sociodemographic and consultation outcomes classified as successful, unsuccessful, or cancelled using standardised Excel formats to assess service effectiveness.

Results and Discussion

As shown in Table 1, gender distribution among VC clients was nearly equal 1535 females (49.5%) and 1566 males (50.5%) indicating balanced service usage. Ethnically, Malays comprised the majority (82%), followed by Chinese (8%), others (6%), and Indians (4%). The highest user group was aged 30-39 (38.6%), followed by 40-49, with those aged 60 and above being the least represented. This suggests VC services are more suited for younger, tech-savvy clients. Most users were from government sectors, reflecting higher productivity due to reduced need for medical leave and travel. Clients with higher education (67%) were more likely to use the service, meeting requirements such as internet access, devices, and email. Table 2 shows 77.6% of consultations were successful, 3% unsuccessful, and 15% cancelled mostly by clients. Presint 18, Putrajaya, had the highest usage and cancellations, likely due to its large working population. These trends affirm VC's relevance in improving access and efficiency in primary Health Care. Client engagement with the Virtual Clinic (VC) service grew steadily from September to April, driven by increasing provider familiarity and the COVID-19 pandemic. Clinics expanded VC teams and consultation frequency, especially during the Movement Control Order, maintaining care while reducing physical contact. Clients valued the convenience, time savings, and reduced travel, while providers benefited from structured training. Challenges included manual data entry, lack of system integration, and limited access for less tech-savvy users. No comprehensive study has yet assessed VC effectiveness, highlighting the need for standardised guidelines. Key lessons include the importance of digital readiness, user education, and data reliability.

Table 1: Distribution of the Sociodemographic

Characteristics	n	Total (%)
Gender		
Female	1535	49.5%
Male	1566	50.5%
Age		
18-29	571	18.4%
30-39	1178	38.6%
40-49	723	23.0%
50-59	378	12.0%
60 years and above	251	8.0%
Ethnicity		
Malay	2561	82%
Chinese	246	8.0%
Indian	114	4.0%
Others	180	6.0%
Education level of clients		
Higher Education	2065	67.0%
Secondary education	645	21.0%
Primary	358	11.0%
No education	33	1.0%
Type of jobs		
Government	1559	50.0%
Private	968	31.0%
Own Job	144	5.0%
Pensioners	97	3.0%
Student	96	3.0%
No Job	46	2.0%
Housewife	185	6.0%

Table 2: Achievements of the PoC Virtual Clinic in five Health Centers

Health Centers	Total Clients	Success	Not Success	Cancelled
1. Presint 18, Putrajaya	1562	1218	74	269
2. Luyang , Kota Kinabalu, Sabah	140	113	1	26
3. Tudan , Miri, Sarawak	140	94	14	34
4. Seksyen 7, Shah Alam, Selangor	539	359	0	60
5. Seberang Jaya , Pulau Pinang	720	622	5	87
Total	3101	2406	94	476
Percentage		77.58%	3%	15.34%

Conclusion

The Virtual Clinic (VC) service has been well-received by both providers and patients, offering flexibility, reduced travel costs, improved productivity, and convenience. Its success highlights potential for nationwide expansion. Aligned with client needs and digital readiness, the Ministry continues advancing healthcare delivery in line with Malaysia's digital health vision.

Acknowledgements

Would acknowledge Sector Policy Development Primary Health Care , Sector Tele Primary Health Care , Sector Infrastructure , Sector Support Service , Sector Emergency, Sector Innovative and quality, Sector Primary Medical Care, Health Center Presint 18, Putrajaya, Health Centre Seberang Jaya , Penang, Health Center Seksyen 7, Shah Alam, Selangor , Health Center Luyang, Sabah and Health Centre Tudan, Sarawak, Federal Territory Kuala Lumpur Health Department, Selangor State Health Department, Penang State Health Department, Sabah State Health Department , Sarawak State Health Department, District Health Department Putrajaya, District Health Department Petaling , District Health Department Seberang Jaya, District Health Department Kota Kinabalu , Division Health Department Miri, Information Management Division , Malaysian Administrative Modernisation and Management Planning Unit (MAMPU), Prime Minister's Office, Putrajaya, Office of General Secretary of MOH not forgetting to acknowledge the Director General Ministry of Health Malaysia.

References

1. Chiu SH, et al. The effectiveness of tele-homecare for self-care behaviours of patients with diabetes in Taiwan: a consecutive observational study. *J Med Sci* 2017; **37**(6):245-52.
2. Firth J, Torous J, Nicholas J, et al. The efficacy of smartphone-based mental health interventions for depressive symptoms: a meta-analysis of randomized controlled trials. *World Psychiatry* 2017; **16**(3):287-98.
Government of Malaysia. *Laws of Malaysia: Act 564. Telemedicine Act 1997 (Reprint 2002)* [Internet]. Available from: http://www.commonlii.org/my/legis/consol_act/ta1997113/ [cited 2021 Aug 18].
3. Uei SL, Kuo YM, Tsai CH, Kuo YL. An exploration of intent to use telehealth at home for patients with chronic disease. *Int J Environ Res Public Health* 2017; **14**(12).
4. World Health Organization (WHO). *World Health Assembly resolution on digital health* [Internet]. 2018 [cited 2021 Aug 18]. Available from: <https://transformhealthcoalition.org/insights/world-health-assembly-resolution-on-digital-health-2018-who/>

FHHMOP17 / 412

Unpacking EMR Experiences in Primary Care: A Qualitative Study

Ariff Azfarahim Ibrahim¹, Mohd Rizal Abdul Manaf², Aniza Ismail², Rosnah Ismail², Ahmad Husni Ariffin³

¹ Public Health Development Division, Ministry of Health Malaysia

² Department of Public Health Medicine, Faculty of Medicine, Universiti Kebangsaan Malaysia

³ Seremban District Health Office, Negeri Sembilan State Health Department

Corresponding author's email: dr.ariffazfarahim@moh.gov.my

Summary

The use of electronic medical records (EMR) in primary care is a step forward in enhancing quality of care, though global findings remain inconsistent. This qualitative study explored healthcare providers' experiences and perceptions of EMR implementation in Negeri Sembilan. Focus group discussions revealed that EMR improves care delivery. However, sustainability is challenged by technical barriers such as inadequate infrastructure and system maintenance. Addressing these limitations is essential to fully realize EMR's potential and ensure long-term success.

Keywords

Electronic medical record (EMR), experiences, benefit, success, barriers

Introduction

The use of electronic medical records (EMRs) to improve healthcare service delivery is expanding globally¹. Evidence suggests that EMRs can reduce medical errors, minimize duplication, decrease unnecessary diagnostic procedures, and enhance data collection and accessibility, ultimately leading to improved satisfaction among healthcare providers and patients. While EMRs have demonstrated clear benefits in most developed countries, evidence from developing countries remains limited and inconsistent². Some studies have shown no significant differences in healthcare quality before and after EMR implementation in these settings³. This study aims to explore healthcare providers' experiences and perceptions of EMR use regarding the quality of care following its implementation in the state of Negeri Sembilan, Malaysia.

Materials and Methods

This study employed a qualitative, explanatory hermeneutic (interpretive) phenomenological approach. Data were collected through focus group discussions (FGDs). A total of six FGDs were conducted, with five participants in each group. Purposive sampling was used to recruit healthcare providers including doctors, assistant medical officers, nurses, and administrators who were actively using the EMR system in primary care facilities. The discussions were transcribed verbatim and analysed using thematic analysis. Transcripts underwent multiple rounds of verification by the researcher to ensure accuracy. The verified transcripts were saved as Word documents and imported into ATLAS.ti version 9 for coding and analysis. Selected quotes were highlighted and coded deductively, guided by

DeLone and McLean's Information Systems (IS) Success Model. Codes were grouped into categories, which were then synthesized into overarching themes.

Results and Discussion

Thematic analysis yielded three main themes; the benefits of EMR, success factors, and implementation barriers. Healthcare providers generally agreed that EMR provided positive benefits for both patients and users in terms of patient satisfaction, job satisfaction, and improved patient care. Doctors reported fewer prescription errors and better communication between doctors and nurses, which improved understanding of patients' conditions by facilitating access to health information⁴. The success factors of EMR were associated with the constructs of information quality and system quality, categorized into good documentation, workflow, ease of use, and time-saving. These findings align with previous literature, where most factors discussed were technically related. EMR implementation inevitably alters workflows in primary care settings due to the fixed nature of technology, but it does not always meet healthcare providers' expectations. Nevertheless, EMR improved workflows in primary care settings, enhancing the quality of care. It improved the registration system, appointment system, and calling system. The system also reduced processes and the time required for them, leading to decreased waiting times due to improved system workflows after EMR implementation. Healthcare providers also found that EMR facilitated data checking and tracing. Unlike before, when misplaced documents and time-consuming file retrieval were common, all documents were now stored electronically. Seven main barriers were identified in this study; availability of training, system maintenance, infrastructure, data accuracy, interoperability, user attitudes, and ease of use. These barriers were mostly technical in nature, with inadequate and poor infrastructure being the most prevalent challenge to EMR implementation, particularly in low- and middle-income countries⁵.

Table 1: The socio-demographic of the FGD

Characteristics	Total	FGD1	FGD2	FGD3	FGD4	FGD5	FGD6
Age, years Mean (SD)	37.8 (5.5)	37.8 (3.11)	35.0 (6.52)	36.0 (7.48)	38.8 (5.17)	37.8 (1.92)	41.4 (7.64)
Gender (%)							
Male	7(23.3)	1	3	1	1	0	1
Female	23(76.7)	4	2	4	4	5	4
Occupation (%)							
Doctor	7(23.3)	1	1	1	1	1	2
Assist. doctor	6(20.0)	1	1	1	1	1	1
Nurse	11(36.7)	2	2	2	2	2	1
Administrator	6(20.0)	1	1	1	1	1	1
Service duration, years, Mean (SD)	13.2 (6.0)	14.6 (2.9)	10.0 (6.9)	12.6 (7.1)	13.8 (6.3)	13.6 (1.9)	14.0 (10.4)
Experience in EMR, years, Mean (SD)	3.4 (1.0)	3.0 (1.4)	3.8 (0.4)	2.6 (1.3)	3.8 (0.4)	3.4 (0.9)	4.0 (0.0)

Table 2: The thematic analysis of users' experiences and perceptions towards EMR in improving healthcare quality

No.	Categories	Themes
1.	Patient care	Benefit of EMR
2.	Patient satisfaction	
3.	Job satisfaction	
4.	Good documentation	Success factors of EMR
5.	Workflow	
6.	Ease of use	
7.	Timesaving	
8.	Training availability	Barriers of EMR
9.	Maintenance	
10.	Infrastructures	
11.	Data accuracy	
12.	Interoperability	
13.	Attitude	
14.	User friendly	

Conclusion

Addressing the identified barriers is essential to ensure the successful and sustainable implementation of EMR systems, ultimately supporting the delivery of high-quality patient care. Future improvements in EMR should involve active collaboration among three key stakeholders, upper management, system vendors, and end users.

References

1. Evans RS. Electronic health records: then, now, and in the future. *Yearb Med Inform.* **2016**;25(S 01):S48-61.
2. Ayaad O, Alloubani A, Alhajaa EA, et al. The role of electronic medical records in improving the quality of health care services: comparative study. *Int J Med Inform.* **2019**;127:63-7. doi:10.1016/j.ijmedinf.2019.04.014
3. Berhe M, Tadesse K, Berhe G, et al. Evaluation of electronic medical record implementation from users' perspectives in Ayder Referral Hospital, Ethiopia. *J Health Med Inform.* **2017**;8(1):1-13.
4. Atasoy H, Greenwood BN, McCullough JS. The digitization of patient care: a review of the effects of electronic health records on health care quality and utilization. *Annu Rev Public Health.* **2019**;40(1):487-500. doi:10.1146/annurev-publhealth-040218-044206
5. Ngugi P, Were MC, Babic A. Facilitators and barriers of electronic medical records systems implementation in low resource settings: a holistic view. In: *Data, informatics and technology: an inspiration for improved healthcare.* **2018.** p. 187-90.

FHHMOP18 / 326

An Integrated Internal Audit on The Key Benefits of Digital X-Ray Services in Primary Healthcare Clinic

Dr. Kisheaan Devarajan¹, Dr. Amirul Ameer bin Rashidan¹, Dr. Thava Viknaraj Sivabalan¹, Ms. Renugah Thevi Murugayah², Ms. Rachael Sharmini Rajendran³

¹*Public Health Development Branch, Penang State Health Department.*

²*Radiology Unit, Klinik Kesihatan Bandar Perda.*

³*Radiology Unit, Klinik Kesihatan Seberang Jaya.*

Corresponding author's email: kisheaan.devarajan@moh.gov.my

Summary

Embracing digitalisation by adopting digital x-ray services in primary care clinic is a positive outset as radiology and diagnostic services form the cornerstone of efficient healthcare delivery. Penang is the first state in Malaysia to adopt digital x-ray system integrating the service between primary care clinics and tertiary hospitals. This approach is not only cost-saving but also enhances the diagnostics and enables early interventions to improve patient outcome. This internal audit reviews the key benefits of digital x-ray services by analysing the financial and process data from primary care clinics.

Keywords

RIS-PACS, digital x-ray, digital health, cost-saving, carbon-saving.

Introduction

Digitalisation in radiology services is a timely and necessary strategy to apply lean principles to healthcare. The process predicaments prior to digitalisation include delay in radiology reporting, excessive staff hours due to manual workflow, high costs of film and compact discs usage and operational inefficiencies in dispatching. To address these challenges, the Penang State Health Department implemented the Radiology Information System - Picture Archiving and Communication System (RIS-PACS) in July 2023, linking 14 health clinics and all district and state hospitals via a centralized radiology network.

Materials & Methods

The Public Health Development Branch of Penang State Health Department conducted a retrospective operational and financial audit from January 2022 to December 2024 across 14 primary care clinics in Penang.

Data on x-ray film purchases, fuel usage for dispatches, and reporting turnaround times were extracted from clinic procurement and financial records, dispatch records and RIS-PACS usage logs. CO₂ emission savings were estimated using standard fuel consumption data and emission factors published by Malaysian Green Technology and Climate Change Corporation.

Results

The advantages of digital x-ray services have been reviewed under the following domains:

1. Resource saving

The direct cost-saving is measured by the reduction in the actual annual expenditure to print x-ray on films and compact discs. The annual cost of x-ray film printing at the 14 primary care clinics in 2022 was RM 184,972.02 and in 2024 was RM 9,928.98; up to 94.7% cost reduction after adopting RIS-PACS. The indirect cost-saving is measured by reduction in travelling time and fuel expenditure for dispatch between primary care clinic and tertiary hospital and subsequent reduction in carbon footprint. Case in point: by eliminating dispatch process from Klinik Kesihatan Bandar Perda to Hospital Seberang Jaya, an estimated average of **132 hours** of travelling time, **RM 866 worth of petrol** (estimated fuel-efficiency RM 0.205 per km) and **9,800kg of CO² emission** (estimated dispatch travel distance 4,224 km per year and carbon emissions factor 2.32kg CO² per litre) have been saved in the year 2024.

2. Process enhancement

Prior to digitalisation, in order to request x-ray reporting from radiologist at tertiary hospital, a medical officer at primary care clinic has to fill up a manual form, dispatch it to the tertiary hospital via a dispatch porter, the request will then be reviewed by radiologist and a hardcopy report will be reverted back to the primary care clinic via dispatch porter. This process has been streamlined with RIS-PACS integration.

3. Diagnostic quality

Traditionally, the conventional x-ray services require up to two weeks from the time an x-ray is shot till formal report obtained from the radiologist. This duration is understandable given the process to request and obtain the report was rather tardy. With RIS-PACS, the whole process can be completed within one working day. Expediting the reporting process enables to review patients much earlier and administer timely intervention.

Discussion

Adopting digital x-ray has led to improvement in the work process as evident by elimination of dispatch delays, automated image retrieval via centralized radiologist access and expedited reporting process. However, the implementation poses several challenges including high initial financial investment to set up the system, the requirement for additional computers and capacity building among staffs to utilize the system. Despite these initial challenges, the sustainability of digitalisation is promising as most of the manual workflow could be eliminated towards a leaner service delivery. Most other states in Malaysia face similar challenges with manual workflow. Hence, by implementing digital x-ray services, similar benefits can be expected. Limitations of this audit include its reliance on administrative data, lack of a comparator as well as short implementation period.

Conclusion

This audit demonstrated substantial cost-savings and workflow improvements following the implementation of RIS-PACS in Penang's primary care clinics. Future evaluations should examine patient-level outcomes and explore scalability to other regions.

References

1. Lockwood, P., Burton, C., Shaw, T. et al. An implementation facilitation intervention to improve the musculoskeletal X-ray reporting by radiographers across London. *BMC Health Serv Res* **25**, 248 (2025). <https://doi.org/10.1186/s12913-025-12356-x>.
2. Raihan A. Influences of the economy, trade, technology innovation, and ICT on Malaysia's carbon emissions. In *Proceedings of the International Conference on Economy, Technology, and Environment 2024*.
3. Alrubayyi A, Fahimi R, Hassan M, Madan J, Uthman OA. Current Clinical Practices and Future Perspectives for Primary Healthcare Use of Point-of-Care Devices: A Scoping Review. *International Journal of Clinical Practice*. 2025;2025(1):4742851.
4. Apipi M, Abdul Rasid SZ, Basiruddin R. Cost-benefit analysis of adopting blockchain technology in the radiology unit of a district hospital. *Journal of Health Management*. 2024 Apr;26(2):256-64.
5. Dahlberg AC, Jukarainen S, Kaartinen TJ, Orre PI. Cost Minimization Analysis of Digital-first Healthcare Pathways in Primary Care. *medRxiv*. 2025:2025-04.

FHHMOP19 / 425

Advancing Public Health Disaster Management through AI and Digitalisation: Lessons from the Putra Heights Disaster

Ahmad Faizul Abd Rahman Sazli¹, Nur Suhada Ramli¹, Sharifah Fazlinda Syed Nor¹, Norain Mansor¹, Anis Salwa Kamaruddin¹, Muhammad Fikri Azmi¹, Mohd Fathulzhafran Mohamed Hanan¹, Humadevi Sivasamy¹, Lalitha Malar Maniam¹, Mas Ahmad Sherzkawee Md Yusoff¹, Jamiatul Aida Md Sani¹, Mohd Shahrol Abd Wahil²

¹ *Petaling District Health Office, Ministry of Health Malaysia*

² *Sector of Environmental Health & Climate Change, Ministry of Health Malaysia*

Corresponding author's email: ahmadfaizul@moh.gov.my

Summary

This case study examined the use of artificial intelligence (AI) and digitalisation by the Petaling District Health Office (PDHO) during the Putra Heights disaster management. Structured interviews, official meeting records, and a post-mortem document were analysed using a deductive thematic approach by focus group discussion (FGD) based on the disaster management cycle. Digitalisation supported key functions, particularly during the response phase, but with some limitations. No AI applications were utilised. Findings highlight the urgent need for integrated, AI-capable, and offline-compatible platforms, as well as standard device and internet provision, to enhance public health disaster management in resource-constrained settings.

Keywords

Putra Heights disaster, AI, digitalisation, disaster management, Petaling District Health Office

Introduction

On 1st April 2025, a methane gas pipeline explosion and fire occurred near residential areas in Putra Heights, Selangor, Malaysia, resulting in extensive damage, casualties, and the displacement of residents¹. The PDHO responded by activating the district-level disaster operations room, deploying Rapid Assessment and Rapid Response Teams to the field and temporary evacuation centres, and participating in on-site inter-agency coordination meetings. This event revealed challenges in disaster management systems, particularly in communication, coordination, and data handling. As disasters become increasingly complex, the adoption of AI and digitalisation offers significant potential to enhance public health disaster management, particularly in enhancing medical team responses and digitising operational workflows for more efficient incident handling². This study aimed to explore how AI and digitalisation were used by PDHO during the Putra Heights disaster, identify strengths and gaps, and propose a way forward for digital transformation in public health disaster management.

Materials and Methods

Data were mainly obtained from structured interviews among various levels of staff responding to the Putra Heights disaster using Google Form, supported by official documents at PDHO level, including daily meeting minutes from the Disaster Operation Room and a post-mortem disaster report. A deductive thematic analysis using Excel was conducted based on predefined disaster management cycle domains by a focus group discussion (FGD) of Public Health Medicine Specialists who validated and refined the emerging themes into mitigation, preparedness, response, and recovery phases³. Triangulation of documents, interviews, and FGD inputs ensured analytical rigour and reduced bias. Informed consent maintained ethical standards.

Results and Discussion

Themes were arranged according to mitigation, preparedness, response and recovery phases. Whereas, subthemes were arranged according to the activities or work processes involved such as casualty tracking, intra-agency meeting, communication, and mobilisation, mental health screening, social listening, field reporting, external aid coordination and follow-up care. There was no AI application utilised in the disaster management process. Digitalisation was most prominent during the response phase. Key tools included Google Sheets, coordinated by the Emergency Department Operation Centre, Hospital Putrajaya, and the Crisis Preparedness and Response Centre, Selangor State Health Department, for casualty tracking. While effective for basic sharing, delays and inconsistencies arose due to manual data input and lack of real-time updates. Hybrid meetings via Google Meet improved intra-agency meeting and coordination but may be hindered by connectivity issues. WhatsApp was used extensively but resulted in fragmented communication and security concerns. Mental health screening was partially implemented through QR-linked Google Forms, enabling discreet reporting but limited by poor integration with clinical systems. Social listening using Google Alerts informed daily risk communications, though its scope was limited to web sources and lacked sentiment analysis. Field teams reported through Google Forms, but required stable internet, indicating a need for offline-capable mobile tools. External aid was coordinated via view-only Google Sheets, facilitating visibility but lacking interactive features. In the preparedness phase, WhatsApp was used for Rapid Assessment Team communication, enabling timely mobilisation. In the recovery phase, digital tools aided in follow-up care documentation post-shelter closure. No digital applications were reported during the mitigation phase. Notably, issues highlighted in these subthemes were partly due to the lack of suitable devices and mobile data connectivity provided by the organisation, which led personnel to rely on personal resources during the disaster response.

Conclusion

The Putra Heights disaster highlighted the values of digitalisation and revealed its critical system gaps. Hence, we should adopt AI-supported, offline-capable platforms, ensure provision of standard devices and internet access to staff, and develop integrated systems for real-time data sharing and coordination to strengthen public health disaster management.

References

1. Dato' Menteri Besar Selangor. *Kenyataan Media Mesyuarat Jawatankuasa Pengurusan Bencana Negeri Selangor*; 3 April 2025 [Internet]. Shah Alam (MY): Pejabat Menteri Besar Selangor; 2025 [cited 2025 May 15]. Available from: <https://web.facebook.com/pejabatsukselangor/posts/1203806177793956>
2. Režek P, Žvanut B. Towards optimal decision making in mass casualty incidents management through ICT: A systematic review. *Int J Disaster Risk Reduct.* 2024;**102**:104281. doi:10.1016/j.ijdr.2024.104281.
3. Kementerian Kesihatan Malaysia. *Pelan Pengurusan Bencana Peringkat Kementerian Kesihatan Malaysia*. Putrajaya (MY): Sektor Pengurusan Bencana, Wabak, Krisis, dan Kecemasan, Cawangan Kesiapsiagaan, Survelan, dan Respons, Bahagian Kawalan Penyakit; 2025.

OCCUPATIONAL HEALTH/ ENVIRONMENTAL HEALTH/ SOCIAL& HEALTH BEHAVIOUR/ OTHERS

OESHOP01 / 180

QHub 1.0: The Development of a Centralised Learning Hub for Quality Improvement in Malaysia

Nur Ezdiani Mohamed ¹, Samsiah Awang ¹, Muhammad Maziz Shamsuddin ¹,
Muhammad Nur Aiman Abdul Rauf ¹, Izzahtul Afiah Kamarullail ¹, Kelly Ngit Khang
², Muhammad Izzuddin Abdul Khalid ², Fadzlena A. Rahim ², Kavitha Vijayan ²,
Zulqarnain Baharau ³, Asnida Abu Bakar ²

¹ Centre for Health Quality Research, Institute for Health Systems Research, National
Institutes of Health, Ministry of Health Malaysia

² ICT Application & Strategic Planning Unit, Information Technology Sector, National
Institutes of Health, Ministry of Health Malaysia

³ Operation & Technical Unit, Information Technology Sector, National Institutes of
Health, Ministry of Health Malaysia

Corresponding author's email: ezdiani@moh.gov.my

Summary

Over the 30 years since the introduction of the Quality Assurance Programme (QAP) for healthcare in Malaysia, numerous Quality Improvement Initiatives (QIIs) have been implemented. Accessing information on these QIIs can be challenging, as some have dedicated websites, others are embedded within division websites, and some have no online presence. QHub 1.0 website was developed to make information more accessible to implementers. The development involved co-production between the Quality Assurance (QA) Secretariat, the National Institutes of Health (NIH) ICT team, and QIIs owners at various stages. Each stage guided the next step. The process development and core contents of QHub 1.0 is delineated here.

Keywords

Content Management System, Website Development Process, Centralised, Quality Improvement

Introduction

QIIs like QA, Wound Care Programme and Credentialing strengthened the healthcare quality through their purposes that support multiple aspects of healthcare¹. Each QII has a unique governance, approach, training, and monitoring details. Easy access to these details will help the ground implementers to understand and implement the QII. Yet, virtually, some QII have dedicated websites, others are embedded within division websites, and some do not exist. A centralised website, named as Quality Improvement Learning Hub (QHub) will be a useful one-stop-learning centre to support the learning of healthcare implementers. Though QHub is planned to be fully developed in four phases ultimately aimed for higher functional requirements such as data collection, analysis, with interactive visual displays, QHub 1.0 which cater information sharing and learning for all QIIs

was launched in 2024. The process development and core contents of QHub 1.0 is delineated here.

Materials and Methods

QHub 1.0, developed by the Institute for Health Systems Research's QA Secretariat, supports Malaysia's National Policy for Quality in Healthcare¹. Its development followed an iterative, co-production approach², gathering input throughout the process³. From 2022-2024, the NIH ICT team, the Technical Working Group, and the Secretariat collaborated to define QHub's purpose, objectives, audience, and content, designing data collection forms (Table 1) and engaging with Quality Improvement Initiative (QII) owners via physical and virtual sessions. A website prototype was created, followed by development using a Content Management System (CMS) framework and continuous testing. QHub 1.0 was then launched on the moh.gov.my domain. Two rounds of user testing with healthcare implementers ensured accessibility and compatibility. Post-launch activities include issue monitoring, feedback collection, and content updates.

Table 1: Data collection template

Content collected		Related information collected or elaboration
Page	QUALITY IMPROVEMENT INITIATIVES (QII)	Involved overview of the QII, the governance structure preferably in an attractive image form, focal person details including the officer's name and email, the unit's hotline, official email and number, website, and social media accounts. Linkages to external local or international websites as additional references to help readers understand the QII. A picture, symbol, or photo resembling the QII in any format.
QII-linked page	Training	Training description and related materials of the QII like a list of training modules, books, and training slides.
QII-linked page	The Experts	Name and official contact details of the QII expert like office phone number, email and workplace.
QII-linked page	Resources	Any QII-related publication or reading materials like technical reports, publicly accessible articles, and related websites.
Page	BEST PRACTICES	This information was collected specifically from four QII namely QA/QI, KIK, COMBI, Lean and Innovation. The information involved the list of projects presented at the QII national level convention together with the project's materials like abstract, poster/oral presentation slides, and write-up that were consented to be publicly shared.
Page	THE EXPERTS AND WINNERS	The list of winners competing at the national level convention of the QA/QI, KIK, COMBI, Lean and Innovation QII.

Content collected		Related information collected or elaboration
		The details collected include the project's name, the winning year, the affiliated facility, the winning category either as poster or oral, and the QII convention.
Page	EVENT	A list of the QII past, present or upcoming events. It should come with a short introduction to the event including related photos and links to external reading materials if accessible.

Results and Discussion

QHub 1.0 can be accessed at <https://qhub.moh.gov.my>. The website was built using the free, open-source Joomla CMS. Each page employed a custom design template suited to its content, dividing the layout into regions for specific content types, UI components (e.g., menus, forms, slideshows), or HTML elements (e.g., images, links). Its content were represented in eight segments - Homepage, About us, NPQH, QII, Best Practices, Experts & Winners, Resources, and Event. Homepage gave an overview of the core content (NPQH, QII, Best Practices). 37 of 45 QII owners provided overview, training and resources materials, and the experts details for their QII. Best Practices has 54 pages of quality projects shared abstracts with QA/QI sharing slides and posters too. 329 experts of diverse QII were listed to connect the ground implementers directly with them via official contact details. 58 pages of projects winners from the QA, KIK, COMBI, Lean and Innovation Conventions were shared in the Winners section. 26 pages of resources were linked or stored in terms of abstract, articles, books, guidelines, journal, slides, videos or others. Events listed past, present or future events shared by the QII owner. Best Practices, Experts & Winners, Resources, and Event have filtering and search features to assist the users. The iterative method strengthened the requirement and design stages. Apart from preparing a solid foundation for QHub 1.0 core content and design, the engagement sessions helped to buy-in >50% of the QII owner. QII with no official websites such as Pain Free Programme in Primary Care was looking forward to its launching. Up until January 2025, 27581 visitors had viewed the website. 16 respondents provided feedback through the evaluation form shared post-launching. Most listed best practices and resources as the most beneficial QHub content for them.

Conclusion

QHub, Malaysia's first QII learning hub, is an actively maintained static website. Its development followed requirements, design, implementation, and operation stages, with requirements and operation being crucial for a successful launch. A maintenance plan exists but requires strengthening.

References

1. Ministry of Health Malaysia, National Policy for Quality in Healthcare: Bridging Silos Accelerating Improvements. 2021, Selangor: Institute for Health Systems Research.
2. Davies N, Hopwood J, Walker N, et al. Designing and developing a co-produced theoretical and evidence-based online support for family caregivers of people with dementia at the end of life. *BMC Palliat Care*. 2019;18(1):71.

3. Yahaya JH, Ibrahim AA, Deraman A. Software Process Model for Dynamic Website Development towards Quality Product. *Journal of Telecommunication, Electronic and Computer Engineering (JTEC)*. 2017;**9**(3-3):39-44.

OESHOP02 / 181

The Manifestation of Work-related Fatigue among Scaffolders as Indicated by Physical and Cognitive Dimension: Objective Fatigue Assessment from a One Group Pre-Post Experimental Study

Heng Pei Pei^{3,1}, Hanizah Mohd Yusoff¹, Mohamad Ridza Hj Illias², Saravanan Karrupayah², Muhammad Fadhli Mohd Yusoff³, Norizzati binti Amsah³, Rozita Hod¹

¹ Department of Public Health Medicine, Faculty of Medicine, National University of Malaysia, Bandar Tun Razak, 56000, Wilayah Persekutuan Kuala Lumpur, Malaysia.

² MKRS Training Institute, Malaysian Scaffold Academy, Bangi Hub Suntrack Industrial Park, 43650, Bandar Baru Bangi, Selangor, Malaysia.

³ Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia, 40170 Bandar Setia Alam, Selangor, Malaysia

Corresponding author: hengpeipei@moh.gov.my

Summary

This study aimed to investigate fatigue manifestation among scaffolders, following an exposure to scaffolding tasks. The quasi-experiment recruited 86 scaffolders. Physical and cognitive fatigue were measured objectively at pre-and post-exposure employing an assessment protocol of 7-tests: hand grip strength for dominant-and non-dominant hand, prone plank, trunk flexor endurance, trunk lateral endurance duration, one leg standing duration with eyes opened and closed, sit and reach distance, and simple reaction time. A significant pre-post deterioration ($p < 0.001$) was reported for all parameters, except for sit and reach distance. The findings will guide the development of fatigue intervention to safeguard scaffolders against occupational fatigue.

Keywords: fatigue manifestation, scaffolders, objective assessment, physical fatigue, cognitive fatigue

Introduction

Scaffolding-related accidents were extensively reported. Two-third of the global construction workforce involved in the operation of scaffold, a temporary building structure to support works at heights¹. Besides physically demanding and fatigue-prone, scaffolders also require cognitive alertness to execute sequential procedural steps². Fatigue assessment is a huge challenge, it is underreported in construction due to job security issue. Self-administered subjective assessment is inadequate to reflect a true fatigue level therefore may provide false alarm of fatigue. Literatures evidently documented several elements of fatigue manifestation (musculoskeletal capacity, postural stability, joint flexibility; and cognitive fatigue parameter of simple reaction time). Given the burden of scaffolding related accidents, and individual attribute like fatigue had been identified as the precursor, feasible assessment tool to measure fatigue manifestation directly on site, is highly warranted. Fatigue is multidimensional. The present study aimed to investigate fatigue manifestation in physical and cognitive dimension among scaffolders, following an exposure to simulated scaffolding tasks. With this exploration, the on-site fatigue assessment plan can be

formulated to guide the Site Safety Supervisor to ensure fitness for duty before scaffolders handle risky tasks.

Materials and Methods

This is a quasi-experiment with one-group pre-post design, employing consecutive sampling to recruit all accessible scaffolders who attended training at the certified scaffolding training site (MKRS Training Institute). Total sample was 86, calculated using two-correlated proportions formula, considering both dimensions of physical and cognitive fatigue. Participants were excluded if had been clinically diagnosed with sleep disorder or pathological fatigue. Fatigue manifestation was assessed at individual level, compared between two contrast states: the pre-and post-exposure to scaffolding erection task (Figure 1). The exposure was hypothesized to generate fatigue. Objective measurement was performed according to parameters of two dimensions: physical fatigue (musculoskeletal capacity, postural stability, joint flexibility) and cognitive fatigue (reaction time); which yielded a 7-tests protocol (Table 1): hand grip strength, prone plank, trunk flexor endurance, trunk lateral flexor endurance, sit and reach, one leg standing with eyes opened and eyes closed, and simple reaction time test. At the same time, participants were asked to self-rated the fatigue level using Likert 1-10. The measurement error was optimally controlled. Data was analysed with SPSS 22 software. Besides descriptive illustration of individual sociodemographic and job characteristics, within group comparison was performed with paired-t test and Wilcoxon Signed Rank test. Ethical approval was obtained from the Research Ethics Committee, UKM (JEP-2022-604), while written informed consent was obtained before recruitment.

Results and Discussion

Majority of the scaffolders were youngsters (19-29 years old) (51.2%), male (95.3%), Malay ethnicity (57.0%), achieved tertiary educational level (89.5%), worked as scaffolders/scaffolding operators (44.2%), and had a field-working experience of less than 5 years (66.3%). Exposure to a full-day of scaffold erection tasks generated fatigue, causing significant next-day deterioration of all objective parameters for fatigue ($p < 0.001$), except for sit and reach test. Gripping force for both hands were significantly reduced at post-exposure. Full-strength recovery was not facilitated by overnight rest, which highlighted the importance of work-break cycles for the accumulated muscular fatigue. A reduced in one leg standing duration reflected postural instability. Trunk exhaustion following loading and lifting tasks can provoke postural control impairment³, thus present study affirmed that exposure to massive lower limb activities (climbing, prolonged standing and bending) during scaffolding tasks impaired postural balancing. For the trunk and back muscular capacity, the post-exposure prone plank, trunk flexor endurance and trunk lateral endurance duration was significantly reduced following scaffolding tasks' exposure. High-intensity scaffolding tasks have been identified as primary cause of core fatigue thus diminishing its overall strength, endurance, and stability; and limits core muscle performance. In support this explanation, Tong et al. also postulated decreased core muscle capacity and function following whole-body exertion⁴. Mean simple reaction time post-exposure was significantly longer, which postulated that scaffolding tasks are cognitively demanding. This result was in consistent with Philippine study which reported an increase in reaction time proportionate to the intensity of construction work⁵. Moreover, exposure to at-

height work adversely affects the vigilance levels and associated with higher levels of mental fatigue. There were no statistically significant changes for the sit and reach flexibility test, hence it might not be a relevant indicator of physical fatigue among scaffolders. Strenuous and repetitive physical activities could improve stretch reflex activity and stretch tolerance. On the other hand, the self-administered subjective fatigue level showed no significant pre-post difference which indicated objective assessment is sensitive to detect of fatigue-related performance declines.

Conclusion

This study confirmed an increase in physical and cognitive fatigue following exposure to scaffolding tasks, which were unlikely to fully recover despite an overnight resting period. Given that fatigue may be related to work accidents, our findings suggested that objective parameters might be employed as an on-site screening tool for concerning levels of work fatigue.

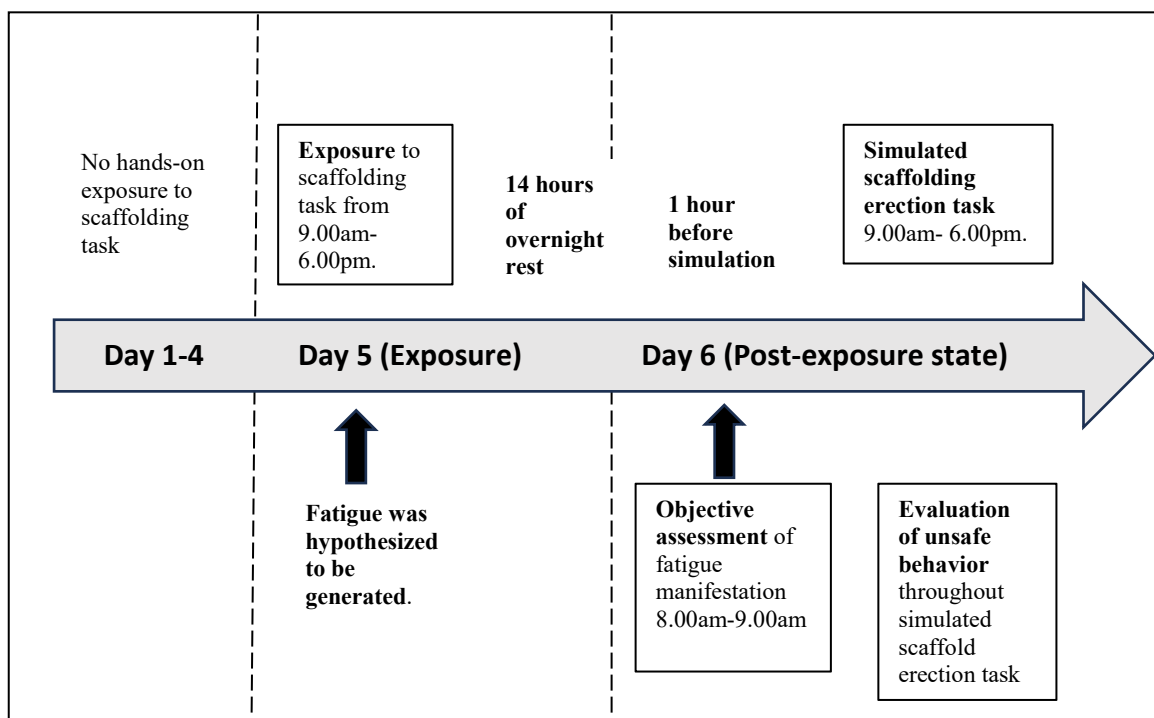


Figure 1: Study protocol illustration

Table 1: Test sequence for the objective assessment of fatigue manifestation

Test sequence	Fatigue dimension	Assessment method/ Test	Test protocol	Measurement
1	Cognitive (Reaction time)	Visual Red light green light simple reaction time test	Subject was required to stop using screen device 15 minutes prior to the test. The 14-inches wide screen laptop was used and subject responded by clicking mouse with dominant hand. First, subject clicked on the start button to begin. When the stoplight turned from red to green, subject clicked on the button as quick as possible. Reaction time was recorded for a total of 5 attempts and the average time of reaction was displayed.	millisecond
2	Physical (Postural stability control)	One leg standing test and with eyes opened and closed	Subject was standing upright second with arms lowered alongside with hips. Firstly, subject lifted up any one leg with eyes opened, and next the same test with eyes closed. The countdown stopped when the lifted leg touched the floor or when subject moved arms away from body to stabilize the position.	
3	Physical (Joint flexibility)	(Joint Sit and Reach (SR) Test	The subject sat on the floor their back, hips and knees straight. With the legs together, both soles of the feet were positioned flat against a box. Subject extended arms with palms down and lightly touched the index fingers together. Subject was asked to bend forward to reach as far forward as possible while keeping the knees extended. The distance was measured between the fingertips and the point at which the feet contacted to the box. 0 cm represented the position of the feet against the box, with larger values for higher flexibility.	Centimetre

4	Physical (Hand grip strength)	Hand dynamometer test for dominant and non-dominant hand	Hand dynamometer was calibrated prior to study. Subject holds dynamometer in one hand, standing upright with elbow flexed at 90-degree angle. The equipment's grip was adjusted accordingly to ensure subject exerted force by only last four phalanges to the handle. The maximal strength was performed for 5 seconds, with 3 attempts on both hands. The highest strength was recorded. Rest period of 30 seconds was allowed between the attempts.	Kilograms
5	Physical (Core strength and stability)	Prone plank test	Subject was positioned prone with elbow positioned at a 90-degree angle. Subject then raised pelvis from the floor and maintain a flat position, the test was terminated when participant unable to hold the position.	second
6	Physical (Trunk flexor endurance)	Trunk flexor endurance test	Subject sat in a semi-reclining position with hips and knees at 90-degree. Both arms were placed across the chest. Subject lean beside a board that is kept in an incline 60-degree angle, whereby the head was maintained in a neutral position. After the board was removed, the position must be maintained using the abdominal muscles to sustain a flat-to-neutral spine, without arching the back. Any evident changes in the position of the trunk such as rising in the low-back arch or an aberration from the neutral position terminated the test	second
7	Physical (Trunk lateral endurance)	Trunk lateral flexor endurance test (side bridge test)	Subject was on one side of the body, both legs extended and the feet in front of another. The elbow of the supporting arm (the arm which is on the lower side during side-lying) was placed below the shoulder	second

with the forearm facing out. The other upper limb was placed on the chest. Subject was instructed to raise the hip. The trunk was supported only by foot, and the elbow/forearm of the lower arm. Any evident changes in the position of the trunk such as rising in the low-back arch or an aberration from the neutral position terminated the test.

Reference

1. Olanrewaju A, Khor JS, Preece CN. An investigation into occupational health and safety of scaffolding practices on construction sites in Malaysia. *Frontiers in Engineering and Built Environment*. 2021.
2. Zhang M, Murphy L, Fang D, et al. Influence of fatigue on construction workers' physical and cognitive function. *Occupational Medicine*. 2015;**65**(3):245-50.
3. Proske U. Exercise, fatigue and proprioception: A retrospective. *Experimental brain research*. 2019;**237**(10):2447-59.
4. Faber LG, Maurits NM, Lorist MM. Mental fatigue affects visual selective attention. *PloS one*. 2012;**7**(10):e48073.
5. Blazeovich AJ, Cannavan D, Waugh CM, et al. Range of motion, neuromechanical, and architectural adaptations to plantar flexor stretch training in humans. *Journal of applied physiology*. 2014.

OESHOP03 / 204

Body Weight Perception and Weight Control Behaviours among School-going Adolescents in Malaysia

Chan Ying Ying¹, Norhafizah Shahril¹, Hamizatul Akmal Abd Hamid¹, Mohamad Aznuddin Abd Razak¹, Lim Kuang Kuay¹, Azli Baharudin¹, Kee Chee Cheong², Zamtira Seman², Mohd Azahadi Omar², Noor Ani Ahmad¹

¹ Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

² Sector for Biostatistics & Data Repository, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: chan.yy@moh.gov.my

Summary

Body weight perception and weight control behaviours play a critical role in adolescent health. This study aimed to determine self-perceived weight status, accuracy of weight perception, and weight control behaviours among school-going adolescents in Malaysia using data from the 2022 Adolescent Health Survey. Results indicate that males tend to underestimate their weight status, and females tend to overestimate. Weight misperception was common in both genders, with only a fair agreement between perceived and actual weight status. These findings underscore the need for gender-specific interventions to improve weight perception accuracy, promote healthy weight management, and reduce long-term health risks among adolescents.

Keywords

Body weight perception, weight control, weight status, misperception, school-going adolescents

Introduction

Adolescence is a critical period of growth and transition. Overweight and obesity rates among adolescents are rising globally, including in Malaysia (1). According to the National Health and Morbidity Survey (NHMS), the prevalence of adolescent overweight and obesity increased from 14.6% and 12.3% in 2012 to 15.6% and 14.8% in 2017. Malaysia continues to address this public health concern through national policies and programmes. Body weight perception refers to a person's subjective assessment of their body weight, regardless of their actual body mass index (BMI). Weight misperception, such as underestimating or overestimating body weight, is a prevalent concern among adolescents in Malaysia and can lead to inappropriate weight control actions (2,3). Understanding body weight perception and weight control behaviours is crucial for developing effective health interventions among adolescents. This study aimed to describe self-perceived weight status, accuracy of weight perception, and weight control behaviours among school-going adolescents in Malaysia.

Materials and Methods

Data for this study were derived from the NHMS 2022: Adolescent Health Survey (AHS), a nationwide school-based cross-sectional study among school-going adolescents (Form 1 to Form 5) from 239 randomly selected secondary schools throughout Malaysia. The survey employed a multi-stage stratified sampling method to select a representative sample of secondary school adolescents using the sampling frame of 2021 provided by the Ministry of Education. A total of 33,523 adolescents participated in this study, giving an overall response rate of 89.0% (4). Participants completed validated self-administered questionnaires on sociodemography, body weight perception, and weight control behaviours. Height and weight were measured to calculate the body mass index (BMI)-for-age and classify weight status using the WHO growth chart. Weighted Cohen's kappa test was used to assess the agreement between perceived and actual weight status. All data were analysed using SPSS version 28.0, accounting for the complex sampling design.

Results and Discussion

Based on BMI, 8.3% of adolescents were classified as thinness, 61.2% were normal weight, 16.2% were overweight, and 14.3% were obese. Most of the thinness adolescents (83.3%) correctly perceived themselves as thin. For normal weight adolescents, 48.4% perceived their weight accurately, 29.8% underestimated their weight, and another 21.7% overestimated their weight. Among overweight adolescents, 58.3% correctly perceived their weight as overweight, 27.4% underestimated their weight, and another 14.4% perceived themselves as obese. For obese adolescents, 43.1% correctly perceived their weight to be obese (Table 1). An analysis of body weight perception against actual body weight status showed an overall agreement of 52.1%; 50.1% for males and 49.9% for females. The Kappa statistics indicated moderate agreement between perceived and actual weight status for both genders (males, $\kappa = 0.482$, $p < 0.001$; females, $\kappa = 0.453$, $p < 0.001$) (Table 2). Significant gender differences were observed in both body weight perception and weight control behaviours ($p < 0.001$). Males were more likely to underestimate their weight [37.3% (95% CI: 36.2, 38.6) vs 24.2% (95% CI: 23.3, 25.2)], while females were more likely to overestimate their weight [23.8% (95% CI: 22.8, 24.7) vs 10.4% (95% CI: 9.7, 11.0)] (Table 3). The findings from this study were consistent with previous studies conducted among adolescents in Malaysia (3,5). Further research is needed to investigate factors associated with body weight misperception in this population.

Table 1: Distribution of body weight perception and weight control behaviours according to their actual body weight status

	Actual body weight status, % (95% CI)			
	Thinness (n=2665)	Normal weight (n=20502)	Overweight (n=5401)	Obese (n=4866)
Prevalence of actual body weight status	8.3 (7.9, 8.8)	61.2 (60.3, 62.1)	16.2 (15.7, 16.8)	14.3 (13.7, 14.9)
Body weight perception				
Perceived thin	83.3 (81.3, 85.0)	29.8 (28.8, 30.8)	5.2 (4.4, 6.2)	3.6 (2.9, 4.5)
Perceived normal	14.7 (13.1, 16.5)	48.4 (47.3, 49.5)	22.2 (20.7, 23.8)	7.6 (6.6, 8.7)
Perceived overweight	1.7 (1.2, 2.5)	19.7 (18.9, 20.6)	58.3 (56.4, 60.1)	45.7 (43.9, 47.5)
Perceived obese	0.3 (0.2, 0.6)	2.0 (1.8, 2.4)	14.4 (13.3, 15.6)	43.1 (41.1, 45.2)
Weight control behaviours				
Trying to lose weight	5.1 (4.1, 6.4)	31.2 (30.2, 32.1)	70.0 (68.1, 71.8)	73.1 (71.2, 75.0)
Trying to gain weight	45.8 (42.8, 48.8)	14.6 (14.0, 15.3)	2.4 (1.9, 3.2)	1.9 (1.4, 2.5)
Nothing / No attempt to change weight	39.8 (37.4, 42.3)	34.7 (33.7, 35.6)	18.3 (16.8, 19.8)	18.0 (16.4, 19.6)
Maintain the same weight	9.2 (7.9, 10.8)	19.5 (18.7, 20.3)	9.3 (8.5, 10.2)	7.0 (6.1, 8.0)

 Misperception of body weight

 Appropriate weight change attempts

Table 2: Agreement (weighted Cohen's kappa) between actual and perceived body weight status among school-going adolescents by gender

Body Weight Perception	Actual Body Weight Status, n (%)				Overall Agreement % (95% CI)	Weighted Kappa κ (95% CI)
	Thinness (n=2665)	Normal weight (n=20502)	Overweight (n=5401)	Obese (n=4866)		
All						
Perceived thin	2215 (83.3)	6033 (29.8)	264 (5.2)	156 (3.6)		
Perceived normal	387 (14.7)	9920 (48.4)	1165 (22.2)	339 (7.6)	52.1	0.466*
Perceived overweight	44 (1.7)	4118 (19.7)	3183 (58.3)	2198 (45.7)	(51.3, 53.0)	(0.460, 0.473)
Perceived obese	15 (0.3)	416 (2.0)	783 (14.4)	2167 (43.1)		
Male						
Perceived thin	1366 (83.3)	3139 (36.4)	177 (7.3)	123 (5.0)		
Perceived normal	240 (14.6)	4380 (50.5)	716 (28.7)	249 (9.5)	50.1	0.482*
Perceived overweight	25 (1.7)	1061 (12.2)	1369 (56.5)	1369 (51.0)	(47.9, 52.3)	(0.473, 0.491)
Perceived obese	9 (0.3)	80 (0.9)	164 (7.5)	959 (34.4)		
Female						
Perceived thin	849 (83.1)	2894 (24.3)	87 (3.1)	33 (1.4)		
Perceived normal	147 (14.8)	5540 (46.6)	449 (15.9)	90 (4.7)	49.9	0.453*
Perceived overweight	19 (1.8)	3057 (26.1)	1814 (59.9)	829 (37.7)	(47.7, 52.1)	(0.444, 0.462)
Perceived obese	6 (0.3)	336 (3.0)	619 (21.1)	1208 (56.2)		

*Analysed by weighted Cohen's kappa at $p < 0.001$, indicating moderate agreement.

Table 3: Gender differences in body weight perception, weight control behaviours, and body weight misperception among school-going adolescents

Variables	All	Male	Female	Gender Difference, P-value (Chi-square)
	% (95% CI)	% (95% CI)	% (95% CI)	
Overall	100.0 (100.0, 100.0)	50.0 (48.0, 52.0)	50.0 (48.0, 52.0)	
Body weight perception				
Perceived thin	26.5 (25.7, 27.3)	31.4 (30.3, 32.5)	21.6 (20.7, 22.4)	<0.001
Perceived normal	35.5 (34.6, 36.4)	36.0 (34.9, 37.2)	34.9 (33.7, 36.2)	
Perceived overweight	28.2 (27.5, 28.9)	24.8 (23.9, 25.7)	31.6 (30.7, 32.5)	
Perceived obese	9.8 (9.3, 10.4)	7.8 (7.2, 8.3)	11.9 (11.2, 12.7)	
Weight control behaviours				
Trying to lose weight	41.3 (40.5, 42.1)	36.8 (35.7, 37.9)	45.8 (44.8, 46.8)	<0.001
Trying to gain weight	13.4 (12.9, 14.0)	17.5 (16.7, 18.4)	9.4 (8.8, 10.0)	
Nothing / No attempt to change weight	30.0 (29.2, 30.9)	28.9 (27.8, 30.1)	31.1 (30.2, 32.1)	
Maintain the same weight	15.2 (14.7, 15.7)	16.7 (15.9, 17.6)	13.7 (13.1, 14.3)	
Body weight misperception				
Underestimate	30.8 (29.9, 31.7)	37.3 (36.2, 38.6)	24.2 (23.3, 25.2)	<0.001
Accurate	52.1 (51.3, 53.0)	52.3 (51.1, 53.5)	52.0 (51.0, 53.0)	
Overestimate	17.1 (16.4, 17.7)	10.4 (9.7, 11.0)	23.8 (22.8, 24.7)	

Conclusion

There are gender differences in body weight perception and weight control behaviours among school-going adolescents in Malaysia. The findings highlight the need for gender-specific interventions and health promotional strategies aimed at maintaining a healthy weight and practising appropriate weight control measures, particularly for overweight and obese adolescents.

References

1. NCD Risk Factor Collaboration (NCD-RisC) (2017). Worldwide trends in body-mass index, underweight, overweight, and obesity from 1975 to 2016: a pooled analysis of 2416 population-based measurement studies in 128.9 million children, adolescents, and adults. *Lancet*, 390(10113), 2627-2642. doi:10.1016/S0140-6736(17)32129-3
2. Aziz, N. S., Salleh, R., Sallehuddin, S. M., Ahmad, M. H., & Baharudin, A. (2020). Factors associated with body weight misperception among adolescents: Findings from Adolescent Nutrition Survey 2017. *International Journal of Public Health and Clinical Sciences*, 7(2), 71-81. doi:10.32827/ijphcs.7.2.71
3. Zainuddin, A. A., Manickam, M. A., Baharudin, A., Omar, A., Cheong, S. M., Ambak, R., Ahmad, M. H., & Ghaffar, S. A. (2014). Self-Perception of Body Weight Status and Weight Control Practices Among Adolescents in Malaysia. *Asia Pacific Journal of Public Health*, 26(5), 185-265. doi:10.1177/1010539514542422
4. Kuay, L. K., Mahjom, M., Awaluddin, S. M., Shawaluddin, N. S., Tuan Lah, T. M. A., Abd Hamid, H. A., Mohd Yusoff, M. F., Tan, L. A., & Ahmad, N. A. (2023). Methodology of National Health and Morbidity Study (NHMS): Adolescent Health, Malaysia 2022: Methodology of adolescent health survey, Malaysia 2022. *International Journal of Public Health Research*, 13(2), 1694-1699. doi:10.17576/ijphr.1302.2023.02.02

5. Jamani, N. A., Said, A. H., Abd Aziz, K. H., & Abd Rahman, M. A. (2020). Agreement between body weight perception and body weight status among late adolescents in Kuantan, Malaysia. *The Medical journal of Malaysia*, 75(2), 158-163.

OESHOP04 / 215

Spatial Distribution of Dietary Patterns and Its Association with Obesity Among Adults in Malaysia

Kimberly Yuin Y'ng Wong^{1,2}, Sanjay Rampal¹, Foong Ming Moy^{1*}

¹ Center for Nutrition Epidemiology Research, Institute for Public Health, Ministry of Health Malaysia.

² Department of Social and Preventive Medicine, Faculty of Medicine, University Malaya, Malaysia

Corresponding author's email: kimberly.w@moh.gov.my

Summary

This study examined the spatial distribution of dietary patterns and their association with Body Mass Index (BMI) among 2,574 respondents from the Malaysian Adult Nutrition Survey (MANS) 2014, using Moran's statistics and multi-level regression. Three dietary patterns explaining 36.0% of variability were derived through principal component analysis. The Western diet showed the least spatial clustering, while the Healthier diet clustered in high-income districts of central Peninsular Malaysia. Substituting Traditional diet with Healthier diet was associated with a lower BMI (-0.8 kg/m^2 , $p < 0.05$). Improving access and appeal to fruits, and vegetables is crucial for obesity prevention in Malaysia.

Keywords

dietary pattern, obesity, public health, nutrition, spatial analysis

Introduction

Rising incomes, globalization, and longer working hours have driven a surge in sugar and fat intake in low- and middle-income countries, increasing obesity risks (1, 2). Additionally, the 2014 Food Barometer Survey revealed that 77% of a nationally representative sample consumed food prepared outside the home daily (3). The food environment shapes eating habits, reinforcing unhealthy behaviours. Areas with a higher density of fast-food outlets, greater sodium intake, lower fruit and vegetable consumption often coincide with obesity clusters, particularly in lower socio-economic areas (4). A local study in urban district of Johor Bahru reported a positive association between perceived neighbourhood food environment and BMI, mediated by diet (5). Identifying spatial clusters of dietary patterns can help governments pinpoint high-risk areas and implement targeted public health strategies. Therefore, this study aims to determine the spatial distribution of dietary patterns and its association with BMI among adults in Malaysia.

Materials and Methods

This study analyzed the data from the (MANS) 2014, using the Habitual Food Intake module. Extreme energy intake values were excluded. Principal component analysis derived three dietary patterns explaining 36% of total variance, and labelled as Healthier, Traditional, and Western. The 126 food items were aggregated into 17 food groups. The total daily calorie of each food group was calculated and used for factor analysis. Factor scores for the three dietary

patterns were estimated using the Bartlett method and assigned to each respondent. Spatial clustering was assessed using Global and Local Moran's I, mapping high-high and low-low clusters. Spatial relationships were defined using a fixed distance of 8 km or the five nearest neighbours. Multi-level linear regression accounted for the survey's cluster design, adjusting for socio-demographics, environment, and energy intake. The substitution model examined BMI changes when replacing Traditional with Western or Healthier diets to estimate the effects of a behaviour change. Spatial and statistical analysis was conducted using ArcMap and STATA, respectively.

Results and Discussion

Overall, total respondents consist of 54.4% of females and 50.8% Malay ethnicity with mean age of 38 years old. Western Diet was higher at East Malaysia, whilst Healthier Diet was adhered more by respondents from Peninsular Malaysia. The Healthier Diet was dominated by whole grain, milk, nut and legumes. The second dietary pattern labelled as Traditional Diet were loaded with preserved foods, fish and seafood. The third dietary pattern dominant in carbonated beverage, fast-food, meat and poultry were labelled as Western Diet. General spatial clustering indicated by the Global Moran's index for all dietary patterns were significant ($p < 0.001$) at both Peninsular Malaysia and East Malaysia. Spatial clustering for Western diet, was lowest at both Peninsular (0.14 vs 0.42, 0.50) and East Malaysia (0.19 vs 0.46, 0.39) indicating a more disperse spatial distribution compared to Healthier diet and Traditional diet. High clusters of Western diet were located at some higher income suburban districts, mainly along the southern west coast of Peninsular (Figure 1). High clusters of Healthier diet were primarily at city districts. In contrast, High clusters of Traditional diet were mainly found at the northern Peninsular whilst low clusters were found at city districts (Figure 1).

None of the dietary patterns were significantly associated with BMI in the crude model. However, in Model 1, the Western diet and Traditional diet were significantly associated with higher BMI after adjusting for socio-demographic factors. Moreover, substituting the Traditional diet or Western diet with the Healthier diet was associated with a lower BMI. In Model 2, after adjusting for total calorie intake, only the Traditional diet remained significantly associated with higher BMI. At equivalent energy intake levels, substituting the Traditional diet with the Healthier diet was associated with a much lower BMI (Table 1).

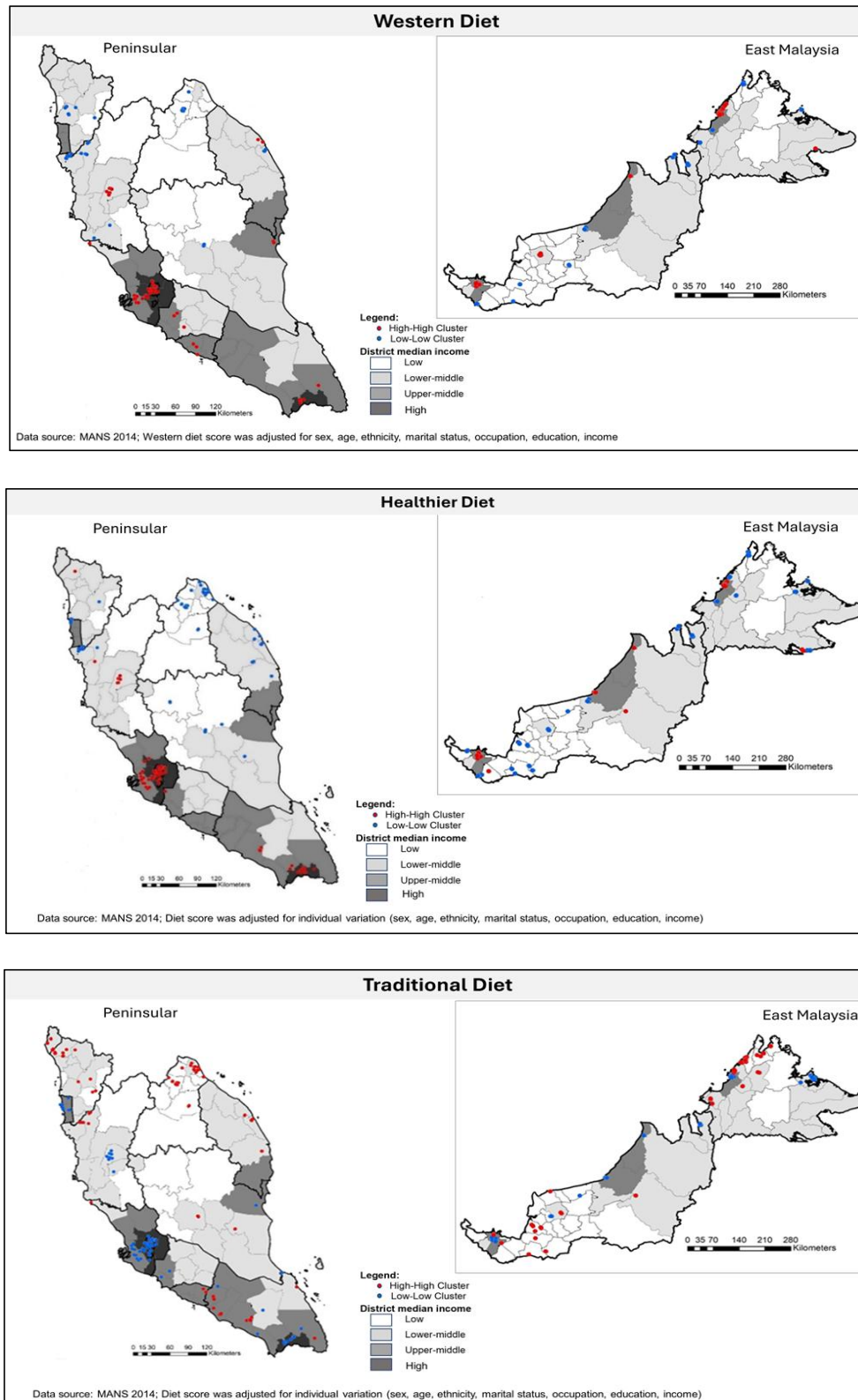


Figure 1: Clusters of dietary patterns in Peninsular Malaysia and East Malaysia

Table 1: Associations between dietary patterns with Body Mass Index (N=2,574)

	Crude	Model 1 ^a	Model 2 ^b
	Δ BMI, kg/m ² (95% CI); p-value		
Dietary patterns			
Western Diet	-0.10 (-0.30, 0.10); <i>p</i> =0.338	0.57 (0.31, 0.84); <i>p</i> <0.001***	0.27 (-0.02, 0.55); <i>p</i> =0.066
Healthier Diet	-0.10 (-0.29, 0.10); <i>p</i> =0.327	0.13 (-0.07, 0.33); <i>p</i> =0.187	-0.01 (-0.21, 0.20); <i>p</i> =0.964
Traditional Diet	0.05 (-0.16, 0.25); <i>p</i> =0.658	0.80 (0.53, 1.07); <i>p</i> <0.001 ***	0.40 (0.11, 0.68); <i>p</i> =0.006**
Substitution analysis			
Substitution of 2SD Traditional diet with 2SD Healthier diet	-0.28 (-0.84, 0.27); <i>p</i> =0.317	-1.33 (-1.96, 0.70); <i>p</i> <0.001***	-0.81 (-1.43, 0.18); <i>p</i> =0.011*
Substitution of 2SD Western diet with 2SD Healthier diet	0.01 (-0.51, 0.52); <i>p</i> =0.991	-0.88 (-1.58, 0.18); <i>p</i> =0.014*	-0.54 (-1.26, 0.17); <i>p</i> =0.135

^a Model 1 was adjusted for sex, age, ethnicity, income, education, occupation, zone, urbanity, district median household income, district population density, and diet misreporting

^b Model 2 additionally adjusted for total energy intake

** *p*<0.05; *** *p*<0.01

Conclusion

This study demonstrated that despite being beneficial to weight management, healthier dietary pattern was spatially clustered at higher socio-economy areas. Thus, increasing affordability and availability of healthier food options, as well as advocacy through interesting recipes are crucial public health actions in combating obesity.

Acknowledgements

The authors appreciate the Director General of Health for his permission to present and publish this abstract. The authors also extend a deep gratitude to the late Dr Aziz Shafie from the Department of Geography, Faculty of Social Sciences, University Malaya, Malaysia, for this guidance and invaluable insights while co-supervising this research.

References

1. Mu M, Xu LF, Hu D, Wu J, Bai MJ. Dietary Patterns and Overweight/Obesity: A Review Article. *Iranian journal of public health*. 2017;46(7):869-76.
2. Ng AP, Jessri M, L'Abbe MR. Using partial least squares to identify a dietary pattern associated with obesity in a nationally-representative sample of Canadian adults: Results from the Canadian Community Health Survey-Nutrition 2015. *PLoS One*. 2021;16(8):e0255415.
3. Fournier T, Tibère L, Laporte C, Mognard E, Ismail MN, Sharif SP, et al. Eating patterns and prevalence of obesity. Lessons learned from the Malaysian Food Barometer. *Appetite*. 2016;107:362-71.
4. Joost S, De Ridder D, Marques-Vidal P, Bacchilega B, Theler J-M, Gaspoz J-M, et al. Overlapping spatial clusters of sugar-sweetened beverage intake and body mass index in Geneva state, Switzerland. *Nutrition & Diabetes*. 2019;9(1):1-10.
5. Majid MR, Lim NHH, Zaman M, Ruslik N. Exploring the Link between BMI, Perceived Neighbourhood Environment and Health Behaviours in Malaysia. *Journal of Sustainability Science Management*. 2021;16(7):190-208.

OESHOP05 / 216

Reimagining Environmental Health in the Digital Age: A Data-Driven Heat Health Warning System (HHWS) for Malaysia

Hadita binti Sapari

Department of Public Health Medicine, Faculty of Medicine, Universiti Teknologi MARA, Malaysia

Corresponding author's email: drhadita@moh.gov.my

Summary

Extreme temperatures pose significant public health risks, particularly in tropical climates such as Malaysia. This study investigates the association between daily ambient temperature and non-accidental mortality in Kedah and Penang from 2011 to 2019. A quasi-Poisson generalized linear regression model with a distributed lag non-linear model (DLNM) was employed to examine the relationship between temperature fluctuations and mortality. The findings revealed a U-shaped relationship in Kedah and a J-shaped pattern in Penang, with the Minimum Mortality Temperature (MMT) identified at 27.4°C and 28.2°C, respectively. These results underscore the urgent need for a data-driven Heat Health Warning System (HHWS) to mitigate temperature-related mortality through real-time monitoring, predictive analytics, and targeted public health interventions.

Keywords

Heat Health Warning System (HHWS); Minimum Mortality Temperature (MMT); Non-accidental Mortality; Climate and Health; Distributed Lag Non-Linear Model (DLNM)

Introduction

As global temperatures continue to rise due to climate change, the health impacts of extreme heat have become a growing concern. Exposure to elevated temperatures has been associated with increased mortality rates, particularly among vulnerable populations such as the elderly and individuals with pre-existing respiratory conditions. Understanding the temperature-mortality relationship is critical in developing preventive strategies that can reduce health burdens and inform climate adaptation policies.

This study examines the non-linear relationship between daily temperature and non-accidental mortality in two states with differing climate characteristics: Kedah and Penang. By determining the MMT for each state, we assess the magnitude of health risks associated with extreme temperatures. The findings serve as the foundation for the development of an HHWS, which integrates GIS-based mapping, real-time temperature surveillance, and AI-driven forecasting to strengthen public health preparedness and response strategies against extreme heat events.

Materials and Methods

A time-series analysis was conducted using daily mortality records and meteorological data from 2011 to 2019. The study utilized a quasi-Poisson generalized linear regression model combined with DLNM to estimate the exposure-lag-response association between temperature and mortality. Mortality outcomes included non-accidental, cardiovascular, and respiratory-related

mortality. GIS-based spatial analysis was performed to identify high-risk areas where temperature-induced mortality was more prevalent. The MMT thresholds for Kedah and Penang were determined as 27.4°C and 28.2°C, respectively, representing the optimal temperature ranges with the lowest mortality risks.

Results and Discussion

The analysis revealed distinct temperature-mortality relationships in Kedah and Penang. Kedah exhibited a U-shaped pattern, indicating increased mortality risks at both high and low temperatures, with the highest relative risk observed at lag 0-3 for non-accidental mortality (RR: 1.16, 95% CI: 1.08-1.26) and lag 0-7 for respiratory mortality (RR: 1.23, 95% CI: 1.03-1.49). In contrast, Penang displayed a J-shaped association, where extreme heat had a more pronounced effect on mortality, particularly at lag 0-7 for non-accidental mortality (RR: 1.21, 95% CI: 1.11-1.33) and lag 0-14 for respiratory mortality (RR: 1.57, 95% CI: 1.24-1.99). Cardiovascular mortality did not show a statistically significant association with extreme temperature exposure in either state. Spatial analysis indicated a noticeable increase in average temperatures between 2016-2019 compared to 2011-2015, with more districts experiencing extreme heat events. These findings highlight the pressing need for adaptive public health measures to mitigate heat-related mortality risks. To address this, the proposed HHWS integrates real-time temperature monitoring, AI-driven risk assessment models, automated public alerts, and healthcare response planning. Through targeted community engagement and intervention strategies, the system aims to safeguard populations most vulnerable to heat-related illnesses.

Conclusion

The findings of this study emphasize the urgent need for climate-resilient public health policies in Malaysia. The development of an HHWS, leveraging predictive modeling and real-time data surveillance, represents a crucial step toward reducing temperature-related mortality. By integrating early warning mechanisms and proactive public health interventions, this system can enhance heat preparedness and protect at-risk populations from the adverse effects of climate change.

Acknowledgments

The authors acknowledge the contributions of meteorological agencies, public health institutions, and research collaborators in providing data and technical support for this study.

References

1. Gasparrini, A., Guo, Y., Hashizume, M., et al. (2015). Mortality risk attributable to high and low ambient temperature: a multicountry observational study. *The Lancet*, 386(9991), 369-375.
2. Anderson, G. B., & Bell, M. L. (2009). Weather-related mortality: how heat, cold, and heat waves affect mortality in the United States. *Epidemiology*, 20(2), 205-213.
3. Vicedo-Cabrera, A. M., Sera, F., Gasparrini, A. (2021). Temperature-related mortality impacts under and beyond climate change. *Environmental Research Letters*, 16(4), 044021.

4. Hondula, D. M., Barnett, A. G. (2014). Heat-related morbidity and mortality in the United States: epidemiologic evidence and adaptive strategies. *Environmental Health Perspectives*, 122(12), 1342-1350.
5. Huang, C., Barnett, A. G., Wang, X., & Tong, S. (2012). The impact of temperature on years of life lost in Brisbane, Australia. *Nature Climate Change*, 2(4), 265-270.

OESHOP06 / 252

Discovering the Health Risks among Healthcare Workers: Prevalence and Its Associated Factors for Obesity in a Major Government Research Institute in Klang Valley, Malaysia

Mona Lisa Md Rasip¹, Mohd Nizam Misran¹, Azra Abdul Aziz¹, Wan Afiqah Wan Sabri¹,
Thanuja Narayanan¹, Rozilawati Jafri¹, Siti Haslina Othman¹, S Maria Awaluddin²

¹ Occupational Safety and Health Unit, National Institutes of Health, Ministry of Health, Jalan Setia Murni U13/52, Seksyen U13 Setia Alam, 40170 Shah Alam, Selangor, Malaysia

² Centre for Occupational Health Research, Institute for Public Health, National Institutes of Health, Ministry of Health, Jalan Setia Murni U13/52, Seksyen U13 Setia Alam, 40170 Shah Alam, Selangor, Malaysia

Corresponding author's email: monalisa.rasip@moh.gov.my

Introduction

Obesity impairs cognitive function, reduces productivity, and lowers overall performance, particularly among healthcare workers engaged in research due to extensive desk-based tasks and prolonged sedentary activity. Obesity among medical researchers like medical doctors, medical researchers, nurses, medical laboratories technician and their assistants are also at risk of multiple health issues. The objective of this study is to determine the prevalence and sociodemographic distribution of obesity among healthcare workers (HCWs) and identify key factors associated with obesity among medical researchers in government research institutes in Klang Valley, Malaysia.

Keywords

Obesity; healthcare workers; sedentary; diabetes mellitus; hypertension.

Methodology

A total 990 participant's complete data from google form done in 2023 annual HCWs medical examination consisting of socio-demographic information, anthropometry measurement and blood investigation were used. A body mass index (BMI) of ≥ 30.0 kg/m² was used to classify individuals as obese. A descriptive analysis and multivariable logistic regression were conducted to determine the prevalence of obesity and its associated factors using IBM SPSS version 25. This study obtained the appropriate approval from the relevant authority.

Results

The study revealed that 26.0% of HCWs were obese, with significant associations found between obesity and overall hypertension (aOR=6.35, 95% CI: 3.94, 10.24, p<0.001), overall diabetes mellitus (aOR=3.86, 95% CI: 1.72, 8.68, p=0.001), and a family history of diabetes mellitus (aOR=1.75, 95% CI: 1.20, 2.54, p=0.004). Additionally, assistant researchers and individuals with physical inactivity were found to have higher odds of obesity, with aOR of 1.73 (95% CI: 1.12, 2.68, p=0.014) and 1.48 (95% CI: 1.00, 2.18, p=0.049), respectively.

Table 1: The sociodemographic profiles of HCWs in a Major Government Research Institutes in Klang Valley, Malaysia.

Variables	Overall, n=990	
	n	%
Median Age (IQR)	37 (9)	-
Age group		
18-34	349	35.3
35 and above	641	64.7
Gender		
Male	250	25.3
Female	740	74.7
Ethnicity		
Malay	761	76.9
Chinese	74	7.5
Indian	72	7.3
Others	83	8.4
Occupation		
Researcher	415	41.9
Assistant researcher	292	29.5
Administrative	283	28.6
Education Level		
Phd	94	9.5
Master	181	18.3
Degree	246	24.8
Diploma	301	30.4
SPM/STPM	168	17.0
Marital status		
currently married	724	73.1
not married	266	26.9
Known Hypertension (Hpt)		
No	912	92.1
Yes	78	7.9
Overall Hpt (Known + BP sys $\geq$ 140 and/or dys $\geq$ 90)		
No	754	79.4
Yes	196	20.6
Family history Hpt		
No	419	42.3
Yes	571	57.7
Known Diabetes Mellitus (DM)		
No	937	94.6
Yes	53	5.4
Overall DM (Known + FBS $\geq$ 6.1)		
No	877	91.8
Yes	78	8.2

Family history of DM		
No	512	51.7
Yes	478	48.3
Family history of stroke		
No	923	93.2
Yes	67	6.8
Family history of heart disease		
No	791	79.9
Yes	199	20.1
Smoking		
No	942	95.2
Yes	48	4.8
Alcohol		
No	956	96.6
Yes	34	3.4
Self-reported PA		
Inactive (<150min/week)	633	63.9
Active (≥150min/week)	357	36.1
BMI category (kg/m ²)		
≥30.0 (Obese)	245	26.0
25.0-29.9 (overweight)	294	31.2
<18.5 (underweight)	30	3.2
18.5-24.9 (normal)	373	39.6

Table 2: Prevalence of Obesity among HCWs based on the sociodemographic and cardiovascular risk factors compared to HCWs with normal BMI

Variables	Group with BMI ≥30.0 kg/m ² , N:245		Group with normal BMI, N:373		*p-value
	n	%	n	%	
Age group					
18-34	80	36.4	140	63.6	0.215
35 and above	165	41.5	233	48.5	
Gender					
Male	56	37.8	92	62.2	0.606
Female	189	40.2	281	59.8	
Occupation					
Researcher	84	32.3	176	67.7	0.006
Assistant researcher	81	46.0	95	54.0	
Administrative	80	44.0	102	56.0	
Education Level					
Tertiary	190	37.0	323	63.0	0.003
Secondary	55	52.4	50	47.6	
Marital status					
currently	172	39.3	266	60.7	

married					
not married	73	40.6	107	59.4	0.766
Overall Hpt					
No	149	30.4	341	69.6	
Yes	94	75.8	30	24.2	<0.001
Family history Hpt					
No	84	32.3	176	67.7	
Yes	161	45.0	197	55.0	0.001
Overall DM					
No	208	36.7	359	63.3	
Yes	37	80.4	9	19.6	<0.001
Family history of DM					
No	108	33.0	219	67.00	
Yes	137	47.1	154	52.9	<0.001
Family history of stroke					
No	232	40.1	347	59.9	
Yes	13	33.3	26	66.7	0.405
Family history of heart disease					
No	201	40.6	296	59.4	
Yes	44	35.8	79	64.2	0.327
Smoking					
No	231	39.2	358	60.8	
Yes	14	48.3	15	51.7	0.330
Alcohol					
No	242	40.3	358	59.7	
Yes	3	16.7	15	83.3	0.043
Self-reported PA					
Inactive	171	42.6	230	57.4	
Active	74	34.1	143	65.9	0.038

Table 3: Factors associated with obesity among HCWs based on simple and multivariable logistic regression

Multivariable logistic Regression								
Variables	Simple logistic regression				#Multivariable logistic regression			
	Crude OR	95% CI		p-value	AOR	95% CI		p-value
		lower	upper			lower	upper	
Age group								
18-34	1.00	-	-		1.00	-	-	
35 and above	0.81	0.58	1.13	0.215	0.97	0.65	1.46	0.891
Gender								
Male	1.11	0.76	1.62	0.607	1.13	0.69	1.83	0.629
Female	1.00	-	-		1.00	-	-	
Occupation								
Researcher	1.00	-	-		1.00	-	-	
Assistant	1.79	1.20	2.65	0.004	1.73	1.12	2.68	0.014

researcher								
Administrative	1.64	1.11	2.43	0.013	1.33	0.85	2.06	0.213
Education Level								
Tertiary	1.00	-	-		1.00	-	-	
Secondary	1.87	1.23	2.85	0.004	1.49	0.85	2.63	0.166
Marital status								
Married	1.00	-	-		1.00	-	-	
not married	1.06	0.74	1.50	0.766	1.13	0.75	1.71	0.562
Overall Hpt								
No	1.00	-	-		1.00	-	-	
Yes	7.17	4.56	11.29	<0.001	6.35	3.94	10.24	<0.001
Family history Hpt								
No	1.00	-	-		1.00	-	-	
Yes	1.71	1.23	2.39	0.002	1.31	0.86		1.99 0.207
Overall DM								
No	1.00	-	-		1.00	-	-	
Yes	7.10	3.36	15.00	<0.001	3.86	1.72	8.68	0.001
Family history of DM								
No	1.00	-	-		1.00	-	-	
Yes	1.80	1.30	2.50	<0.001	1.75	1.20	2.54	0.004
Family history of stroke								
No	1.00	-	-		1.00	-	-	
Yes	0.75	0.38	1.49	0.407	0.79	0.36	1.76	0.569
Family history of heart disease								
No	1.00	-	-		1.00	-	-	
Yes	0.82	0.54	1.23	0.327	0.65	0.40	1.05	0.077
Smoking								
No	1.00	-	-		1.00	-	-	
Yes	1.45	0.69	3.05	0.333	0.99	0.36	2.73	0.977
Alcohol								
No	1.00	-	-		1.00	-	-	
Yes	0.30	0.09	1.03	0.056	0.30	0.08	1.17	0.083
Self-reported PA								
Inactive	1.44	1.02	2.03	0.039	1.48	1.00	2.18	0.049
Active	1.00	-	-		1.00	-	-	

Discussion

The high prevalence of obesity among HCWs and its strong association with hypertension, diabetes mellitus, and occupational roles call for urgent action. NCD strategies, including Malaysia's National Strategic Plan for Non-Communicable Diseases (NSP-NCD), focus particularly on adults aged 30-65 years because this group bears the highest burden of NCD-related morbidity and mortality (MOH Malaysia, 2016). Within this range, 35 years is seen as an important early checkpoint for screening, lifestyle modification, and targeted intervention. As for workplace Health Promotion Relevance, a workplace-based interventions like

KOSPEN Plus, individuals aged 35 and above represent the highest-priority group for action because they are at the peak of both career responsibilities and vulnerability to NCDs. Focusing on this group allows for preventive occupational health strategies to be most impactful in reducing long-term healthcare costs and productivity loss (WHO Global Plan of Action on Workers' Health, 2008). Targeted interventions focusing on effective management of hypertension and diabetes, along with workplace health promotion programmes, are essential to address this growing health issue. By improving the health and well-being of HCWs, we can enhance their productivity and the quality of care they provide, ultimately benefiting the broader healthcare system.

References

1. Abubakar MB, Yaaqub Abiodun U, Kasimu Ghandi I. Prevalence of Overweight and Obesity among Health-care Workers in Ghana: A Systematic Review. *Niger J Exp Clin Biosci*. 2021;9(1).
2. Alnasiri ASA, Alruwaili NM. Influence of physicians' BMI on counseling practice for obesity in primary health care clinics in Aljouf region, Saudi Arabia. A cross-sectional study. 2019;8(4):4143-6.
3. WHO Expert Consultation. Appropriate body mass index for Asian populations and its implications. *Lancet*. 2004;363:157-63.
4. Dadar Singh NK, Loo JL, Ko AMN, et al. Obesity and mental health issues among healthcare workers: a cross-sectional study in Sabah, Malaysia. *J Heal Res*. 2022;36(5):939-45.
5. Kit LP, Saad HA, Jamaluddin R, et al. Prevalence of Overweight and Obesity among Primary Healthcare Workers In Perak, Malaysia. *IJUM Med J Malaysia*. 2020;19(1).
6. Kunyahamu MS, Daud A, Jusoh N. Obesity among Health-Care Workers: Which Occupations Are at Higher Risk of Being Obese? *Int J Env Res Public Heal*. 2021;18(8):4381.
7. Tong SW, Chui PL, Chong MC, et al. Health-promoting behaviours and perceived lifestyle cancer risk factors among nurses. *Collegian*. 2023;30(1):32-8.
8. Hazmi H, Ishak WRW, Jalil RA, et al. Traditional cardiovascular risk-factors among healthcare workers in Kelantan, Malaysia. *Southeast Asian J Trop Med Public Health*. 2015;46(3):504-11.
9. Siew Hong H. Eating Behaviour and Its Associations with Overweight among Nurses on Shift Duty in Teaching Hospital. *Med Health*. 2019;14(1):68-77.
10. Guo X, Gong S, Chen Y, et al. Lifestyle behaviors and stress are risk factors for overweight and obesity in healthcare workers: a cross-sectional survey. *BMC Public Health*. 2023;23(1):1-13.

OESHOP07 / 255

Sequential Food Poisoning Outbreaks in a Boarding School: Risk Factors and the Cloud Kitchen Risks

Diana Raj¹, Chew Cheng Hoon², Shakirah binti Jamaludin¹, Anussa a/p Krishnan¹, Engku Norma binti Engku Aziz¹, Mohd Imran bin Mohammed Abdul Wahab¹, Noriah binti Ismail¹

¹Klang District Health Office, Ministry of Health, Malaysia

²Institute for Medical Research, Ministry of Health, Malaysia

Corresponding author: chewch@moh.gov.my

Summary

Two food poisoning outbreaks (FPO) in a Malaysian boarding school exposed a dangerous gap in regulating cloud kitchens. FPO 1, linked to *Bacillus cereus* from the school kitchen, prompted its closure, shifting meal preparation to an unregulated cloud kitchen, triggering FPO 2. Compromised samples hindered pathogen identification in FPO 2. These events highlight "risk migration" where closing regulated kitchens move food safety risks to unregulated settings, exposing regulatory gaps. This case underscores the urgent need for enhanced monitoring and protocols for cloud kitchens to safeguard public health in emerging food service models.

Keywords

Food poisoning outbreak, risk migration, cloud kitchen, boarding school, food safety

Introduction

Foodborne illnesses are a global public health burden, exacerbated in Malaysia's warm, humid climate, ideal for pathogens like *Bacillus cereus*. This study investigates the epidemiological and environmental factors behind two sequential food poisoning outbreaks at a secondary boarding school. Following FPO 1, linked to the school kitchen, regulatory closure shifted meal preparation to an unregulated cloud kitchen, triggering FPO 2. This study examines outbreak causes, food safety risks, and regulatory gaps. It advocates for proactive policies to address vulnerabilities in emerging food preparation models like cloud kitchens, protecting vulnerable populations from preventable illness.

Materials and Methods

Two case-control studies investigated food poisoning outbreaks among boarding school students (FPO 1: 17-18 July 2024, school kitchen; FPO 2: 22-23 July 2024, cloud kitchen). Cases were defined as students experiencing gastrointestinal symptoms within these periods. Active case finding involved interviewing students, staff, and food handlers about food consumption and symptoms. Environmental inspections of the school kitchen and cloud kitchen followed Hazard Analysis Critical Control Points (HACCP) principles. Laboratory testing examined hand/rectal swabs, food, and environmental samples. Chi-square analysis determined associations between food consumption and illness. Attack rates and odd ratios were calculated for both outbreaks.

Results and Discussion

FPO 1 affected 37 out of 177 students after consuming spicy prawn *sambal* from the school kitchen (*Bacillus cereus* confirmed; $\chi^2=4.650$, $p=0.031$, OR=3.61, 95% CI: 1.07-12.14). Kitchen closure shifted meals to an unregulated cloud kitchen, where 46 students fell ill after chicken soup in FPO 2 (suspected *B. cereus*; $\chi^2=0.247$, $p=0.620$). Limited sampling prevented pathogen confirmation, though symptoms aligned with *B. cereus*. The outbreaks peaked within days, with distinct incubation periods (Figure 1).

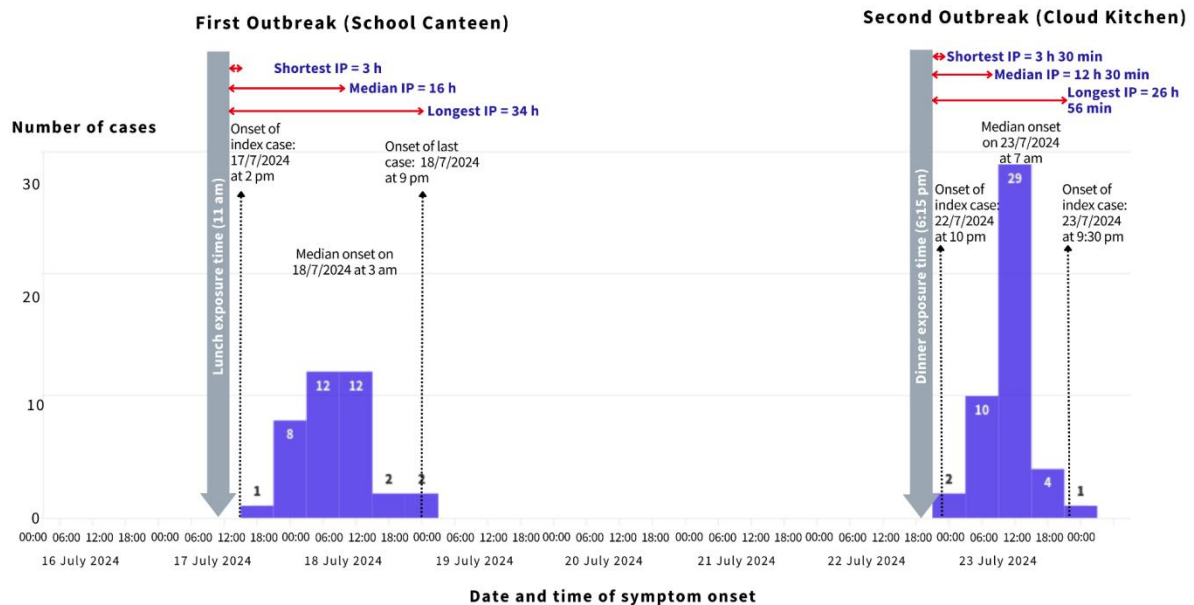


Figure 1: Epidemic curve of the two food poisoning outbreaks in a secondary school on 17 July 2024 (n = 37) and 22 July 2024 (n = 46). (IP = incubation period; h = hours; min = minutes)

Table 1 contrasts factors: FPO 1 (attack rate 21%) arose from cross-contamination and poor cooking (median incubation 16h), while FPO 2 (26.0%) stemmed from improper handling and packaging (12h 30m). Symptoms included abdominal pain (75.7% FPO 1, 80.4% FPO 2) and diarrhoea (70.3% FPO 1, 78.3% FPO 2). Critical control failures underscored vulnerabilities in both settings.

Table 1: Key elements contributing to the outbreaks

Characteristic	First Outbreak	Second Outbreak
Date	17-18 July 2024	22-23 July 2024
Cases	37	46
Attack rate	21%	26%
Suspected food	Spicy prawn <i>sambal</i>	Chicken soup
Preparation location	School kitchen	Cloud kitchen
Median incubation period	16 hours	12 hours 30 minutes
Primary symptoms	Abdominal pain (75.7%),	Abdominal pain (80.4%),

Characteristic	First Outbreak	Second Outbreak
	diarrhoea (70.3%)	diarrhoea (78.3%)
Pathogen identified	<i>Bacillus cereus</i> (food, hands, kitchen)	Suspected <i>B. cereus</i>
Critical control point failures	Poor hygiene, inadequate cooking	Unsafe food handling & packaging while hot
Regulatory Oversight	Regulated kitchen	Unregulated kitchen

FPO 1's OR of 3.61 suggests that students eating prawn *sambal* were over three times more likely to get sick. Pathogen identification in FPO 2 was impossible as the caterer maintained no food samples, and student-preserved samples were compromised after 24 hours at room temperature. The investigation faced significant regulatory challenges, as no specific laws govern cloud kitchens in Malaysia, complicating enforcement actions and accountability when violations occur. These events highlight 'risk migration' from regulated to unregulated settings, exposing critical regulatory gaps in emerging food service models. This case underscores the urgent need for legal frameworks specifically addressing cloud kitchens, including clear lines of responsibility, mandatory sample retention, and enhanced monitoring protocols to safeguard public health.

Conclusion

Sequential outbreaks reveal how "risk migration" to unregulated cloud kitchens amplifies food safety risks. This study urges regulators to mandate sample retention and hygiene audits for cloud kitchens could prevent future outbreaks. Robust training and monitoring are vital to protect vulnerable populations, like boarding students, from preventable foodborne illnesses.

References

1. Pudaruth CC, Biranjia-Hurdoyal SD. Microbiological Quality of Food Purchased from Home-Based Dark Kitchens. *European Journal of Agriculture and Food Sciences*. 2024 Jul 17;6(4):19-21.
2. Leong SS, Korel F, King JH. *Bacillus cereus*: A review of "fried rice syndrome" causative agents. *Microbial pathogenesis*. 2023 Dec 1;185:106418.
3. Laheri Z, Ferris I, da Cunha DT, Soon-Sinclair JM. 'Going dark' or under the radar? Challenges and opportunities for local authorities and dark kitchens in ensuring food safety. *Food Control*. 2025 Jan 25:111179.
4. Rampal L, Jegathesan M, Lim YS. An outbreak of *Bacillus cereus* food poisoning in a school hostel, Klang. *Med J Malaysia*. 1984;39(2):116-122.
5. World Health Organization. Food safety. WHO; 2022.

OESHOP08 / 256

Machine Learning Identifies Autoantibody-defined Systemic Lupus Erythematosus Subgroups and Their Association with Clinical Manifestations

Lay-Kim Tan¹, Ch'ng-Suyin Shereen², Norliza Zainudin², Ravathy Nasadurai², Habibah Mohd-Yusoof², Mollyza Mohd-Zain², Malek Faris Riza Feisal-Jeffrizal², Say-Lee Pok³, and Fariz Yahya³

¹ Sector Biostatistics & Data Repository, Office of NIH Manager, National Institutes of Health, Ministry of Health Malaysia, Selangor, Malaysia

² Department of Medicine, Selayang Hospital, Ministry of Health Malaysia, Selangor, Malaysia

³ Department of Medicine, University Malaya, Kuala Lumpur, Malaysia

Corresponding author's e-mail: tanlk@moh.gov.my

Summary

This study present the first autoantibody-based classification of 239 clinically heterogeneous Malay SLE patients using a machine learning approach, identifying four distinctive clusters defined by specific autoantibody profiles. Feature importance analysis identified anti-Ro52 IgG, anti-SSA IgG, anti-nRNP_Sm IgG, and anti-nucleosome IgG as key contributors. Clusters 2 (anti-SSA IgG and anti-Ro52 IgG) and Cluster 3 (anti-nucleosomes IgG, anti-Histones IgG and anti-nRNP_Sm IgG) were associated with significantly higher disease activity (SLEDAI-2K), while Cluster 3 also showed strong links to mucocutaneous and renal involvement. Our findings demonstrate the utility of machine learning in identifying clinically relevant subtypes to support personalised disease management.

Keywords

Machine learning, autoantibody profile, systemic lupus erythematosus, cluster analysis

Introduction

Machine learning (ML) approach has enabled the identification of autoantibody-defined systemic lupus erythematosus (SLE) subgroups among the clinically diverse SLE patients based on their autoantibody profile. The identified subgroups were differed regarding their associations with clinical phenotypes and immunological parameters. These findings have been primarily reported in White Caucasian and East Asian populations, and to date, no data is available for Malaysian population, particularly the Malay ethnic group. Therefore, we applied ML techniques to subgroup Malay SLE patients using their autoantibody profiles and explored the associations between these subgroups and clinical manifestations.

Materials and Methods

A total of 239 Malay SLE patients who met the 2019 EULAR/ACR Classification Criteria were subjected to autoantibody profiling using immunoblotting and ELISA methods. Sociodemographic, lifestyle, and clinical data were collected using a standardised data collection form. Feature importance was assessed using a random forest classifier, and unsupervised cluster analysis was conducted to define

patient subgroups. Associations between clusters, disease activity (SLEDAI-2K), and clinical manifestations were examined.

Results and Discussion

Among the 239 SLE patients analysed, 94% were female, with a mean age of 40.84 (12.51) years and a mean disease duration of 11.34 (8.43) years. Feature importance analysis identified anti-Ro52 IgG, anti-SSA IgG, anti-nRNP_Sm IgG and anti-nucleosome IgG were the four most influential SLE-associated autoantibody with the Mean Decrease Accuracy values of 33.67, 30.40, 23.40 and 20.81, respectively. The cluster analysis successfully identified four distinctive clusters: Cluster 1 (41.4%) was characterised by anti-nRNP_SM IgG (55.6%); Cluster 2 (26.8%) by anti-SSA IgG (85.9%) and anti-Ro52 IgG (75.6%); Cluster 3 (12.1%) by anti-nucleosomes IgG (93.1%), anti-Histone IgG (93.1%), and anti-nRNP_Sm (86.2%) and Cluster 4 (19.7%) was autoantibody negative (Figure 1). Significantly higher disease activity, measured by SLE Disease Activity Index 2000 (SLEDAI-2K), was observed in Cluster 2 ($P_{adj} = 0.02$) and Cluster 3 ($P_{adj} < 0.001$) compared to Cluster 4, while Cluster 4 also showed higher SLEDAI-2K than Cluster 1 ($P_{adj} = 0.01$) (Figure 2). Furthermore, Cluster 3 was strongly associated with mucocutaneous manifestations (OR 10.8, 95% CI 2.8-56.3), and renal involvement (OR 8.30, 95% CI 1.1-171.0). No significant relationships were observed between the autoantibody-defined SLE subgroups and organ damage, age of onset or age of diagnosis.

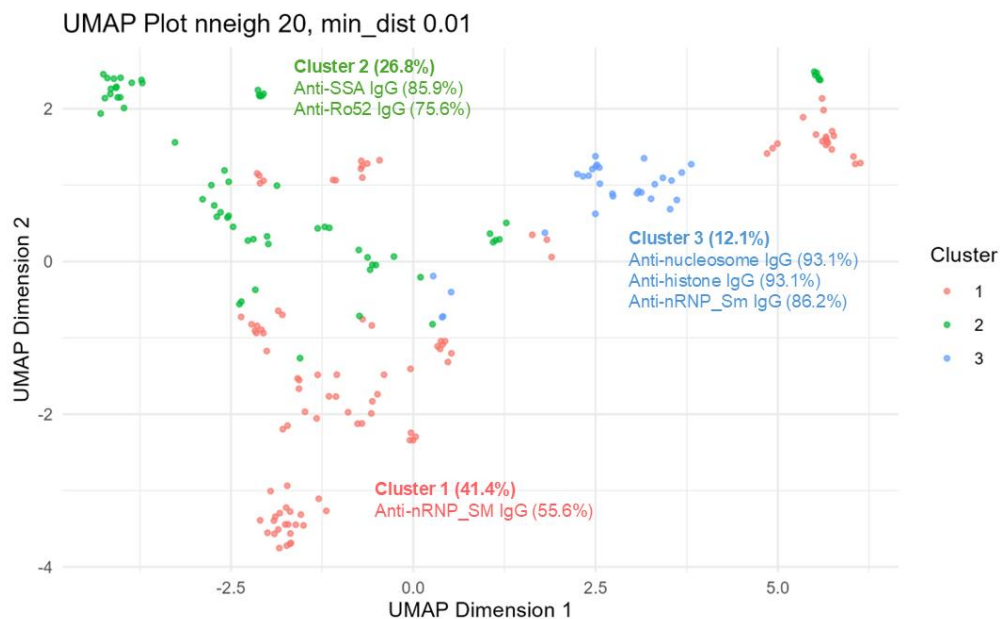


Figure 1: UMAP plot representing the subgroups of patients with systemic lupus erythematosus identified by an unsupervised analysis using 21 autoantibodies.

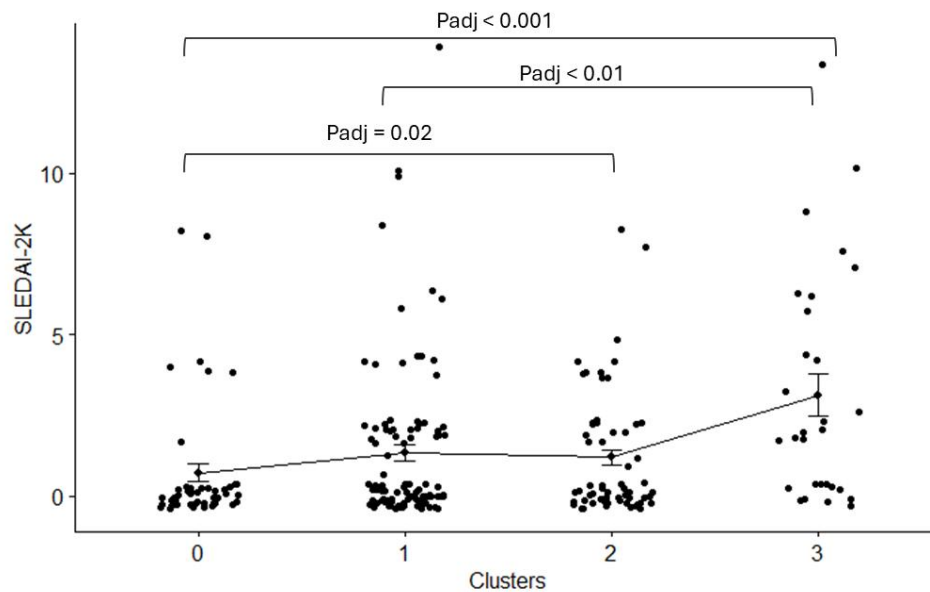


Figure 2: SLE disease activity, measured by SLEDAI-2K scores, was compared across four autoantibody-defined SLE clusters identified using a machine learning approach. Data are presented as individual values with mean $\pm$ standard error. Statistical analysis was performed using the Kruskal-Wallis test (overall $P < 0.01$), followed by post-hoc pairwise comparisons with adjusted P-values ($P_{adj} < 0.01$) indicating significantly higher disease activity in Clusters 2 and 3 compared to Cluster 0.

Conclusion

Autoantibody-based clustering revealed distinct clinical subgroups among SLE patients, with specific clusters associated with higher disease activity and organ involvement. These findings support the utility of machine learning approaches in uncovering clinically meaningful SLE subtypes, with potential implications for personalised patient management.

References

1. Choi MY, Chen I, Clarke AE, et al. Machine learning identifies clusters of longitudinal autoantibody profiles predictive of systemic lupus erythematosus disease outcomes. *Annals of the Rheumatic Diseases*. 2023;**82**(7):927-36.
2. Ding Y, Zhou Y, Zhan F, et al. Phenotypic subgroup in serologically active clinically quiescent systemic lupus erythematosus: A cluster analysis based on CSTAR cohort. *Med*. 2024;**5**(10):1266-74.e3.
3. DiCillo EB, Pisetsky DS, Svenungsson E, et al. Characterization of autoantibody profiles in clusters of systemic lupus erythematosus using a novel autoantigen discovery technology. *J Immunol*. 2025.
4. Diaz-Gallo LM, Oke V, Lundström E, et al. Four Systemic Lupus Erythematosus Subgroups, Defined by Autoantibodies Status, Differ Regarding HLA-DRB1 Genotype Associations and Immunological and Clinical Manifestations. *ACR Open Rheumatol*. 2022;**4**(1):27-39.

OESHOP09 / 276

Development and Validation of an Educational Model for Adult with Allergic Rhinitis

Chii-Chii Chew^{1,4}, Xin-Jie Lim², Pathma Letchumanan³, Maithrea Suresh Narayanan³, Philip Rajan^{2,3}, Chee Ping Chong⁴

¹ Clinical Research Centre, Hospital Raja Permaisuri Bainun, Institute for Clinical Research, National Institute of Health, Ministry of Health Malaysia, Ipoh, Perak, Malaysia.

² Clinical Research Centre, Hospital Raja Permaisuri Bainun, Ministry of Health, Level 4, Ambulatory Care Centre (ACC), Jalan Raja Ashman Shah, 30450 Ipoh, Perak, Malaysia.

³ Department of Otorhinolaryngology—Head and Neck Surgery, Hospital Raja Permaisuri Bainun, Ministry of Health, Ipoh, Perak, Malaysia.

⁴ Discipline of Clinical Pharmacy, School of Pharmaceutical Sciences, Universiti Sains Malaysia, 11800 Minden, Penang, Malaysia.

Corresponding author's email: chiichii.crcperak@gmail.com

Summary

Patient education is crucial in managing chronic diseases, including allergic rhinitis (AR), alongside pharmacotherapy. However, standardised patient education materials are lacking. Pharmacist-led educational interventions have proven effective in chronic disease management. This study developed a structured educational model for AR management in adults, which includes patient education and pharmaceutical care. Content was validated by experts using a Delphi survey, and the educational material (video) was tested for understandability and actionability among end-users. This model serves as a valid tool for healthcare providers, particularly pharmacists. It can act as a standardised guide for patient education and has potential for clinical integration.

Key word

Allergic rhinitis, patient education, educational model, educational material, Delphi Technique

Introduction

Allergic rhinitis (AR) affects 10-30% of adults globally. It negatively impacts academic and workplace performance, accounting for 5.2 billion USD in annual indirect healthcare costs¹. Patients trivialising the disease, self-medicating, and lacking understanding of its chronic nature contributing to disease burden. Effective self-management, supported by healthcare providers, is crucial in chronic disease management, with patient education playing a fundamental role. However, 22 to 70.1% of patients lack knowledge of AR management, one of the causes of pharmacotherapy non-adherence. Specifically, 36.9-67.3% of patients are non-adherent to intranasal corticosteroids². Inconsistent advice, delivery methods, and educational materials—particularly online—further confuse patients. Pharmacists play a key role in patient education, with proven benefits in AR symptom control and quality of life, yet their role remains underutilised.

To address this, we developed patient educational materials in two stages: 1) content development and validation, 2) material creation and evaluation the material for understanding.

Materials and methods

Stage 1

A total of 604 articles on allergic rhinitis, patient education, and clinical guidelines (2017-2022) were identified from five databases. Thirty-seven eligible articles were reviewed and used to develop a Delphi survey with two sections: (A) patient education (10 domains, 130 items) and (B) pharmaceutical care algorithm (15 domains, 43 items), rated on a 9-point Likert scale. "Consensus agreement" was defined as at least 70% of panellists rating an item between 7 and 9 (3). Additional strategies, including a relative interquartile range (VRIR) of <0.30 and a coefficient of variation (VCV) of $<40\%$ for internal agreement, were used to assess consensus and stability. Expert panels with ≥ 5 years of experiences in the field were invited to participate in the Delphi survey.

Stage 2

Patient educational material was developed using the Cognitive Theory of Multimedia Learning, featuring AI-generated audio-visual animations created with Canva Pro[®]. The material was tested on adult AR patients using the validated Patient Education Materials Assessment Tool for Audiovisual Materials (PEMAT-A/V) to assess understandability and actionability⁴. A sample size of 79 patients was calculated. A 70% threshold of was set for acceptability.

Results and discussion

Section A's domains identified were knowledge of the disease, symptoms, diagnosis, allergen avoidance strategies, nasal corticosteroids, antihistamines, decongestants, nasal douching, actions to be taken during symptom flare-ups, and consequences of non-adherence. Section B's domains included patient selection, symptom assessment, quality of life, goal setting, new and existing nasal spray users, alert signs, follow-up, discharge, algorithm, addressing concerns, medication adherence, stepwise treatment approach, and pharmacotherapy agents. In the first round of the Delphi survey, 43 panellists participated (comprising otorhinolaryngologists, family medicine specialists, medical doctors, and pharmacists), and 171 out of 173 items reached "consensus agreement" (75.4-100%). Items brought forward for the second round included those with consensus agreement of less than 70% or those suggested for improvement. In the second round, 32 of the original 43 panellists responded. Items were re-rated, and comparisons with Round one findings indicated consensus agreements were achieved (87.5-100%). Most items remained stable between rounds (VRIR: -0.11 to 0.36), and all items demonstrated acceptable internal consistency (VCV: -12.21 to 15.81). Inter-rater reliability was 0.608 in Round 1 and 0.970 in Round 2. In section A, two items under "allergen avoidance" did not achieve consensus in the first round (64%) due to unclear or impractical wording. After revision by clarifying "wearing goggles" as "Wearing wrap-around sunglasses when being outside". Some panellists commented "Ensuring the door and window are kept closed" was unrealistic in real life" and suggesting "closing windows during poor air quality". Consensus was reached in Round 2. Despite slight instability (VRIR: 0.36), a VCV of 15.81 indicated internal agreement, and the increased ratings (92.9%) reflected the items' perceived importance for inclusion. All items in Section B achieved consensus in Round one (87.1-100%). In Round two, improvements were made, such as expanding patient inclusion to all patients, with resource limitations considered.

The initial patient selection criteria to recruit only severe patients was based on the heavy outpatient workload, with 44.9 million prescriptions annually⁵. This change increased consensus agreement from 88.1% to 90.6%.

Stage 2

Considering the optimal educational video length of 6-9 minutes to maintain engagement, an eight-minute video was developed using validated content from Section A. Participants rated the material as understandable (81.8-100%) and fully actionable (100%).

Conclusion

The validated educational model provides structured patient education and pharmaceutical care for adults with AR. The educational material tested on end-users, and enables standardised information delivery by healthcare providers. Further research is needed to assess its effectiveness in improving symptom control and quality of life.

References

1. Dierick BJH, van der Molen T, Flokstra-de Blok BMJ, et al. Burden and socioeconomics of asthma, allergic rhinitis, atopic dermatitis and food allergy. *Expert Review of Pharmacoeconomics & Outcomes Research*. 2020;20(5):437-53.
2. Bender BG. Motivating patient adherence to allergic rhinitis treatments. *Curr Allergy Asthma Rep*. 2015;15(3):10.
3. Downar J, Hawryluck L. What should we say when discussing “code status” and life support with a patient? A Delphi analysis. *J Palliat Med*. 2010;13(2):185-95.
4. Shoemaker SJ, Wolf MS, Brach C. Development of the Patient Education Materials Assessment Tool (PEMAT): A new measure of understandability and actionability for print and audiovisual patient information. *Patient Educ Couns*. 2014;96(3):395-403.
5. Ministry of Health Malaysia. Pharmaceutical Services Programme Annual Report 2021. Petaling Jaya, Malaysia: Pharmaceutical Services Programme Annual; 2021. www.pharmacy.gov.my/v2/sites/default/files/document-upload/laporan-tahunan-program-perkhidmatan-farmasi-2021_0.pdf

OESHOP10 / 290

Spatio-temporal Analysis of Leptospirosis Hotspot Areas and its Association with Hydroclimatic Factors in Selangor (2011-2019) and Developing a Predictive Model

Muhammad Akram Ab Kadir ¹, Rosliza Abdul Manaf ¹, Siti Aisah Mokhtar ¹, Luthffi Idzhar Ismail ²

¹ Department of Community Health, Universiti Putra Malaysia, Serdang, Selangor, Malaysia

² Department of Electrical & Electronic Engineering, Universiti Putra Malaysia, Serdang, Selangor, Malaysia

Corresponding author's email: rosliza_abmanaf@upm.edu.my

Summary

Leptospirosis, a climate-sensitive zoonotic disease, has shown a rise in Selangor, highlighting the need for spatially informed surveillance. This study analysed leptospirosis hotspots (2011-2019) and their relationship with hydroclimatic factors using Geographic Information System (GIS), remote sensing, and machine learning. A total of 1,045 confirmed cases were mapped. Spatial analysis revealed mostly sporadic distribution, with clustering in 20 of 103 months, primarily in central Selangor. Three machine learning models—Support Vector Machine (SVM), Random Forest (RF), and Light Gradient Boosting Machine (LGBM)—were used to develop the leptospirosis hotspot area predictive model. LGBM achieved the highest predictive performance (ROC-AUC = 0.81), identifying river water level and rainfall as the strongest predictors.

Keywords

Leptospirosis, hotspot areas, hydroclimatic factors, Selangor, GIS, predictive model

Introduction:

Leptospirosis is an endemic disease in countries with tropical climates such as South America, Southern Asia, and Southeast Asia. There has been an increase in leptospirosis incidence in Malaysia from 1.45 to 25.94 cases per 100,000 population between 2005 and 2014. With increasing incidence in Selangor, Malaysia, and frequent climate change dynamics, a study on the disease hotspot areas and their association with the hydroclimatic factors would enhance disease surveillance and public health interventions¹. This study aims to examine the association between the spatio-temporal distribution of leptospirosis hotspot areas from 2011 to 2019 with the hydroclimatic factors in Selangor using the geographical information system (GIS) and remote sensing techniques, and develop a leptospirosis hotspot predictive model.

Materials and Methods

This ecological cross-sectional study utilised Geographic Information System (GIS) and remote sensing to analyse the spatial and temporal distribution of leptospirosis in Selangor from 2011 to 2019. Laboratory-confirmed human cases were obtained from the Selangor State Health Department and georeferenced based on geographic coordinates. Topographic data, including subdistrict boundaries and

river distribution, were obtained from the Department of Survey and Mapping Malaysia. Spatial analyses were performed using ArcGIS Pro, applying Moran's I for spatial autocorrelation and Getis-Ord Gi* for hotspot analysis². Monthly rainfall and land surface temperature data were retrieved from NASA's Giovanni EarthData portal and processed into monthly average values. River hydrometric data were obtained from the Department of Drainage and Irrigation. All datasets were integrated into thematic GIS layers for spatial analysis². Machine learning analysis was conducted using Python 3 software within the Jupyter Notebook platform (Anaconda Environment) to develop the leptospirosis hotspot predictive model of based on the hydroclimatic variables.

Table 1: Model performance

Model	LGBM	Random Forest	SVM
ROC-AUC	0.81	0.81	0.72
Cross-validation score	0.81	0.79	0.71
Test Score	0.81	0.81	0.72
Precision	0.35	0.31	0.20
Sensitivity	0.53	0.57	0.51
F1-score	0.42	0.40	0.29
Training time (minutes)	5.03	1.10	0.38

Results and Discussion

This study analysed 1,045 laboratory-confirmed leptospirosis cases in Selangor from 2011 to 2019. Spatial autocorrelation analysis using Moran's I revealed a predominantly random distribution, with clustering observed in only 20 of 103 months. Hotspot analysis using Getis-Ord Gi* indicated recurring high-risk areas in central Selangor. These findings suggest that leptospirosis outbreaks are largely sporadic and influenced by localised environmental or behavioural factors rather than uniform spatial patterns³. A weak but statistically significant negative correlation was observed between land surface temperature and leptospirosis hotspot areas ($r = -0.086$), while rainfall and river levels did not show linear associations. These results highlight the complexity of environmental interactions and suggest that traditional statistical methods may not sufficiently capture nonlinear relationships. To address this, three machine learning models—Support Vector Machine (SVM), Random Forest (RF), and Light Gradient Boosting Machine (LGBM) were utilised to develop the leptospirosis hotspot area predictive model. The LGBM outperformed the other models with the highest ROC-AUC (0.81) and F1-score (0.42), demonstrating superior balance between precision and recall (Table

1)⁴. Feature importance analysis identified river water level and rainfall as the most influential predictors of hotspot areas. These findings support the integration of GIS and machine learning for spatial disease modelling. The LGBM model's performance underscores its suitability for predicting leptospirosis hotspots, providing a promising approach for targeted public health interventions and enhancing disease surveillance in endemic regions⁵.

Conclusion

This study utilising GIS revealed a predominantly sporadic leptospirosis occurrences with limited spatial clustering in Selangor. Leveraging machine learning, specifically the LGBM algorithm, demonstrated capabilities for forecasting leptospirosis hotspot areas. Integrating GIS and machine learning provides a valuable approach to disease surveillance, enabling targeted public health interventions in high-risk areas.

References

1. Lau CL, Smythe LD, Craig SB, et al. Climate change, flooding, urbanisation and leptospirosis: fuelling the fire? *Trans R Soc Trop Med Hyg.* 2010;**104**(10):631-8.
2. ESRI. Hotspot analysis (Getis-Ord Gi*) (Spatial Statistics). ArcGIS Pro 3.2. 2021 Retrieved November 2023 from <https://pro.arcgis.com/en/pro-app/latest/tool-reference/spatial-statistics/h-how-hot-spot-analysis-getis-ord-gi-spatial-stati.htm>
3. Nozmi N, Samsudin S, Sukeri S, et al. Low Levels of Knowledge, Attitudes and Preventive Practices on Leptospirosis among a Rural Community in Hulu Langat District, Selangor, Malaysia. *Int J Environ Res Public Health.* 2018;**15**(4).
4. Abas MZ, Li K, Hairi NN, et al. Machine learning based predictive model of Type 2 diabetes complications using Malaysian National Diabetes Registry: A study protocol. *J Public Health Res.* 2024;**13**(1):22799036241231786.
5. Jagarlapoodi S. The F1 Score: A Comprehensive Measure of Classification Performance. 2023. Retrieved March 24, 2024, from <https://www.linkedin.com/pulse/f1-score-comprehensive-measure-classification-jagarlapoodi/>

OESHOP11 / 296

Enhancing Ergonomic Risk Prediction: Modifying The National Institute for Occupational Safety and Health (NIOSH) Lifting Equation with Individualised Data Inputs

Noor Adillah Dawad¹, Siti Munira Yasin¹, Azlan Darus², Ahmad Taufik Jamil¹, Nyi Nyi Naing³

¹ Department of Public Health Medicine, Faculty of Medicine, Universiti Teknologi MARA, Sungai Buloh Campus, Jalan Hospital, 47000 Sungai Buloh, Selangor, Malaysia

² Prevention, Medical and Rehabilitation Division, Social Security Organization, Kuala Lumpur, Malaysia

³ Department of Community Medicine, Faculty of Medicine, Universiti Sultan Zainal Abidin, Medical Campus, Jalan Sultan Mahmud, 20400 Kuala Terengganu, Terengganu, Malaysia

Corresponding author's email: smunira@uitm.edu.my

Summary

Personalised ergonomic risk assessment offers novel ways to improve risk prediction in occupational health. This study evaluates the predictive ability of a modified Revised National Institute for Occupational Safety and Health (NIOSH) Lifting Equation (RNLE), termed the Individual Lifting Equation (ILE), by incorporating age, gender, and body mass index (BMI). Based on observational data in manufacturing industry among Malaysian manual lifting workers, the study demonstrates enhanced predictive ability of the ILE over RNLE, particularly with the inclusion of age and BMI multipliers. The ILE holds significant promise as a data-driven decision making in ergonomics, supporting public health strategies.

Keywords

RNLE, NIOSH Lifting Equation, manual lifting, ergonomics risk assessment.

Introduction

Prediction modelling is essential for disease screening and prevention as it enhances decision-making through forecasts and risk assessments. In occupational health, the RNLE is widely used to assess the risk of low back pain (LBP) during manual lifting from various physical factors such as lifting distance, angle, frequency, and coupling. This equation uses a multiplicative model with a load constant and multipliers to calculate a Recommended Weight Limit (RWL). The Lifting Index (LI) is then determined by the ratio of the actual load weight to the RWL, with an LI greater than one suggesting a risk of LBP¹. However, the RNLE does not account for individual differences which can influence ergonomic risk. This study aimed to evaluate the ILE, a modified version of the RNLE that incorporates age, gender, and BMI. The ILE represents an innovation in ergonomic assessment, offering a more precise and individualised risk model.

Materials and Methods

This cross-sectional study involved manual lifting workers from manufacturing companies. An observational ergonomic risk assessment done using the RNLE, while sociodemographic information and LBP finding through the Malay-translated Nordic Musculoskeletal Questionnaire were collected. Data were analysed using Stata/SE

18. The analysis had two parts. First, binary logistic regression was used to identify predictors of LBP in the equation, which included RNLE core components and individual components (age, gender, and BMI), both factors and multipliers. The dependent variable was the 1-month prevalence of LBP. Second, LI risk estimates from the RNLE and seven ILE models were compared using simple logistic regression across five risk levels and various LI cut-points that categorise risk into higher and lower levels^{2,3}. Models with stronger odd ratios (ORs) than the RNLE were further evaluated to determine the ILE's accuracy using sensitivity, specificity, predictive values, and likelihood ratios. Diagnostic confidence was also calculated.

Results and Discussion

There were 165 participants across four companies, including automotive, chemical and pharmaceutical manufacturers. Load and vertical location during lifting were significant predictors in the ILE model. In the analysis of the seven ILE models and the RNLE, across five risk levels, ranging from very low to very high risk based on LI, only the high ($2.0 < LI \leq 3.0$) and very high ($LI > 3.0$), were consistently found to be significant predictors of LBP. While at LI cut-point of 2.0, all ILE models and RNLE significantly predicted LBP. Among LI cut-point of 2.0, Models 3 and 5 exhibited the highest ORs, followed by Model 2 and 4, all exceeding those of the core RNLE model as shown in Table 1. Models 4 and 5 which include more variables, were selected for further evaluation of the ILE's predictive ability. The models achieved accuracy with high sensitivity and specificity shown in Table 2. Model 5, which includes additional Age and BMI multipliers, is the proposed ILE model with a diagnostic confidence of 73.8%.

The predictive ability of the ILE was evaluated by comparing its LI risk estimates with those of the RNLE. The LI was stratified into two risk categories, to enable comparison with existing literature. A cut-point of 2.0 emerged as a significant predictor of LBP in both the RNLE and ILE models, aligning with previous findings that reported significant odd ratio for LBP at similar threshold⁴. These results underscore the robustness of the ILE, particularly at the 2.0 cut-point. Additionally, another study using a modified equation with an LI cut-point of 3.0 also reported a significant association with LBP, suggesting that higher thresholds may be applicable in certain contexts or populations⁵.

Table 1: Occupational Low Back Pain Risk Estimates by Simple Logistic Regression based on Lifting Index Cut-point of 2.0 in Individual Lifting Equation (n=165)

Model	P	Crude OR (95% CI)
RNLE	0.008 ^a	2.79 (1.30-5.97)
Model 1	0.008 ^a	2.79 (1.30-5.97)
Model 2	0.002 ^a	2.94 (1.49-5.80)
Model 3	0.005 ^a	2.96 (1.39-6.33)
Model 4	0.002 ^a	2.94 (1.49-5.80)
Model 5	0.005 ^a	2.96 (1.39-6.33)
Model 6	0.021 ^a	2.16 (1.12-4.15)
Full Model	0.021 ^a	2.16 (1.12-4.15)

^a: Statistically significant at $\alpha < 0.05$

RNLE: Core Model

Model 1: Core model with the additional Age

Model 2: Core model with additional Gender
Model 3: Core model with additional BMI
Model 4: Core model with additional Age and Gender
Model 5: Core model with additional Age and BMI
Model 6: Core model with additional Gender and BMI
Full model: Core model with additional Age, Gender and BMI

Table 2: Accuracy of Lifting Index in Individual Lifting Equation Models 4 and 5 Compared to the Revised NIOSH Lifting Equation

Model	Diagnostic Properties			RNLE		Total
				Lower LBP Risk ^a	Higher LBP Risk ^b	
Model 4	Sensitivity	1.00	Lower LBP Risk ^a	113	15	128
	Specificity	0.88	Higher LBP Risk ^b	0	37	37
	ROC area	0.94	Total	113	52	165
	LR (+)	8.53				
	LR (-)	0.00				
	PPV	0.71				
	NPV	1.00				
Model 5	Sensitivity	1.00	Lower LBP Risk ^a	127	1	128
	Specificity	0.90	Higher LBP Risk ^b	0	37	37
	ROC area	1.00	Total	127	38	165
	LR (+)	128.00				
	LR (-)	0.00				
	PPV	0.97				
	NPV	1.00				

Lower LBP Risk^a: ≤ 2.0 (Lifting Index Cut-point)

Higher LBP Risk^b: >2.0 (Lifting Index Cut-point)

ROC: Receiver Operating Characteristics

LR (+): Positive Likelihood Ratio

LR (-): Negative Likelihood Ratio

PPV: Positive Predictive Value

NPV: Negative Predictive Value

Conclusion

This study demonstrates that modifying the RNLE by incorporating the age and BMI multipliers into the ILE at a LI cut-point of 2.0 results in higher ORs with high accuracy and diagnostic confidence, suggesting a personalised enhancement of the RNLE.

References

1. Waters TR, Putz-Anderson V, Garg A. Applications manual for the revised NIOSH lifting equation. OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 94-110 (Revised 9/2021). 1994.
2. Fox RR, Lu ML, Occhipinti E, et al. Understanding outcome metrics of the revised NIOSH lifting equation. *Appl Ergon*. 2019;**81**:102897.
3. Sesek R, Gilkey D, Drinkaus P, et al. Evaluation and quantification of manual materials handling risk factors. *International Journal of Occupational Safety and Ergonomics*. 2003;**9**(3):271-87.

4. Lu M-L, Waters TR, Krieg E, et al. Efficacy of the revised NIOSH lifting equation to predict risk of low-back pain associated with manual lifting: a one-year prospective study. *Human factors*. 2014;**56**(1):73-85.
5. Barim MS, Sesek RF, Capanoglu MF, et al. Improving the risk assessment capability of the revised NIOSH lifting equation by incorporating personal characteristics. *Applied Ergonomics*. 2019;**74**:67-73.

OESHOP12 / 303

Validation of the Integrated Palliative Care Outcome Scale (IPOS) - Malay Version

Diana Katiman^{1,2}, Wen Jun Wong³, Hadhinah Ahmad Puaad³, Wen Yea Hwong³, Teoh Cy Oun⁴

¹ Faculty of Medicine, Sungai Buloh Campus, Universiti Teknologi MARA (UiTM), Selangor, Malaysia

² Palliative Care Unit, Hospital Al-Sultan Abdullah, Universiti Teknologi MARA (UiTM), Puncak Alam, Selangor, Malaysia

³ Centre for Clinical Epidemiology, Institute for Clinical Research, National Institutes of Health, Ministry of Health, Selangor, Malaysia

⁴ Department of Palliative Medicine, Hospital Selayang, Selangor, Malaysia

Corresponding author's email: wwjun@crc.moh.gov.my

Summary

The Integrated Palliative Care Outcome Scale (IPOS) is a brief, patient-reported outcome measures that evaluates palliative care concerns. This study aimed to evaluate the validity and reliability of the Malay-translated version of IPOS. IPOS was forward and backward translated from English into Malay. The validation took place in four hospitals with palliative care units by assessing its construct validity (confirmatory factor analysis, known group comparisons, convergent validity) and reliability (internal consistency, inter-rater agreement and test-retest reliability). The Malay-translated IPOS is a valid and reliable outcome measure for assessing symptoms and concerns of patients receiving palliative care.

Keywords

IPOS, palliative care, reliability, validity, Malay

Introduction

Palliative care focuses on enhancing the quality of life for patients with life-limiting illnesses and their families. Patient reported outcome measures (PROM) are tools used to assess patient outcomes from their perspective, playing a crucial role in identifying needs and improving the quality of care. The Integrated Palliative Care Outcome Scale (IPOS) is a brief, 17-item PROM used to assess palliative care concerns covering physical and psychological symptoms, social and spiritual concerns, practical concerns and information needs (1). IPOS was originally developed in English has been validated in several other languages and various settings including hospitals, nursing home and hospices. IPOS is available in two versions: a patient self-report and a staff proxy-rating version for measuring outcomes. This study aimed to evaluate the validity and reliability of the Malay-translated version of IPOS (IPOS-MAS) among patients referred to hospital palliative care services.

Materials and Methods

Patients aged 18 years and above admitted to palliative care units at four hospitals were recruited consecutively. Data were collected at two timepoints for both patients and staff responses - baseline and follow up at 3-7 days. Patients provided

responses to the IPOS-MAS patient version and the Malay version of World Health Organization Quality of Life Brief version (WHOQOL-BREF). Staff provided responses to IPOS-MAS staff version and Australia-modified Karnofsky Performance Status (AKPS). Total IPOS-MAS and subscale scores were summed with higher score reflecting greater severity of symptoms and unaddressed needs. Structural validity was assessed by confirmatory factor analysis (CFA), known group comparison by comparing patients with different performance status and convergent validity by correlating IPOS-MAS with WHOQOL-BREF. Reliability was assessed using internal consistency (Cronbach's alpha), inter-rater agreement between patient and staff responses and test-retest reliability of patient responses between two timepoints. All data were analysed using R version 4.2.2.

Results and Discussion

A total of 218 patients were recruited at baseline. Mean age was 56.0 years and 113 (51.8%) were female. Most patients (201, 91.2%) had a cancer diagnosis with moderately impaired functional status with a mean AKPS score of 56.5. The prevalence of symptoms was 14.7% (vomiting)–85.7% (family anxiety). A three-factor model (Physical Symptoms, Emotional Symptoms, and Communication/Practical Issues) was confirmed through post-hoc modification analysis, showing good fit indices (Confirmatory Fit Index of 0.939 and Tucker-Lewis Index of 0.928 with root mean square error of approximation of <0.08). Patients with lower AKPS scores had significantly higher total IPOS-MAS and physical subscale score compared to those with higher functional status (29.4 versus 24.4; 16.9 versus 13.0, $p < 0.001$). Weak to moderate convergent validity was observed for the hypothesised correlations between items from IPOS-MAS and WHOQOL-BREF (Table 2). Good internal consistency was observed for the total and physical subscale ($\alpha = 0.78$ – 0.80) while emotional, communication and practical issues subscale showed weaker consistency (Table 3). Test-retest reliability for the total IPOS-MAS score was moderate (ICC=0.70), whereas inter-rater reliability between patients and staff was low (ICC=0.24). The IPOS-MAS showed overall good measurement properties with good structural validity, internal consistency and acceptable test-retest reliability. The poor inter-rater agreement observed in this study is consistent with findings from a similar study conducted in Singapore (2) but is contrasting other international validation study (3). This may be attributed to responses being provided by ward doctors who may not have been the primary caregivers for the patients throughout their admission. Hence, this could lead to less familiarity with patients' experiences and needs. The overrepresentation of cancer patients limits the generalizability of findings for other non-cancer palliative populations. Future studies should assess the validity of IPOS-MAS in non-cancer palliative care populations to confirm its broader applicability.

Table 2. Correlations between IPOS single symptom items and WHOQOL-BREF items

	n	r	95% CI	p
Weakness or lack of energy/Enough energy	213	-0.384	-0.493, -0.263	<0.001
Anxiety or worry about illness or treatment/Negative feelings	215	-0.435	-0.538, -0.320	<0.001
Depression/Negative feelings	215	-0.552	-0.639, -0.452	<0.001
Information	213	-0.412	-0.518, -0.294	<0.001

Pain/Physical pain	216	-0.363	-0.474, -0.241	<0.001
Drowsiness/Sleep satisfaction	215	-0.212	-0.336, -0.080	0.002
Feeling at peace/Content with oneself	212	-0.220	-0.344, -0.088	0.001
Feeling at peace/Meaningful life	214	-0.119	-0.249, 0.015	0.082
Sharing feelings/Satisfied with supports from friends	211	0.003	-0.132, 0.138	0.961
Practical matters/Financially sufficient	215	-0.502	-0.596, -0.395	<0.001
Practical matters/Content with work capacity	172	-0.103	-0.249, 0.047	0.178

Table 3 Cronbach's alpha for patient responses at baseline, test-retest reliability and interrater agreement

	Number of items	Cronbach's alpha	Test-retest reliability (ICC)	Interrater agreement (ICC)
		N = 208	N = 64	N = 195
Total	17	0.78	0.70	0.24
Physical	10	0.80	0.64	0.32
Emotional	4	0.68	0.64	0.19
Communication and practical issues	3	0.44	0.53	0.10

ICC, intraclass correlation

Conclusion

IPOS-MAS is a valid and reliable outcome measures for palliative care patients. It demonstrates good structural validity, good internal consistency and effective known group comparisons. As most participants were cancer patients, further research is needed to confirm applicability in non-cancer palliative care settings. The poor inter-rater reliability between patient and staff responses highlights the need to explore ways to improve the administration of proxy measures.

References

1. Murtagh FE, Ramsenthaler C, Firth A, Groeneveld EI, Lovell N, Simon ST, Denzel J, Guo P, Bernhardt F, Schildmann E, van Oorschot B, Hodiament F, Streitwieser S, Higginson IJ, Bausewein C. A brief, patient- and proxy-reported outcome measure in advanced illness: Validity, reliability and responsiveness of the Integrated Palliative care Outcome Scale (IPOS). *Palliat Med.* 2019 Sep;33(8):1045-1057. doi: 10.1177/0269216319854264.
2. Long VJE, Cheung YB, Qu D, Lim K, Lee G, Yee ACP, Guo P, Harding R, Yang GM. Validity and reliability of the English and translated Chinese versions of the Integrated Palliative care Outcome Scale (IPOS) in Singapore. *BMC Palliat Care.* 2021 Mar 9;20(1):40. doi: 10.1186/s12904-021-00737-y.
3. Sterie AC, Borasio GD, Bernard M; French IPOS Consortium. Validation of the French Version of the Integrated Palliative Care Outcome Scale. *J Pain Symptom Manage.* 2019 Nov;58(5):886-890.e5. doi: 10.1016/j.jpainsymman.2019.07.012.

OESHOP13 / 306

Low Back Pain Among Medical Laboratory Technologists: Associating Factors and Ergonomic Risk Assessment

Imanul Hassan Abdul Shukor¹, Mohd Faiz Ibrahim¹, Siew Wei Fern², Kamal Haikal Mat Rabi³, Nurul Farehah Shahrir¹, Rohaida Ismail¹

¹ Environmental Health Research Centre, Institute for Medical Research, National Institutes of Health, Ministry of Health Malaysia

² School of Public Health, Faculty of Medicine, IMU University

³ Infectious Disease Research Centre, Institute for Medical Research, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: imanul@moh.gov.my

Summary

Ergonomic risk assessment (ERA) is essential in predicting the severity of ergonomic risk in medical laboratory workers. This study utilizes Rapid Upper Limb Assessment (RULA) as a tool in ERA among medical laboratory technologists (MLT) in a medical research institute. The findings of this study revealed laboratories with medium ergonomic risk level had significantly higher odds for low back pain among its workers compared to low-risk laboratory workers. Therefore, by assessing the ergonomic risks in their daily work tasks, loopholes in workplace design can be tackled by implementing corrective and preventive measures as a risk control strategy to improve working condition.

Keywords

Occupational health, musculoskeletal disorders, rapid upper limb assessment, medical laboratories, workplace safety.

Introduction

Low back pain (LBP) is one of the leading musculoskeletal conditions that contributed substantially to the overall burden of occupational diseases¹. Medical laboratory technologists (MLT) who exclusively work in a confined laboratory space throughout the day are notably at risk of musculoskeletal disorders (MSD) due to the physical nature of their work, including prolonged standing, awkward postures, pipetting, and continuous data entry. In addition, workplace furniture arrangement also contributed to the causation of MSD occurrence². In the absence of pro-active risk control measures, MSD particularly LBP may decrease worker's productivity due to sickness absenteeism, decreased work performance and poor quality of life³. While there are numerous studies focusing on LBP in laboratory workers worldwide, literature on LBP among medical laboratory workers in Malaysia is scarce. This study aims to investigate the associating factors of LBP and its ergonomic risk factors within the MLT population in a medical research institute.

Materials and Methods

This cross-sectional study was conducted among MLT in a research institute with two branches in Kuala Lumpur and Selangor. Participants were recruited through purposive sampling, with eligibility criteria a minimum of 1 year working experience without any congenital musculoskeletal abnormality. Socio-

demographic data such as age, gender, ethnic groups, and years of working experience were collected via self-administered questionnaire. Ergonomic risk assessments were conducted using Rapid Upper Limb Assessment (RULA). The LBP complaints within the past 12 months were collected using Nordic Musculoskeletal Questionnaire. Socio-demographic data and RULA risk levels were the independent variables, and the association with LBP were analysed using either Chi-Square or Fisher Exact Test for categorical data and using independent t-test for continuous data. Multiple logistic regression was used for the final model to determine the direction and strength of the association of the variables with low back pain. Statistical Package for Social Science (SPSS) version 29.0 was used for data analysis.

Results and Discussion

A total of ninety MLT were involved in this study with mean age of 35.12 (± 7.02) years. Majority of them were females (81.1%) and Malay ethnicity (66.7%). For bivariate analysis, marital status and location of the laboratory had significant association with LBP. The results of bivariate analysis are tabulated in Table 1.

Table 1: Chi-square and Fisher exact tests

Variable	Low back pain		p-value
	Yes	No	
Gender			
Male	2	15	0.221 ^a
Female	22	51	
Race			
Malay	18	42	0.312
Non-Malay	6	24	
Education			
Diploma	17	51	0.530
Bachelor's degree	7	15	
Marital status			
Single	4	27	0.044 ^a
Married/Widowed/Divorced	20	39	
Laboratory location			
Selangor	15	57	0.012
Kuala Lumpur	9	9	

^a Fisher exact tests were applied as expected count of one of the cells were less than 5.

Age, body mass index (BMI), and years of working experience did not show any significant relationship with LBP. Table 2 describes the results.

Table 2: Independent t-tests

Variable	Mean	Standard deviation	p-value
Age (years)			
Having LBP	24.79	6.10	0.789
No LBP	35.24	7.37	
BMI			
Having LBP	26.55	4.57	0.644
No LBP	25.96	5.51	
Working experience (years)			
Having LBP	8.71	6.28	0.679
No LBP	8.05	6.84	

Regression analysis showed higher odds of having LBP among MLT working in Kuala Lumpur laboratories (OR=3.45, 95% CI=1.13-10.48). However, for unmarried MLT, the result was not significant (OR=0.318, 95% CI=0.095-1.063). Table 3 describes the findings.

Table 3: Multiple logistic regression

Variable	Crude OR	95% CI	p-value	Adjusted OR	95% CI	p-value
Marital status						
Single	0.289	0.089 - 0.940	0.039	0.318	0.095 - 1.063	0.063
Married/Separated/Widowed	1.000	-	-	1.000	-	-
Laboratory location						
Kuala Lumpur	3.800	1.284 - 11.245	0.016	3.445	1.133 - 10.477	0.029
Selangor	1.000	-	-	1.000	-	-

These findings are consistent with the ergonomic risk assessment scores, with low-risk level in Selangor laboratories compared to medium-risk level in Kuala Lumpur laboratories. This underscores the importance of ERA in evaluating the adequacy of workplace design in accommodating the physical needs of the workers, as workplace environment affects worker's health and wellbeing ⁴.

Conclusion

Ergonomic risk assessment is essential in identifying ergonomic risks in medical laboratories. Implementation of appropriate risk control measures with prioritisation of work tasks associated with high ergonomic risk scores is vital in reducing the incidence of LBP among medical laboratory workers and in promoting a workplace that adheres to ergonomic best practices.

References

1. Driscoll T, Jacklyn G, Orchard J, Passmore E, Vos T, Freedman G, et al. The global burden of occupationally related low back pain: estimates from the Global Burden of Disease 2010 study. *Ann Rheum Dis*. 2014 Jun 1;**73**(6):975-81.
2. Bai Y, Kamarudin KM, Alli H. A systematic review of research on sitting and working furniture ergonomic from 2012 to 2022: Analysis of assessment approaches. *Heliyon*. 2024 Apr 15;**10**(7):e28384. Schnell, O., Crocker, J. B., & Weng, J. (2017).
3. Alfalogy E, Mahfouz S, Elmedany S, Hariri N, Fallatah S. Chronic Low Back Pain: Prevalence, Impact on Quality of Life, and Predictors of Future Disability. *Cureus*. **15**(9):e45760.
4. Forooraghi M, Miedema E, Ryd N, Wallbaum H. How Does Office Design Support Employees' Health? A Case Study on the Relationships among Employees' Perceptions of the Office Environment, Their Sense of Coherence and Office Design. *Int J Environ Res Public Health*. 2021 Dec 3;**18**(23):12779.

OESHOP14 / 322

Modifying Effects of Temperature on PM_{2.5}-Related Hospital Admissions in Klang Valley, Malaysia

Mohd Faiz Ibrahim ¹, Rohaida Ismail ¹, Nik Muhammad Nizam Nik Hassan ¹, Nor Zam Azihan Mohd Hassan ², Farhana Aminuddin ², Sarah Saizan ³, Fawzi Zaidan Ali ⁴, Halmy Sirat ⁵

¹ Environmental Health Research Centre, Institute for Medical Research, National Institutes of Health, Ministry of Health, Malaysia

² Centre of Health Economics Research, Institute for Health Systems Research, National Institutes of Health, Ministry of Health, Malaysia

³ Kuala Krai District Health Office, Kuala Krai, Kelantan, Malaysia

⁴ Medical Services Development Section, Medical Development Division, Ministry of Health, Malaysia

⁵ Air Division, Department of Environment, Malaysia

Corresponding author's email: drfaizibrahim@moh.gov.my

Summary

The interaction between air pollution and temperature on health outcomes remains poorly understood in tropical cities. This study analysed a time series of daily hospital admissions for cardiorespiratory diseases in Klang Valley, Malaysia, using distributed lag non-linear models (DLNM) over a 14-day lag period. High-temperature days were defined as days exceeding the 75th percentile of average daily temperature (29°C). Results showed that PM_{2.5} exposure significantly increased asthma admissions during normal-temperature days, with the highest cumulative relative risk observed at lag 14 (RR = 1.44, 95% CI: 1.15-1.79), but no significant effect during high-temperature periods. Behavioural adaptations and atmospheric changes during heat may explain the attenuation, emphasising the need for climate-responsive public health strategies.

Keywords

Air pollution, effect modification, heat, respiratory diseases, cardiovascular diseases

Introduction

Air pollution remains a major environmental determinant of health, particularly in rapidly urbanising regions. Fine particulate matter (PM_{2.5}) is strongly linked to increased hospital admissions for respiratory and cardiovascular diseases^{1,2}. However, the role of ambient temperature as a modifier of these health effects is less well understood in tropical settings. In Malaysia, seasonal variation in PM_{2.5} is compounded by episodic transboundary haze and variable climatic conditions, creating complex exposure scenarios³. Understanding how temperature influences the relationship between PM_{2.5} and health outcomes is critical for effective public health planning and climate adaptation. This study examines the modifying effects of temperature on the association between PM_{2.5} and hospital admissions for cardiorespiratory diseases in Klang Valley, a densely populated urban region.

Materials and Methods

A time-series analysis was conducted using daily hospital admissions from 2018 to 2023 in Klang Valley, Malaysia, covering asthma, COPD, lower respiratory infections (LRI), ischaemic heart disease (IHD), and stroke. Hospital admissions from seven major hospitals were linked to daily ambient PM_{2.5} concentrations and meteorological variables. PM_{2.5} exposure was modelled using distributed lag non-linear models (DLNM) with natural splines (4 degrees of freedom (df) for exposure-response; 2 df for lag over 14 days). The health effects were expressed as cumulative relative risks, representing the total effect of PM_{2.5} exposure from lag 0 to lag 14. Ambient temperature was categorised into normal- and high-temperature days, using 29°C (the 75th percentile) as the cut-off value. Generalised linear models with a quasi-Poisson distribution adjusted for long-term trends, seasonality, day of the week, public holidays, relative humidity, ozone, and the COVID-19 pandemic. Effect modification by temperature was assessed through interaction terms. All analyses were conducted in R Studio using the DLNM and splines packages.

Results and Discussion

Under normal-temperature conditions, positive cumulative associations were observed between PM_{2.5} exposure and hospital admissions for asthma, but not for other outcomes such as LRI, COPD, IHD, stroke, or overall cardiorespiratory diseases. Asthma admissions demonstrated a positive association, with the relative risk steadily increasing over the 14-day lag period (Figure 1). The highest cumulative relative risk for asthma was observed at lag 14 (RR = 1.44, 95% CI: 1.15-1.79). Although upward trends were noted for LRI and overall cardiorespiratory admissions, the wider confidence intervals indicated a lack of statistical significance. During high-temperature days, no significant positive associations were observed across all outcomes. The lack of positive PM_{2.5}-health associations during high-temperature days may reflect attenuation of risk due to behavioural adaptations or atmospheric changes. For asthma, the cumulative risk curve even suggested a potential protective association with PM_{2.5} exposure under hotter conditions (Figure 2). However, the absence of significant positive associations between PM_{2.5} and the outcomes during high-temperature periods does not imply that heat itself lacks health impacts. High temperatures may independently affect health outcomes through different physiological stress pathways or exposure patterns unrelated to PM_{2.5} levels. A study conducted in Poland reported that PM_{2.5} concentrations decreased slightly with rising temperatures and were more strongly influenced by relative humidity, particularly in areas with moderate air quality⁴. These findings highlight the complex, location-specific interactions between meteorology and air pollution, which may indirectly influence health outcomes. In contrast, a study from Peru found that PM_{2.5}-related cardiorespiratory mortality and emergency room visits were amplified during high-temperature days⁵. These divergent patterns underscore the importance of considering local environmental, behavioural, and healthcare factors when assessing climate-related health risks across different urban contexts.

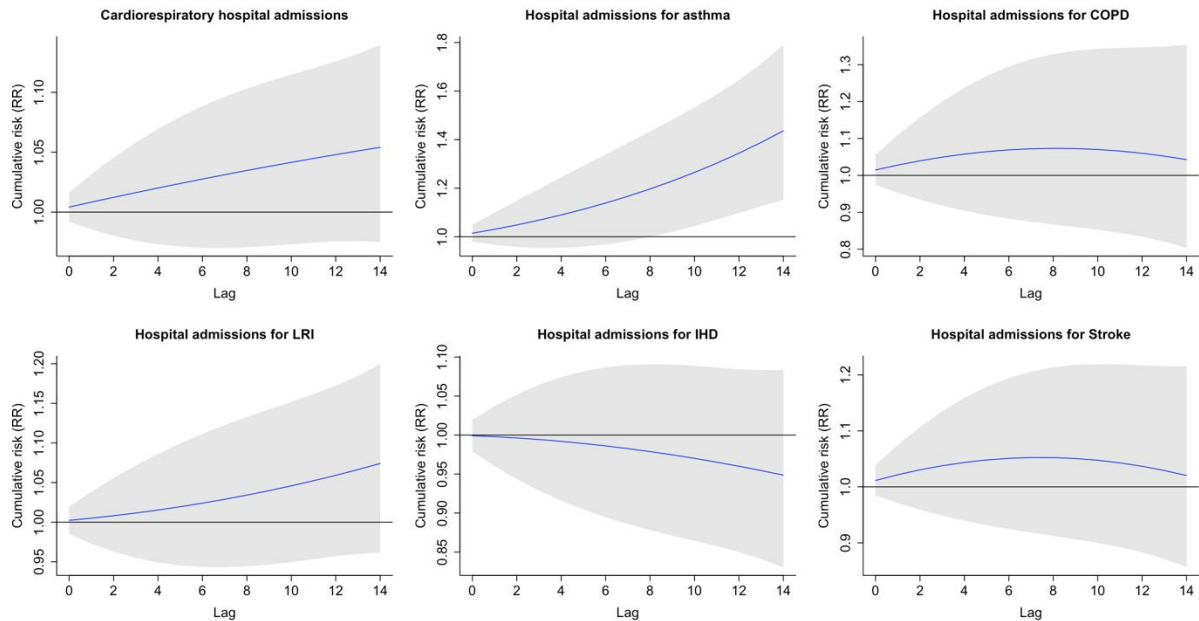


Figure 1: Cumulative relative risk of hospital admissions for cardiorespiratory diseases, asthma, COPD, LRI, IHD, and stroke associated with $PM_{2.5}$ exposure during normal-temperature days (below 75th percentile, $<29^{\circ}C$).

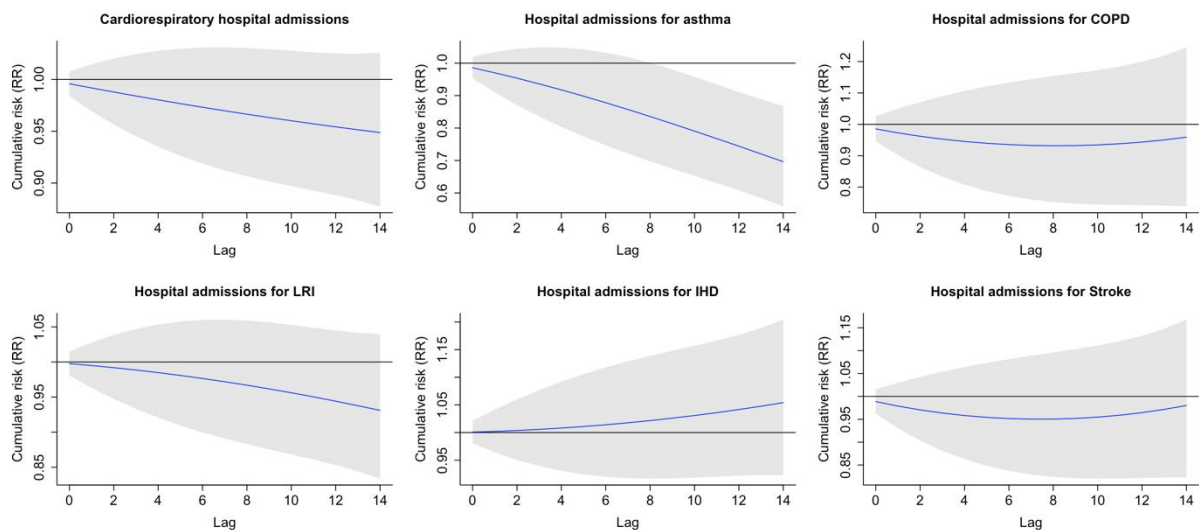


Figure 2. Cumulative relative risk of hospital admissions for cardiorespiratory diseases, asthma, COPD, LRI, IHD, and stroke associated with $PM_{2.5}$ exposure during high-temperature days (≥ 75 th percentile, $\geq 29^{\circ}C$).

Conclusion

This study demonstrates that ambient temperature modifies the association between $PM_{2.5}$ exposure and hospital admissions in Klang Valley, with stronger effects observed during normal-temperature days and attenuation during high-temperature periods. The findings highlight the need for integrated public health strategies that address both air pollution and heat-related health risks in tropical urban environments.

References

1. Ibrahim MF, Hod R, Mohammed Nawi A, Sahani M. Association between ambient air pollution and childhood respiratory diseases in low- and middle-income Asian countries: A systematic review. *Atmospheric Environment*. 2021;**256**:118422.
2. de Bont J, Jaganathan S, Dahlquist M, Persson A, Stafoggia M, Ljungman P. Ambient air pollution and cardiovascular diseases: an umbrella review of systematic reviews and meta-analyses. *Journal of Internal Medicine*. 2022;**291**(6):779-800.
3. Jaafar H, Azzeri A, Isahak M, Dahlui M. The impact of haze on healthcare utilizations for acute respiratory diseases: Evidence from Malaysia. *Frontiers in Ecology and Evolution*. 2021;**9**:764300.
4. Zender-Swiercz E, Musiolik-Pysz L, Czechowska-Kosacka A, Gromiec M. The effect of temperature and humidity of air on the concentration of particulate matter - PM_{2.5} and PM₁₀. *Atmospheric Environment*. 2024;**319**:120206.
5. Steenland K, Vu B, Scovronick N. Effect modification by maximum temperature of the association between PM_{2.5} and short-term cardiorespiratory mortality and emergency room visits in Lima, Peru (2010-2016). *Journal of Exposure Science and Environmental Epidemiology*. 2021;**31**(6):1006-1014.

OESHOP15 / 330

Translation and Validation of the Motivation Thought Frequency Scales for Alcohol (MTF-A) into an Indigenous Language (Jakun Version)

Rifhan Rasuli ¹, Aimi Nadira Mat Ruzlin ¹, and Mariam Mohamad ¹

¹Department of Public Health Medicine, Faculty of Medicine, Universiti Teknologi MARA (UiTM), Sungai Buloh Campus

Corresponding author's email: mariammd@uitm.edu.my

Summary

The Motivation Thought Frequency Scales for Alcohol (MTF-A) is a questionnaire designed to assess individuals' motivation to reduce or quit drinking. This study aimed to translate and validate the MTF-A into Indigenous Jakun language. After translation, the tool underwent face and construct validation using exploratory (EFA) and confirmatory (CFA) factor analyses, while reliability was assessed through internal consistency. A two-factor model demonstrated good construct validity, differing from the original three-factor model. Cronbach's alpha values showed strong internal consistency. The Jakun version of the MTF-A is a valid and reliable tool for assessing motivation among Jakun drinkers.

Keywords

Alcohol drinking, Indigenous peoples, Motivation, Translations, Validation study

Introduction

Alcohol consumption among Indigenous communities in Peninsular Malaysia has traditionally been associated with cultural practices and celebrations. However, modernisation and external cultural influences have introduced risks of alcohol abuse¹, which can adversely impact health and social well-being, potentially leading to health disparities. Assessing individuals' motivation to cut down or quit drinking is essential for effective intervention, which can be performed by employing the Motivation Thought Frequency Scales for Alcohol (MTF-A)². This study aimed to translate and validate the MTF-A from English into Indigenous Jakun language, maintaining its linguistic and cultural relevance in measuring motivation among Jakun drinkers.

Materials and Methods

A cross-sectional study was conducted in three Indigenous settlements in Rompin, Pahang, using universal sampling to recruit current drinkers aged ≥ 18 . Sociodemographic information was collected via self-report or interviews. The MTF-A, which consisted of three factors, underwent forward and backward translation, followed by validation (face and construct)³, and reliability evaluation. Construct validity was assessed through exploratory factor analysis (EFA) and confirmatory factor analysis (CFA), while reliability was measured by internal consistency. EFA examined data suitability with Kaiser-Meyer-Olkin (KMO) and Bartlett's Test of Sphericity. Items with high correlations (>0.80) were removed. Principal component analysis (PCA) and Varimax rotation were utilised, with factors retained according to, at this point, two-factor structure⁴. CFA assessed

model fit using Chi-Square statistics, Root Mean Square Residual (SRMR), Bentler's Comparative Fit Index (CFI), and Parsimonious Normed Fit Index (PNFI) to validate the final model⁵.

Results and Discussion

The face validation of the harmonised Jakun version of the MTF-A, involving 10 participants, showed perfect item-level face validity (I-FVI=1) for all 12 items. In the psychometric evaluation, 317 participants were recruited, predominantly male (82.0%), aged 18-29 (37.9%), married (71.0%), with primary education (51.4%), self-employed (64.7%), and low-income (99.7%). EFA with 108 respondents retained two factors (intensity and imagery) from the original three (Table 1). All three intensity items were retained, while four out of six imagery items were kept. The final 7-item factor solution showed good data suitability (KMO=0.878, Bartlett's test $p < 0.001$) and explained 84.32% of the variance. No cross-loadings occurred, and items remained in their respective factors. CFA with 209 respondents demonstrated an acceptable model fit (Chi-square/df=4.867, SRMR=0.0289, CFI=0.964, PNFI=0.546) (Figure 1). Cronbach's alpha values for each factor were 0.912 and 0.920 respectively, indicating strong internal consistency (Table 2).

Table 1: Rotated component matrix on the final two-factor solution (N = 108)

Item	Factor 1	Factor 2
Intensity		
Item 1: Feel you wanted to do it (cutting down or stopping drinking)? "Rasa nak kurokkan atau berenti bermaler?"		0.830
Item 2: Feel you needed to do it (cutting down or stopping drinking)? "Rasa mesti kurokkan atau berenti bermaler?"		0.876
Item 3: Have a strong urge to do it (cutting down or stopping drinking)? "Ada dorongan nak kurokkan atau berenti bermaler?"		0.733
Imagery		
Item 4: Imagine yourself doing it (cutting down or stopping drinking)? "Bayangkan diri aji kurokkan atau berenti bermaler?"	0.815	
Item 5: Imagine how you would do it (cutting down or stopping drinking)? "Bayangkan macam mana aji akan kurokkan atau berenti bermaler?"	0.775	
Item 6: Imagine how good it would be to do it (cutting down or stopping drinking)? "Bayangkan betapa baiknya kalau aji kurokkan atau berenti bermaler?"	0.842	
Item 9: Imagine how much worse you'd feel if you didn't do it (cutting down or stopping drinking)? "Bayangkan betapa terok perasaan aji kalau tak kurokkan atau berenti bermaler?"	0.855	

Table 2: Cronbach's alpha value for each subscale in the finalised MTF-A (Jakun version) (N= 209)

Subscale	Number of items	Cronbach's alpha	Corrected item-total correlation	Cronbach's alpha if item deleted
Intensity	3	0.912		
Item 1			0.821	0.875
Item 2			0.826	0.872
Item 3			0.823	0.873
Imagery	4	0.920		
Item 4			0.821	0.895
Item 5			0.854	0.884
Item 6			0.848	0.886
Item 9			0.760	0.918

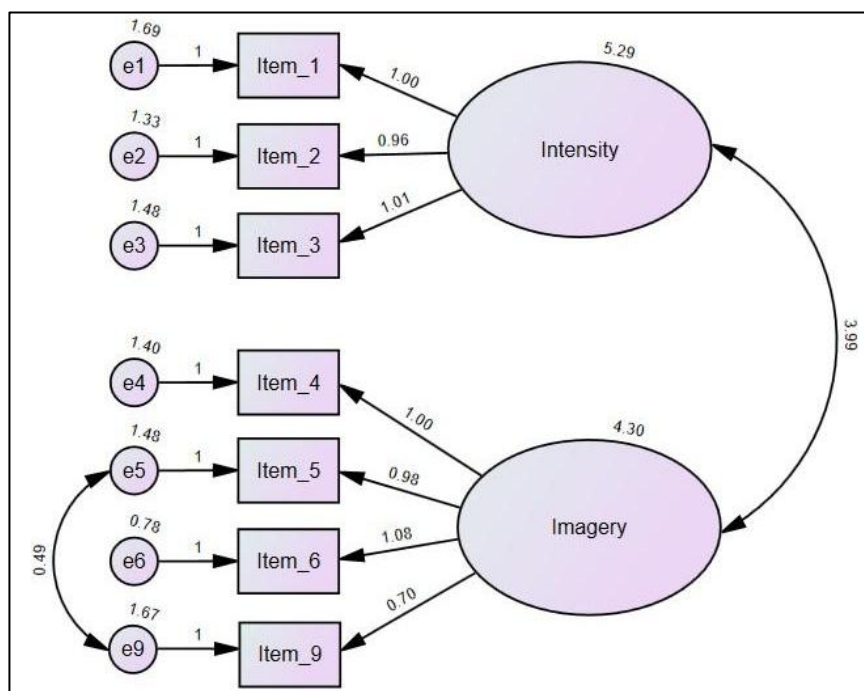


Figure 1: CFA of the MTF-A (Jakun Version): two-factor model (N = 209)

Conclusion

The Jakun version of the MTF-A has proven to be a valid and reliable tool for assessing motivation to reduce or quit drinking among Jakun drinkers. This can assist healthcare professionals in designing tailored interventions to effectively address alcohol consumption within this community.

Acknowledgment

The authors would like to thank Universiti Teknologi MARA for its support and guidance during the project proposal sessions. Sincere appreciation to the Department of Indigenous People Development (JAKOA) Malaysia, JAKOA Rompin, and local Indigenous community leaders for allowing the research to take place.

References

1. Parker J, Ashencaen Crabtree S, Crabtree Parker M, et al. 'Behaving like a Jakun!' A case study of conflict, 'othering' and indigenous knowledge in the Orang Asli of Tasik Chini. *J Sociol Dev* 2019; **3**(1):23-45.
2. Robinson N, Kavanagh D, Connor J, et al. Assessment of motivation to control alcohol use: the motivational thought frequency and state motivation scales for alcohol control. *Addict Behav* 2016; **59**:1-6.
3. Yusoff MSB. ABC of response process validation and face validity index calculation. *Educ Med J* 2019; **11**(10):21315.
4. Field A. *Discovering statistics using IBM SPSS statistics*. 3rd ed. London: Sage Publications Ltd; 2009.
5. Hooper D, Coughlan J, Mullen M. Structural equation modeling: guidelines for determining model fit. *Electron J Bus Res Methods* 2007; **6**:53-60.

OESHOP16 / 338

Exploring Barriers in Anticipatory Guidance Practices on Oral Health for Toddlers Among Dental Therapists

Susan Shalani A/P Gnanapragasam¹, Aznilawati Binti Abdul Aziz², Wan Nadzirah Binti W Pauzi¹, Nurul Adila Binti Mat Dait¹, Farhani Md Azizan³

¹ Oral Health Division, Terengganu State Health Department, Level 1, Federal Building, Jalan Sultan Ismail, 20920 Kuala Terengganu, Terengganu

² Oral Health Programme, Ministry of Health Malaysia, Level 5, Block E10, Parcel E, Precinct 1, Federal Government Administrative Centre, 62590 Wilayah Persekutuan Putrajaya, Malaysia

³ Kampung Raja Dental Clinic, 22200 Besut, Terengganu

Corresponding author's email: susanshalani@moh.gov.my

Summary

Early Childhood Caries (ECC) remains highly prevalent among Malaysian pre-schoolers, especially in Terengganu. Anticipatory Guidance (AG), a preventive strategy by dental therapists (DT), educates parents/caregivers on oral health of toddlers but faces delivery challenges. This qualitative study explored barriers in AG practices on oral health for toddlers from DT perspectives through focus group discussions with 40 DTs from government primary dental clinics of Kuala Terengganu and Besut districts. Identified barriers included misconceptions about AG, environmental constraints, workforce issues, limited training, and parental/caregiver related issues. Findings highlight the need to strengthen AG practices in public oral healthcare services.

Keywords

Anticipatory guidance, early childhood caries, dental therapists, toddlers, oral health

Introduction

Early childhood caries (ECC) affects 48.0% of pre-schoolers globally and is associated with pain and orofacial infections¹. In Malaysia, ECC prevalence among 5-year-olds is 71.3%, with higher rates in Terengganu². AG, a developmentally appropriate approach that educates parents/caregivers on child oral health, is proven to prevent caries by addressing key risk and protective factors early. According to Shetty, Acharya and Higgins³, AG spans five developmental stages and covers six core areas: oral development, fluoride adequacy, oral hygiene, diet and nutrition, behavioural guidance, and injury prevention. Each stage is tailored to the child's age-specific needs. In 2023, surveillance data from Terengganu indicated that nearly all parents of toddlers received AG from dental therapists (DT). However, despite almost two decades of implementation, little is known about the challenges in delivering AG effectively. This study aims to explore barriers in AG practices on oral health for toddlers from DT perspectives.

Materials and Methods

A phenomenological qualitative study was conducted involving DT from government primary dental clinics in Kuala Terengganu and Besut in Terengganu. Purposive sampling was used to recruit DTs and focus group discussions (FGD) were conducted until data saturation was achieved. A semi-structured FGD guide was used to identify barriers to AG practices, while sociodemographic data were gathered through a separate questionnaire. The guide underwent content validation by two Dental Public Health Specialists, and two pilot FGD was conducted in Kuala Nerus for face validation. All FGDs were audio-recorded, transcribed verbatim, and translated from Malay to English. Thematic analysis was performed, with investigator triangulation, data triangulation and member checking employed to enhance validity. All transcripts were coded and analysed using ATLAS.ti version 23. Ethical approval was obtained from the Medical Research Ethics Committee, Ministry of Health Malaysia (NMRR ID-: 24-01455-LYW (IIR)) to conduct this research.

Results and Discussion

A total of 40 female DT participated in eight FGD conducted in Besut and Kuala Terengganu. Almost all (97.5%) participants were Malay, and only 25.0% had attended AG-related workshops after graduation. Five themes and relevant subthemes were identified from thematic analysis. The five themes were misconceptions about AG, environmental constraints, workforce challenges, limited knowledge and training in AG, and parental/caregiver-related issues. The themes, subthemes and quotes are summarized in Table 1.

Table 1: Themes, Subthemes, and Quotes of Barriers in AG practises

Theme	Subthemes	Quotes
Misconceptions about AG	1. Limited understanding of developmental milestones	“We need to ensure a follow-up every 6 months for toddlers.” (FGD 5, Puan DD)
	2. Simplification of AG as oral health education	“Most advice is just about brushing daily.” (FGD 2, Puan F)
Environmental Constraints	1. Inadequate space for AG delivery	“Some clinics have no proper space for AG, making it hard for us to carry out sessions effectively.” (FGD 3, Puan N)
	2. Unfavourable conditions in facilities	“The waiting area is often too noisy, making it hard for parents to concentrate on AG sessions.” (FGD 5, Puan BB)
Workforce Challenges	1. Insufficient manpower & heavy workload	“We are overwhelmed with treatment cards, numerous updates, and record-keeping.” (FGD 6, Puan II)
	2. Time constraints	“Following a schedule is challenging due to time constraints.” (FGD 6, Puan HH)

Theme	Subthemes	Quotes
Limited Knowledge and Training in AG	1. Lack of AG training courses 2. Limited exposure in dental therapist training	"There's never been an AG course." (FGD 1, Puan B) "During training school, the emphasis was more on clinical skills, so we had limited exposure to AG." (FGD 4, Puan Q)
Parental/ caregiver related issues	1. Limited availability due to work 2. Poor parental socioeconomic status 3. Lack of interest and commitment 4. Non-compliance with appointments 5. Time constraints hindering participation	"It's often challenging for working parents to attend, many of them struggle to find the time." (FGD 3, Puan M) "Involving villagers is difficult as many are poor fishermen or work for daily wages." (FGD 1, Puan B) "It's sad. Some parents like the idea of brushing but don't monitor their child." (FGD 2, Puan H) "We set specific dates and times for AG, but they still don't come." (FGD 7, Puan MM) "AG sessions are usually done in 4-5 minutes at KKIA because patients want it quick." (FGD 6, Puan FF)

This study supports previous findings that limited training reduces provider confidence and traditional tools limit effectiveness of AG delivery, while also identifying novel barriers such as misconceptions about AG, environmental constraints, workforce challenges and parental/caregiver-related issues^{4, 5}. These factors, particularly in rural and urban settings, significantly affect AG delivery for toddlers. Notably, this is the first study conducted in Malaysia to explore these barriers from the perspective of DT, offering valuable insights into local settings.

Conclusion

Addressing these barriers requires a comprehensive approach, focusing on DT professional development and the broader operational and societal contexts. This can enhance the delivery of AG among DT, ultimately improving early childhood oral health and long-term health outcomes.

References

1. Uribe SE, Innes N, Maldupa I. The global prevalence of early childhood caries: a systematic review with meta-analysis using the WHO diagnostic criteria. *Int J Paediatr Dent* 2021; **31**(6):817-30.
2. Ministry of Health Malaysia. *National Oral Health Survey of Preschool Children*. Putrajaya: Oral Health Programme, Ministry of Health Malaysia; 2015.
3. Shetty KV, Acharya BS, Higgins M. Anticipatory guidance in paediatric oral health. *Internet J Pediatr Neonatol* 2005; **6**.
4. Rothe V, Kebriaei A, Pitner S, et al. Effectiveness of a presentation on infant oral health care for parents. *Int J Paediatr Dent* 2010; **20**(1):37-42.

5. Hussein AS, Schroth RJ, Abu-Hassan MI. General dental practitioners' views on early childhood caries and timing of the first dental visit in Selangor, Malaysia. *Asia Pac J Public Health* 2015; **27**(2):2326-38.

OESHOP17 / 359

Understanding Service Uptake and Eye Health Inequities in Machang's B40 Community

Noor Halilah Buari¹, Nur Izzah Afifah Shahrir^{1,2}, Nur Suhailah Alias¹, Sabrina Subri¹

¹ Centre for Optometry Studies, Faculty of Health Science, Universiti Teknologi MARA Selangor, Puncak Alam Campus, 42300 Bandar Puncak Alam, Selangor, Malaysia.

² Rosmadi Optometrist, Pt 592, Jalan Che Yem, 16800, Pasir Puteh, Kelantan

Corresponding author's email: noorhalilah@uitm.edu.my

Summary

This study elucidates eye care awareness, utilisation, and challenges among rural B40 residents in Machang, Kelantan. Among 128 respondents, only 26.6% were aware of eye health issues, despite 73.5% reporting ocular conditions. Annual eye care visits were low (15.6%), with most seeking care from optical shops. Key challenges included time constraints, financial issues, distance, and cultural beliefs. The study highlights the underutilisation of eye care services and the need for targeted interventions to address accessibility and awareness gaps. Findings provide insight for policymakers to develop inclusive strategies that improve eye health equity and break the cycle of preventable vision loss.

Keywords

Eye care utilisation, rural, health, low-income, barriers to healthcare, B40

Introduction

In Malaysia, the B40 income group—households earning below RM5,249 monthly—faces disproportionate challenges in accessing healthcare, especially in rural areas. Rural regions may lack adequate health infrastructure and awareness campaigns, further exacerbating health inequalities. These limitations, combined with low health literacy and financial hardship, contribute to underutilising essential services like eye care¹. Untreated visual impairment affects education, employment, and quality of life, perpetuating the poverty cycle². However, data on eye care utilisation and specific barriers among low-income rural populations in Malaysia remain scarce. Understanding eye care utilisation patterns and challenges is key to designing effective, inclusive eye health programs. Therefore, this study explores awareness, utilisation rate, and challenges to eye care service uptake among rural B40 residents in Machang, Kelantan.

Materials and Methods

This community-based cross-sectional study was conducted in Mukim Pangkal Berangan, Machang District, Kelantan, among adults aged 18 years and above. A self-administered online survey (Google Forms) was distributed to B40 residents who had resided in rural areas for at least one year. The 32-item survey was divided into six sections presented in Bahasa Melayu and covered demographics, socioeconomic status, general and ocular health history, eye care utilisation, and challenges to access. Quantitative data were analysed using descriptive statistics.

Results and Discussion

A total of 128 respondents completed the survey, with a gender distribution of 35.2% males (n=45) and 64.8% females (n=83). Participants were aged between 18 and 70 years, representing the economically active segment of the population. The sociodemographic is tabulated in Table 1. The awareness level regarding eye health among low-income residents was low (26.6%), despite 73.5% reporting ocular disorders such as refractive error, cataracts, or glaucoma (Table 2). Awareness increased slightly with age but remained low overall; however, females (17.2%) were remarkably more aware than males (9.4%). These findings are consistent with previous studies where education levels were contributing factors³. Older adults, with age as a significant risk factor, tend to have greater awareness of eye diseases and are more likely to seek care and education from healthcare providers⁴.

Table 1: Sociodemographic Profile of Respondents

Variables		Frequency (n=128)
Age group	18-34 years old	15 (11.7%)
	35-54 years old	53 (41.4%)
	55-70 years old	60 (46.9%)
Gender	Male	45 (35.2%)
	Female	83 (64.8%)
Ethnic	Malay	128 (100%)
Marital status	Married	112 (87.5%)
	Divorced/Widowed	16 (12.5%)
Educational status	Secondary School	103 (80.5%)
	High Education	25 (19.5%)
Income group	B1 & B2	103 (80.5%)
	B3 & B4	25 (19.5%)
Received financial aid	Yes	59 (46.1%)
	No	69 (53.9%)
Own transportation	Yes	126 (98.4%)
	No	2 (1.6%)
Having insurance	Yes	19 (14.8%)
	No	109 (85.2%)
Having at least one systemic disease	Yes	64 (50.0%)
	No	64 (50.0%)

Table 2: Awareness of ocular health

Variables	Level of Awareness		
	Not Aware, n (%)	Aware, n (%)	Total, n (%)
Overall awareness	94 (73.4)	34 (26.6)	128 (100.0)
Age			
18-34 years old	11 (73.3)	4 (26.7)	15 (100.0)
35-54 years old	38 (71.7)	15 (28.3)	53 (100.0)
55-70 years old	45 (75.0)	15 (25.0)	60 (100.0)
Gender			
Male	33 (73.3)	12 (26.7)	45 (100.0)
Female	61 (73.5)	22 (26.5)	83 (100.0)

As illustrated in Figure 1, annual eye care utilisation was reported by merely 15.6% of the rural residents, suggesting underuse of preventive eye care services. Most sought services from optical shops (43.5%) and optometry clinics (39.5%), with minimal interaction with government-based hospitals or private eye specialists. This trend reflects limited awareness of the importance of comprehensive eye health checks and a tendency toward episodic, symptom-driven health-seeking behaviour rather than regular preventive care, indicating a critical need to strengthen eye health education and promote routine eye examinations in rural communities.

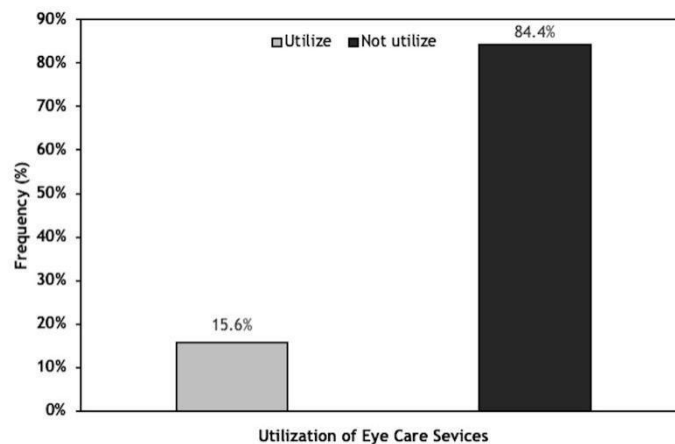


Figure 1: Utilisation rate of eye care services among low-income rural residents in Machang

The primary challenges to seeking eye care included time constraints (34.7%), financial limitations (26.2%), distance to service providers (11.5%) and cultural beliefs (11.5%). These findings align with existing literature highlighting time, cost, and geographical accessibility as persistent deterrents for healthcare engagement in rural settings^{1,5}. The predominance of optical shops as the preferred point of service may reflect a combination of accessibility and perceived affordability but raises concerns about the comprehensiveness of care received. The outcome underscores the role of proximity and convenience in shaping health-seeking behaviours. At the same time, cultural attitudes, limited health literacy, and livelihood demands likely further deprioritise routine eye care in this population.

Conclusion

The study revealed low eye health awareness and utilisation among low-income rural residents in Machang, Kelantan, with time, cost, and distance being significant challenges. These findings underscore the urgency of targeted health promotion and service delivery interventions to enhance equitable access to eye care for underserved rural populations in Malaysia. Addressing these challenges requires a multi-pronged approach with targeted strategies to increase eye care utilisation. Such efforts are crucial for improving service uptake and fostering long-term behavioural change among rural low-income populations.

Acknowledgement

The Malaysian Ministry of Higher Education funds this study through the Fundamental Research Grant Scheme (FRGS/1/2023/SKK04/UITM/02/2).

References

1. Ezinne NE, Ekemiri KK, Chukwuma I, et al. Utilisation of eye care services in an underserved community in Enugu State, Nigeria. *Niger J Clin Pract* 2023; **26**(1):81-9.
2. Jaggernath J, Øverland L, Ramson P, et al. Poverty and eye health. *Health (NY)* 2014; **6**(14):1-12.
3. Dinesh Eshwar M, Jabeen A, Jalily QA, Begum GS. Knowledge, awareness, and perception of common eye diseases and eye donation among people seeking healthcare in a tertiary hospital in Telangana, South India. *Cureus* 2022; **14**(11):e31412.
4. Voleti VB, Hubschman JP. Age-related eye disease. *Maturitas* 2013; **75**(1):29-33.
5. Assaye AK, Tegegn MT, Belete GT. Eye care utilisation among older subjects with visual impairment in Northwest Ethiopia. *J Ophthalmic Vis Res* 2023; **18**(3):306-17.

OESHOP18 / 419

Vision impairment among Urban School Children: Socioeconomic Barriers to Eye Health in Kuala Lumpur

Naufal Nordin ¹, Mohd Helmi Abu Yahya ², Noor Haziq Saliman ³

¹ Centre for Community Health Studies (ReaCH), Faculty of Health Sciences, Universiti Kebangsaan Malaysia Jalan Raja Muda Abdul Aziz, Kuala Lumpur 50300, Malaysia

² Office of the Prime Minister (Department of Federal Territories), Federal Government Administration Center, 62590 Putrajaya, Malaysia

³ Centre for Optometry Studies, Faculty of Health Sciences, Universiti Teknologi MARA Cawangan Selangor, Bandar Puncak Alam Selangor, Malaysia

Corresponding author's email: haziqsaliman@uitm.edu.my

Summary

This study aimed to explore the relationship between socioeconomic status (SES) and two key public health concerns: self-reported visual clarity and barriers to obtaining vision correction. There were 1,966 school children from five different primary schools in Kuala Lumpur participating in this study. The results revealed that children from lower SES backgrounds (B40) were more likely to report unclear vision and cited financial constraints or lack of parental awareness as key reasons for not acquiring any corrective lenses. These findings reflect underlying disparities in vision care access within the urban population in Kuala Lumpur, Malaysia.

Keywords

Socioeconomic status, visual clarity, vision screening, children, urban

Introduction

Clear vision is crucial for a child's academic performance, development, and quality of life. Socioeconomic factors (SES) can affect the access to eye care, leading to undetected or untreated visual problems¹. In Malaysia, where the socioeconomic population is segmented into three groups; 40% lower income (B40), 40% middle income (M40), and 20% top income (T20), children from B40 households may face more barriers to vision correction². Vision problems such as uncorrected refractive error is among the leading causes of visual impairment in children³. Early detection through school-based programs has been recommended by previous study as an effective public health intervention⁴. While existing studies highlight the prevalence of refractive error, limited attention has been given to children's self-perceived vision clarity and the practical barriers. This study hence aims to address the gap by examining SES-based differences in visual clarity and the reasons for not acquiring corrective lenses among urban school children.

Materials and Methods

A cross-sectional study was conducted from July to November 2024 involving 1,966 students aged 7 to 9 from five public schools in Kuala Lumpur. Socioeconomic groups of the participants, either B40 or non-B40 (M40 and T20) were categorised based on the national household income thresholds. A structured survey was administered to assess the self-reported visual clarity and reasons for not acquiring

corrective lenses. Habitual visual acuity was measured monocularly at 3 meters using an electronic vision chart. A pass/fail threshold was set at 6/12 or worse (VA $\leq$ 0.5). All responses were analysed using SPSS v29. The associations between SES and categorical variables were examined using the Chi-square test. The study received an ethical approval from the Ministry of Federal Territories Malaysia.

Results and Discussion

Among all participants, 76.8% reported having clear vision, while 6.4% reported uncertain and 16.8% reported unclear vision. Table 1 shows a significantly higher proportion of B40 children reported unclear vision (20.2%) compared to their non-B40 peers (13.3%) and there is a significant association between socioeconomic status and clarity of vision ($\chi^2 = 22.870$, $p < 0.001$). When the participants were asked the reasons for not acquiring any corrective lenses, 5.1% of the B40 children cited financial constraints, while only 1.7% of non-B40 children reported the same reason. Lack of parental awareness was also more common among the B40 group compared to non-B40 groups (11.7% vs. 9.8%). Notably, 82.4% of B40 participants responded “Not relevant” indicating they did not perceive the need of wearing corrective lenses or were not aware of any vision issue (Table 2). This suggests that under-detection or low awareness in this group is apparent. In addition to self-reported clarity, objective screening revealed that 702 children (35.7%) failed the habitual visual acuity test. The mean habitual VA in the right eye was lower in B40 children (mean = 0.67 ± 0.26) compared to non-B40 children (mean = 0.71 ± 0.26 , $p < 0.001$). A similar pattern was observed in the left eye (B40 = 0.69 ± 0.26 vs. non-B40 = 0.72 ± 0.256 , $p = 0.002$) (Table 3). These disparities suggest that economic limitations and informational barriers remain as substantial challenges to achieving equitable vision health among school children. From a public health perspective, early vision screening and parental education programs towards lower-income urban populations could significantly reduce avoidable vision-related disadvantages.

Table 1: Self-reported Clarity of Vision by socioeconomic Group

Socioeconomic Group	Clear Vision	Unclear/Uncertain Vision	Not Clear	Total
B40	749 (75.0%)	202 (4.8%)	48 (20.2%)	999
Non-B40	761 (78.8%)	128 (8.0%)	77 (13.3%)	966
Total	1510 (76.8%)	125 (6.4%)	330 (16.8%)	1965

Table 2: Barriers to Obtaining Vision Correction by Socioeconomic Group

Socioeconomic Group	Not Relevant	Financial Constraints	Lack of Awareness	Others	Total
B40	823 (82.4%)	51 (5.1%)	117 (11.7%)	8	999
Non-B40	854 (88.3%)	16 (1.7%)	95 (9.8%)	2	967
Total	1677 (85.3%)	67 (3.4%)	212 (10.8%)	10	1966

Table 3: Habitual Visual Acuity and Screening Outcomes by Socioeconomic Group

Socioeconomic Group	Mean Right VA ($\pm$ SD)	Mean Left VA ($\pm$ SD)	Pass vision screening	Fail vision screening	Total
B40	0.67 $\pm$ 0.26	0.69 $\pm$ 0.26	612	387	999
Non-B40	0.71 $\pm$ 0.26	0.72 $\pm$ 0.26	652	315	967
Total	-	-	1264	702	1966

Conclusion

Children from lower socioeconomic backgrounds living in the urban area are more likely to report unclear vision and face greater barriers to obtaining corrective lenses. Public health strategies should address both affordability and awareness in tackling visual health inequality, with the aim to reduce the prevalence of visual impairment in children.

Acknowledgments

This study was supported by the National Community Foundation under the Ministry of Federal Territories Malaysia.

References

1. Holden BA, Fricke TR, Wilson DA, Jong M, Naidoo KS, Sankaridurg P, et al. Global prevalence of myopia and high myopia and temporal trends from 2000 through 2050. *Ophthalmology*. 2016;123(5):1036-42.
2. Bakar NSA, Manual A, Ab Hamid J. Socioeconomic status affecting inequity of healthcare utilisation in Malaysia. *Malays J Med Sci*. 2019;26(4):79-88.
3. Koay CL, Goh PP, Razak IA, Ismail S, Tan AK, Chew FL, et al. Avoidable causes of childhood blindness in Malaysia. *Int Ophthalmol*. 2015;35(2):201-7.
4. Adhishesha Reddy P, Bassett K. Visual acuity screening in schools: a systematic review of alternate screening methods. *Cogent Med*. 2017;4(1):1371103

OESHOP19 / 429

Awareness and Knowledge of Childhood Eye Problems among Special School Teachers in Selangor

Sabrina Subri¹, Nur Suhailah Alias¹, Noor Halilah Buari¹

¹Centre of Optometry, Faculty of Health Sciences, Universiti Teknologi MARA, UiTM Cawangan Selangor, 42300 Puncak Alam, Selangor, Malaysia

Corresponding author's email: sabrinasubri@uitm.edu.my

Summary

This study assessed awareness and knowledge of childhood eye problems among special school teachers in Selangor using a questionnaire. Most participants demonstrated high knowledge, particularly about refractive errors and amblyopia, while strabismus and childhood cataract were the least known conditions. Awareness was highest for refractive errors and lowest for childhood cataracts. No significant association was found between knowledge level and demographic factors except the teachers' level of education. These highlights the need for targeted eye health education among the teachers, especially on cataracts and strabismus, ideally through social media platforms which was reported to be their main source of information.

Keywords

Knowledge, Awareness, Childhood Eye Problems, Special School Teachers, Children

Introduction

Ocular health is vital for children, as inadequate visual stimulation can impair development of vision-related brain areas, particularly after the critical plasticity period¹. Children with special needs are more likely to get eye problems, as these often co-exist due to prenatal factors and acquired injuries². Common problems include refractive errors, strabismus, cataracts, and keratoconus, all of which can hinder their general development, learning and academic performance³. Since children, especially those with special needs, may not voluntarily report if they have visual problems, parents and teachers must be vigilant. Although many teachers are aware of visual problems, few are trained to detect them. Since early identification and treatment can significantly improve a child's development and that this is yet to be reported in Malaysia, therefore this study aimed to determine special school teachers' awareness and knowledge of childhood eye problems.

Materials and Methods

A cross-sectional study was conducted among 52 special school teachers in Selangor. Participants had at least one year experience teaching any special schools in Selangor and understood English or Malay. Those in part-time jobs were excluded. Consent was obtained, and data were collected via an online bilingual questionnaire adapted from previous studies (4-5), consisting of 33 questions across four sections: demographics, awareness (4 questions), knowledge (11 questions), and eye care-seeking behaviour (5 questions). The questionnaire was translated, validated and pilot-tested, with Cronbach's $\alpha > 0.70$. Responses were collected via Google Forms shared on social media and analysed using SPSS v28.

Awareness levels were categorized as low (<40%), moderate (40-60%), and high (>60%), while knowledge scores were classified based on the total of correct scores. Descriptive statistics, Chi-squared and correlation tests were used to analyse the association between variables. All tests were two-tailed, with an alpha level set at 0.05.

Results and Discussion

The demographic of the respondents who were predominantly female (67.3%) and Malay (98%) is summarized in Table 1.

Table 1: Demographic information (N=52)

Demographic characteristics		n (%)	Mean (SD)
Age			M=38.98 (SD=9.15)
Teaching experience			M=13.15; (SD=8.853)
Level of teaching school	Primary school	43 (82.7)	
	Secondary school	9(17.3)	
Highest education level	Diploma	5 (9.6)	
	Degree	43 (82.7)	
	Postgraduate	4 (7.7)	
Marital status	Single	2 (3.8)	
	Married	45 (86.5)	
	Divorce	5 (9.6)	
Socioeconomic status	B40	13 (25)	
	M40	33 (63.5)	
	T20	6 (11.5)	
Number of children	1	4 (7.7)	
	2	19 (36.5)	
	3	10 (19.2)	
	4	5 (9.6)	
	>4	3 (5.8)	
Has children with a history of eye disease	Yes	7 (13.5)	
	No	34 (65.4)	

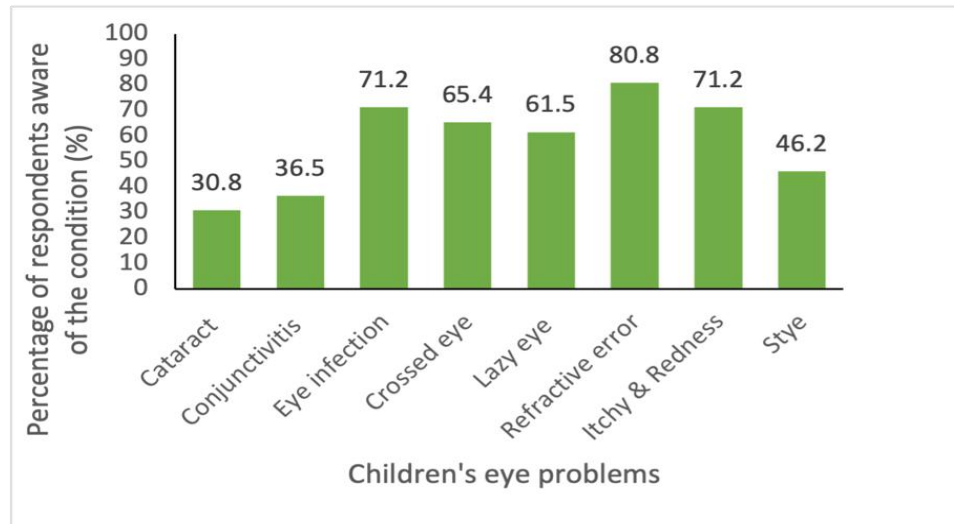


Figure 1: Level of awareness for different eye problems

Despite a good level of awareness of the symptoms and available treatments, there were some misconceptions remaining about eye conditions and eye care in children. Examples of misconceptions are the participants thought that those under five should not wear spectacles and that care should only be sought when the children complained. This reflects the fact that social media was reported to be the main source of information that the teachers relied on for health information, hence the risk of misinformation.

Results showed half of the participants had a high level of knowledge with refractive error and amblyopia being the most known conditions (Table 2). There was no significant link between knowledge and demographic factors except education level ($X(42)=82.52, p<0.001$). Figure 1 shows the common eye problems that the participants are aware of.

Table 2: Level of knowledge

Level of knowledge (Score range)	n (%)
High (21-28)	30 (57.7)
Intermediate (11-20)	21 (40.4)
Low (1-10)	1 (1.9)

Teachers' limited knowledge about certain conditions, like strabismus, cataract and the use of spectacle in children, highlights the need for targeted health education.

Conclusion

Special school teachers showed good awareness of childhood eye diseases, but had limited knowledge of strabismus and cataracts. Health education addressing these gaps and misconceptions about children's eye care is needed, preferably via social media as this was reported as their main source of information.

Acknowledgements

This study was funded by the Malaysian Ministry of Higher Education (Fundamental Research Grant Scheme: FRGS/1/2023/SKK04/UITM/02/2) in collaboration with the Malaysian Ministry of Housing and Local Government (KPKT).

References

1. Dennis M, Spiegler BJ, Juranek JJ, et al. Age, plasticity, and homeostasis in childhood brain disorders. *Neurosci Biobehav Rev.* 2013;**37**(10 Pt 2):2760-2773. doi:10.1016/j.neubiorev.2013.09.010
2. Salt A, Sargent J. Common visual problems in children with disability. *Arch Dis Child.* 2014;**99**(12):1163-1168. doi:10.1136/archdischild-2013-305267
3. Schneider J, Leeder SR, Gopinath B, et al. Frequency, course, and impact of correctable visual impairment (uncorrected refractive error). *Surv Ophthalmol.* 2010;**55**(6):539-560. doi:10.1016/j.survophthal.2010.02.004
4. Baashar A, Yaseen A, Halawani M, et al. Parents' knowledge and practices about child eye health care in Saudi Arabia. *Int J Med Dev Ctries.* 2020;**4**(2):454-460. doi:10.24911/ijmdc.51-1577288335
5. Nirmalan PK, Sheeladevi S, Tamilselvi V, et al. Perceptions of eye diseases and eye care needs of children among parents in rural South India: The Kariapatti Pediatric Eye Evaluation Project (KEEP). *Indian J Ophthalmol.* 2004;**52**(2):163-167.

LIST OF E-POSTER PRESENTATIONS

EPIDEMIOLOGY (COMMUNICABLE/ NON-COMMUNICABLE DISEASE)

EPIDPP01 / 179

Insights for COVID-19 Booster Dose Acceptance in Kolkata, India: A Regional Cross-sectional Study

Abhishek Lachyan ^{1,2}, Min Fui Wong ³, Indranil Saha ⁴, Vivek Jason Jayaraj ⁵

¹ Apex Regional STD Centre, Safdarjung Hospital, New Delhi, India.

² All India Institute of Medical Sciences, New Delhi, India.

³ Centre for Health Policy Research, Institute for Health Systems Research, Selangor, Malaysia.

⁴ ICMR-Centre for Ageing & Mental Health, Indian Council of Medical Research, Kolkata, India.

⁵ Bahagian Kesihatan Digital, Ibu Pejabat Kementerian Kesihatan Malaysia, Kementerian Kesihatan Malaysia.

Corresponding author's email: dr.estherwong@moh.gov.my

Summary

This study assessed COVID-19 vaccine booster acceptance in Kolkata through a cross-sectional online survey of 503 adults from March 2022 to March 2023. The acceptance was 93.4%, with determinants of acceptance including male gender (AOR 2.50, 95% CI 1.15-5.43) and full-time/self-employment (AOR 3.15, 95% CI 1.50-6.58). Vaccine hesitancy stemmed from concerns about efficacy, side effects, and low perceived risk. Targeted education and equitable vaccine distribution for the sub-groups are crucial to improving uptake. Future research should address sociocultural barriers and inequities to inform better policy strategies, ensuring preparedness for future surges and optimizing vaccine deployment.

Keywords

COVID-19 Booster acceptance, vaccine hesitancy determinants, public health strategies

Introduction

Kolkata, one of India's hardest-hit cities during the COVID-19 pandemic, experienced over 120,000 infections and 9,700 deaths in 2020¹. High population density and poor living conditions contributed to the spread. Just like in other countries, the Indian government's early containment strategies focused on isolation and hygiene, was later shifted to vaccination efforts. While 98% of the eligible population in Kolkata is fully vaccinated, only 30% have received a booster dose, significantly lower than New Delhi (58%)^{2,3}. This is much lower than the global statistic, for booster acceptance, which varies between 51.6% and 97.9%, influenced by age, previous side effects, and vaccine confidence. In India, booster hesitancy is linked to a lack of awareness, belief that the pandemic is over, and concerns about side effects and vaccine efficacy. Variability in vaccine types, efficacy, and manufacturer trust also affect decisions. The high prevalence of vaccine booster hesitancy, waning immunity, and the emergence of SARS-CoV-2 variants of concern can lead to increased COVID-19 morbidity and mortality⁴. Given

the urgency of the above issues and limited research on booster acceptance in Kolkata, this study aims to identify factors for COVID-19 vaccine booster acceptance to inform strategies to increase uptake.

Materials and Methods

This study utilized a cross-sectional survey conducted in Kolkata from March 2022 to March 2023 through a self-administered online questionnaire distributed via social media platforms, primarily WhatsApp groups of professionals engaged in community outreach. With a purposive sampling method, this study targeted individuals aged 18 and above who provided electronic informed consent. The survey included sections on socio-demographics, COVID-19 vaccine acceptance, factors influencing booster uptake, and ranked vaccine preferences. The questionnaire, adapted from Wong et al. (2021)⁵, underwent translation, validation, and pilot testing. Ethical approval was obtained from the Noida International University Ethics Review Board. Data analysis included descriptive statistics and multivariable logistic regression to examine determinants of booster acceptance, ensuring model validity through the Hosmer-Lemeshow test and multicollinearity checks, with statistical significance set at $p \leq 0.05$ using SPSS version 22.0.

Results and Discussion

A total of 503 participants completed the survey, yielding a 100% response rate. The mean participant age was 36.0 (SD:7.5) years, with the majority being male (82.3%), of Hindu religion (52.5%), holding certificate/A-level education (47.3%), and engaged in full-time employment (47.3%) (Table 1).

Table 1: Socio-demographic of participants

Participants Characteristic	n	(%)
Total	503	100
Age group (years)		
<=30	26	5.2
31-40	325	64.6
41-50	101	20.1
>50	51	10.1
Gender		
Male	414	82.3
Female	89	17.7
Religion		
Hindu	264	52.5
Christian	43	8.5
Muslim	196	39.0
Highest educational attainment		
Primary school	42	8.3
Secondary school/ O-level	95	18.9
Certificate/ A-level	238	47.4
Bachelor's degree/ Postgraduate	128	25.4

Employment status

Full time	238	47.3
Part-time	73	14.5
Self-employed	121	24.1
Homemaker	27	5.4
Student/ Retired/ Unemployed	44	8.7

72.4% of participants had previously delayed or refused vaccines despite vaccine availability. However, the acceptance rate for the COVID-19 booster dose was high at 93.4%, though only 63.8% had received it. Regarding vaccine characteristics, 52.3% were willing to accept vaccines with effectiveness below 90%, while 75% preferred vaccines offering at least 12 months of protection. Nearly 60% rejected mRNA-based vaccines, and 56% preferred vaccines from specific countries.

The final multivariable model confirmed that full-time and self-employed participants (AOR 3.15, 95% CI 1.50-6.58) had significantly higher acceptance than students, retirees, or unemployed individuals. Male participants also demonstrated greater acceptance (AOR 2.50, 95% CI 1.15-5.43). Education level remained a crucial factor, in improving model fitness indicators.

From the results, the high acceptance rate (93.4%) can be seen in this study, compared to others in the region, was likely influenced by participants' higher education levels (72.8% attained A-level and above), which significantly impacted vaccine uptake. However, a notable gap between booster acceptance (93.4%) and actual uptake (63.8%) suggests the gradual rollout process affected availability. The booster campaign in India, launched in January 2022, coincides with this study period, prioritized high-risk groups, potentially delaying access for subgroups in the population. Males showed higher acceptance, possibly due to greater smartphone ownership and access to online health information. Additionally, full-time and self-employed individuals (AOR 3.15, 95% CI 1.50-6.58) perceived a higher infection risk, increasing willingness for boosters. Although vaccine-related factors were not significant, addressing knowledge gaps on COVID-19 vaccines remains crucial to improving uptake. The online survey method may introduce selection bias, but given movement restrictions, it was the most effective way to ensure broad public participation and data collection.

Conclusion

This study found a high booster acceptance rate (93.4%), with males and full-time or self-employed individuals being the determinants. Addressing vaccine hesitancy through targeted education and equitable distribution among sub-groups is essential for improving uptake. Future research should address sociocultural barriers and inequities affecting the sub-groups for better policy strategies, ensuring preparedness for future surges and optimizing vaccine deployment.

References

1. West Bengal State Government. Awareness & prevention of COVID-19. A dedicated website on COVID-19 by the West Bengal State Government [Internet]. 2020. Available from: <https://wb.gov.in/COVID-19.aspx>
2. India V. Vaccinate India: Dashboard for vaccination monitoring [Internet]. 2024. Available from: <https://vaccinate-india.in/about>

3. Achrekar GC, Batra K, Urankar Y, et al. Assessing COVID-19 Booster Hesitancy and Its Correlates: An Early Evidence from India. *Vaccines (Basel)*. 2022;**10**(7).
4. Sharma N, Basu S, Lalwani H, et al. COVID-19 Booster Dose Coverage and Hesitancy among Older Adults in an Urban Slum and Resettlement Colony in Delhi, India. *Vaccines (Basel)*. 2023;**11**(7).
5. Wong LP, Alias H, Danaee M, et al. COVID-19 vaccination intention and vaccine characteristics influencing vaccination acceptance: a global survey of 17 countries. *Infect Dis Poverty*. 2021;**10**(1):122.

EPIDPP02 / 197

Unmasking Susceptibility: HBV in Malaysia's Vaccinated Population, A Cross-Sectional Study from National Health & Morbidity Survey 2020

Filza Noor Asari¹, Eida Nurhadzira Muhammad¹, Nurfatehar Ramly¹, Mohd Hatta Abdul Mutalip¹, Muhammad Faiz Mohd Hisham¹, Chong Zhuo Lin¹

¹Institute for Public Health, National Institutes of Health, Setia Alam, Selangor, Malaysia

Corresponding author's email: filza.a@moh.gov.my

Summary

Hepatitis B virus (HBV) remains a significant public health concern in Malaysia, despite widespread vaccination efforts. This study aimed to determine the prevalence and risk factors associated with HBV susceptibility among vaccinated adults, utilising data from the National Health and Morbidity Survey (NHMS) 2020. The findings highlight a concerning prevalence of HBV susceptibility among vaccinated adults in Malaysia, particularly among specific demographic groups. These disparities may be attributed to variations in vaccine efficacy, waning immunity, or gaps in vaccination coverage.

Keywords

Hepatitis B, susceptibility, among vaccinated, Malaysia

Introduction

Hepatitis B virus (HBV) infection is a global health issue, leading to chronic liver disease, cirrhosis, and hepatocellular carcinoma (HCC) (1). Vaccination against HBV has been a cornerstone of public health efforts to control and eliminate HBV transmission. Malaysia introduced universal infant HBV vaccination in the late 1980s, aiming to reduce the burden of HBV-related diseases. However, despite high vaccination coverage rates, HBV remains a significant public health concern. The effectiveness of HBV vaccination can be influenced by factors such as vaccine quality, storage conditions, administration techniques, and host immune response (2). Furthermore, immunity acquired through vaccination may wane over time, which leads to susceptibility to HBV infection especially in adults vaccinated during infancy(3). Understanding the prevalence and risk factors associated with HBV susceptibility in vaccinated adults is crucial for optimising vaccination strategies and preventing HBV-related morbidity and mortality in Malaysia.

Materials and Methods

This study utilised data from the NHMS 2020 a cross-sectional, nationwide survey conducted by the Ministry of Health Malaysia. The study population consisted of adults aged 15 years and older residing in non-institutional living quarters. After obtaining informed consent, blood samples were successfully collected from 4,083 out of 5,302 eligible respondents, achieving a collection rate of (77.0%). Blood samples were tested for hepatitis B surface antigen (HBsAg), antibody to hepatitis B surface antigen (anti-HBs), and antibody to hepatitis B core antigen (anti-HBc) using commercially available enzyme immunoassays (EIAs). HBV susceptibility was defined as the absence of anti-HBs (anti-HBs < 10 mIU/mL) in individuals who were

HBsAg negative and anti-HBc negative (4). Data analysis was performed using IBM SPSS Statistics version 26, incorporating complex sampling design features. Descriptive statistics were used to summarize demographic characteristics and complex sampling logistic regression was used to identify risk factors associated with HBV susceptibility.

Results and Discussion

Approximately 62.9% of the population were susceptible to HBV. Among vaccinated individuals, the overall prevalence of susceptibility was 22.9% (Table 1). The prevalence of HBV susceptibility varied across demographic groups. Higher susceptibility was observed in urban residents (15%), young adults aged 15 to 29 years (19.0%), and Malay (20.5%). Those with tertiary education (18.9%) and single individuals (20.1%) also showed higher susceptibility (Table 1). The complex sampling logistic regression revealed significant associations between HBV susceptibility, ethnicity, and education level. Specifically, Chinese respondents had significantly higher odds of being susceptible to HBV than Malays, with an adjusted odds ratio (aOR) of 7.10 (95% CI: 2.67, 18.91). Similarly, individuals in the “Others” category also had significantly higher odds of HBV susceptibility compared to Malays, with an (aOR) of 5.68 (95% CI: 2.03, 15.92) (Table 2). Education level was strongly associated with susceptibility, with tertiary-educated individuals having nearly 10 times higher odds than those with no formal education (aOR 9.82, 95% CI: 3.61, 26.73). The observed differences among demographic groups necessitate further investigation to determine the underlying factors contributing to the susceptibility patterns observed within the vaccinated population. The higher susceptibility among young adults may reflect waning immunity from childhood vaccination (5). The decline in susceptibility with increasing age, with the lowest prevalence in those aged 60 and above (43.4%), could be due to higher rates of natural immunity acquired through past exposure before the widespread implementation of vaccination programmes. The strong association between education level and HBV susceptibility is intriguing and requires further exploration. The study has limitations, including the lack of verification of immunisation records for HBV vaccination status and the use of serological markers to define infection in recruited individuals from the general population. Additionally, no clinical assessments or doctor diagnoses were conducted to confirm HBV infection.

Table 1: Prevalence of susceptibility to HBV by sociodemographic variables among adults in Malaysia and among vaccinated adults

Variables	Participant, n (%)	Estimated population, N(%)	Susceptible to Hepatitis B			Susceptible to Hepatitis B among vaccinated adults		
			Unweighted count, n	Estimated population, N	Prevalence (%)	Unweighted count, n	Estimated population, N	Prevalence (%)
Overall	4083(100.0)	24,205,348 (100.0)	2649	15,155,978	62.9 (57.4, 68.0)	548	3,403,770	22.9 (16.8, 30.5)

Residential area								
Urban	1891 (46.3)	18,767,041 (77.5)	1478	11,840,323	63.4 (56.7, 69.5)	346	2,868,305	15.0 (10.3, 21.5)
Rural	2192 (53.7)	5,438,307 (22.5)	1171	3,315,655	61.1 (52.9, 68.6)	202	535,464	9.8 (5.4, 16.9)
Gender								
Male	1923 (47.1)	12,478,826 (51.5)	1198	7,650,783	61.6 (56.0, 67.0)	249	1,692,885	13.4 (9.4, 18.8)
Female	2160 (52.9)	11,726,522 (48.5)	1451	7,505,195	64.2 (58.2, 69.8)	299	1,710,885	14.3 (10.2, 19.8)
Age group								
15-29	1257 (30.8)	8,814,160 (36.4)	979	6,616,029	75.4 (67.6, 81.8)	265	1,708,186	19.0 (13.5, 26.2)
30-39	785 (19.2)	5,304,485 (21.9)	533	3,326,749	62.8 (55.6, 69.5)	122	761,199	14.2 (10.2, 19.4)
40-49	685 (16.8)	3,693,993 (15.3)	442	2,318,327	63.2 (55.3, 70.4)	80	507,957	13.7 (7.9, 22.7)
50-59	630 (15.4)	2,991,937 (12.4)	348	1,418,467	47.7 (40.6, 55.0)	48	242,391	7.9 (4.1, 14.7)
60 years and above	726 (17.8)	3,400,772 (14.0)	347	1,476,408	43.4 (37.0, 50.1)	33	185,035	5.4 (3.3, 8.6)
Ethnicity								
Malay	2494 (61.1)	11,552,958 (47.8)	1807	8,770,773	76.0 (72.2, 79.5)	379	2,398,174	20.5 (14.1, 28.8)
Chinese	387 (9.5)	5,449,457 (22.6)	111	1,709,323	31.4 (23.6, 40.0)	24	343,797	6.1 (3.3, 11.1)
Indian	200 (4.9)	1,526,953 (6.3)	155	1,142,202	74.8 (64.5, 82.9)	19	170,258	11.3 (5.1, 22.9)
Other Bumiputeras	707 (17.3)	2,716,832 (11.2)	429	1,725,768	64.2 (56.4, 71.4)	117	414,812	15.1 (9.2, 23.9)
Others*	295 (7.2)	2,959,148 (12.1)	147	1,807,913	62.0 (47.4, 74.7)	9	76,728	2.6 (1.0, 6.5)
Education level								
No formal education	266 (6.5)	1,352,333 (5.5)	123	764,811	57.6 (40.4, 73.1)	7	10,533	5.8 (0.8, 32.7)
Primary education	884 (21.7)	4,776,596 (20.0)	488	2,488,707	52.5 (45.1, 59.8)	71	359,521	7.5 (5.0, 11.1)

Secondary education	1927 (47.2)	10,608,786 (44.5)	1344	7,119,940	67.2 (61.4, 72.6)	294	1,638,835	15.2 (10.9, 20.8)
Tertiary education	1006 (24.6)	7,161,323 (30.0)	694	4,580,799	64.0 (56.6, 70.9)	176	1,384,367	18.9 (13.0, 26.7)
Marital status								
Single	1167 (28.6)	7,675,557 (31.6)	877	5,481,842	71.8 (65.3, 77.6)	245	1,563,971	20.1 (14.2, 27.5)
Married/living with partner	2564 (62.8)	14,557,162 (60.2)	1584	8,802,936	60.7 (55.4, 65.7)	281	1,716,772	11.6 (8.1, 16.4)
Widowed (er)/Divorce	351 (8.6)	1,969,974 (8.2)	187	868,545	44.1 (34.8, 53.8)	22	123,027	6.1 (3.4, 10.9)

Others*: Other minority groups in Malaysia

Table 2: Sociodemographic factors associated with susceptibility among vaccinated population in Malaysia in the National Health and Morbidity Survey 2020

	Susceptible & vaccinated					
	Univariate Analysis			Multivariate Analysis		
	Crude odds ratio	95% Confidence Interval	P value	Adjusted odds ratio	95% Confidence Interval	P value
Residential						
Urban	1.00 (Ref)			1.00 (Ref)		
Rural	0.61	0.28, 1.32	0.206	0.52	0.24, 1.10	0.087
Age group (years)						
15 - 29	1.00 (Ref)			1.00 (Ref)		
30 - 39	0.70	0.49, 0.99	0.044	0.79	0.54, 1.17	0.240
40 - 49	0.67	0.41, 1.10	0.115	0.81	0.49, 1.32	0.391
50 - 59	0.36	0.21, 0.62	<0.001	0.47	0.25, 0.90	0.240
60 and above	0.24	0.15, 0.38	<0.001	0.38	0.22, 0.69	0.001
Ethnicity						
Malay	1.00 (Ref)			1.00 (Ref)		
Chinese	9.73	3.39, 27.9	<0.001	7.10	2.67, 18.91	<0.001
Indian	2.45	0.62, 9.72	0.201	1.70	0.43, 6.72	0.445
Other Bumiputeras	4.78	1.23, 18.51	0.024	3.40	0.86, 13.42	0.080
Others*	6.70	2.28, 19.68	<0.001	5.68	2.03, 15.92	0.001
Marital Status						
Single	1.00 (Ref)			1.00 (Ref)		
Married	0.53	0.40, 0.69	<0.001	0.73	0.52, 1.01	0.060
Separated/ Divorced/ Widowed	0.26	0.16, 0.43	<0.001	0.54	0.31, 0.94	0.029
Education						
No formal education	1.00 (Ref)			1.00 (Ref)		
Primary education	10.17	4.00, 25.81	<0.001	6.96	2.77, 17.51	<0.001
Secondary education	22.53	8.19, 61.94	<0.001	8.88	3.42, 23.11	<0.001
Tertiary education	29.32	9.77, 88.10	<0.001	9.82	3.61, 26.73	<0.001

Others*: Other minority groups in Malaysia

Conclusion

This study highlights the need to monitor HBV susceptibility in vaccinated populations. The high susceptibility prevalence among vaccinated adults in Malaysia calls for targeted interventions, including education campaigns and improved vaccination outreach. Further research is needed to understand the contributing factors and optimise vaccination strategies for HBV elimination.

References

1. World Health Organization. (2023). Hepatitis B. Retrieved from <https://www.who.int/news-room/fact-sheets/detail/hepatitis-b>
2. Centers for Disease Control and Prevention. (2022). Hepatitis B FAQs for Health Professionals. Retrieved from Vaccine Storage and Handling Toolkit - January 2023
3. Ren W, Ren J, Wu Z, Shen L, et al. Long-term persistence of anti-HBs after hepatitis B vaccination among adults: 8-year results. *Hum Vaccin Immunother*. 2020 Mar 3;**16**(3):687-692.
4. Centers for Disease Control and Prevention. Retrieved from <https://www.cdc.gov/hepatitis-b/hcp/diagnosis-testing/index.html>
5. Leuridan E, Van Damme P. Hepatitis B and the need for a booster dose. *Clin Infect Dis*. 2011;**53**(1):68-75.

EPIDPP03 / 205

Association Between Cardiovascular Disease and Cataract: A Meta-Analysis

Jun Fai Yap¹, Pei Pei Heng¹, Wan Nur Syamimi Wan Mohamad Darani¹, Halizah Mat Rifin¹, Nor Asiah Muhamad², Muhammad Fadhli Mohd Yusoff¹

¹ Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

² Sector for Evidence-Based Healthcare, National Institutes of Health, Ministry of Health, Malaysia

Corresponding author's email: junfai@moh.gov.my

Summary

This meta-analysis explored the association between cardiovascular disease (CVD) and cataracts by analysing 11 studies involving 758,207 adults. The findings indicated that adults with CVD had significantly higher odds of developing cataracts (Pooled odds ratio = 1.34; 95% confidence interval (CI): 1.23, 1.47). Stroke was specifically associated with an increased risk of cataract in cohort studies (Pooled relative risk = 1.34; 95% CI: 1.16, 1.54). Given the increased cataract risk among individuals with CVD, especially those with a history of stroke, earlier ophthalmologic screening and timely cataract surgery are recommended to enhance vision-related quality of life in this population.

Keywords

Acute coronary syndrome, heart failure, lens opacity, stroke, venous thromboembolism

Introduction

Emerging evidence suggests a shared pathophysiological basis between cataracts and cardiovascular disease (CVD)¹. Oxidative stress (caused by an imbalance between reactive oxygen species production and the human body's antioxidant defenses) leads to both abnormal lens protein aggregation in cataracts and lipid oxidation in atherosclerosis, a key component in CVD. This overlap of pathophysiology indicates that systemic vascular health may influence cataractogenesis. While shared risk factors for both CVD and cataracts, such as diabetes mellitus or hypertension, are well-documented in meta-analyses, the direct relationship between CVD and cataracts remains incompletely understood based on past epidemiological studies. To our knowledge, no systematic review or meta-analysis has specifically addressed the research question: "*Do adults with established CVD have a higher risk of developing cataracts or requiring cataract surgery compared to those without CVD?*" Therefore, this meta-analysis aimed to synthesize existing evidence to better understand the association between CVD and cataract risk.

Materials and Methods

CVD was operationally defined as acute coronary syndrome, stroke, deep vein thrombosis, pulmonary embolism, congestive cardiac failure, or peripheral artery disease. A systematic literature search was conducted in PubMed, Scopus, Web of Science, and Embase using Medical Subject Headings terms. The search included

all published English-language studies from the inception of each database until 31 December 2024. Original research articles involving adults (≥ 18 years) that assess the statistical relationship between CVD and cataracts were included. The search process followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines². The quality of the evidence was assessed with the Newcastle-Ottawa Scale (NOS)³. Odds ratio (OR) or relative risk (RR) were pooled with a 95% confidence interval (CI) to evaluate the relationship between CVD and cataract risk. A random-effects model was employed, and heterogeneity was assessed using the I^2 statistic. Subgroup analyses were performed based on CVD subtypes.

Results and Discussion

A total of 11 studies (5 cohort, 5 cross-sectional and 1 case-control) met the inclusion criteria, involving 758,207 adults (Table 1). All 11 included studies had good quality (NOS score ≥ 7). The pooled results showed a significantly increased odds of cataracts in adults with CVD, particularly among cross-sectional studies (Pooled OR = 1.34; 95% CI: 1.23, 1.47), with low heterogeneity across studies ($I^2 = 33\%$) (Figure 1). Subgroup analysis by CVD subtypes showed that stroke was associated with a higher incidence of cataract in cohort studies (Pooled RR = 1.34; 95% CI: 1.16, 1.54) with low heterogeneity ($I^2 = 0\%$) (Figure 2).

Compromised systemic circulation in adults with CVD, especially those with a history of stroke, may reduce ocular perfusion, disrupt the metabolic balance of the crystalline lens, and subsequently increase the risk of cataract formation. Furthermore, stroke survivors often experience physical impairments or neurological deficits that may delay routine ophthalmologic visits, allowing cataracts to progress. Thus, cataracts in this population are often diagnosed at a more advanced stage.

In terms of strength, multiple studies were identified using broad search strategy, allowing stratification of CVD subtypes. However, all included studies were observational and susceptible to various biases related to study design. For example, most studies relied on self-reported CVD histories, which, while practical for population-based surveys, may introduce inconsistencies in CVD classification⁴. Similarly for cataract, while a few studies utilised standardised photographic grading systems, such as the Lens Opacities Classification System III⁵, others relied on self-reports or less rigorous clinical assessments, increasing the risk of misclassification bias. Additionally, there was a lack of data from Asian countries, as most included studies were conducted among adults residing in Western countries. This underrepresentation of study population may limit the generalisability of findings to other regions.

Table 1: Summary of study location, study design, sample size, first author and year of publication.

No	Study location	Study design (Sample size)	First author (Year of publication)
1	United States	Cross-sectional (n = 4,926)	<u>Klein BE (1997)</u>
2	United States	Prospective cohort (n = 3,684)	<u>Klein BE (1998)</u>

3	France	Cross-sectional (n = 2,584)	<u>Delcourt C (2000)</u>
4	Australia	Prospective cohort (n = 3,654)	<u>Younan C (2003)</u>
5	Australia	Prospective cohort (n = 3,654)	<u>Tan JSL (2008)</u>
6	Taiwan	Prospective cohort (n = 5,462)	<u>Chen YC (2013)</u>
7	Israel	Retrospective case-control (n = 12,984)	<u>Nemet AY (2010)</u>
8	Korea	Cross-sectional (n = 715,554)	<u>Rim TH (2015)</u>
9	Australia	Cross-sectional (n = 1,665)	<u>Wang SB (2016)</u>
10	Sweden	Cross-sectional (n = 760)	<u>Hugosson M (2020)</u>
11	Singapore	Prospective cohort (n = 3,280)	<u>Tan AG (2020)</u>

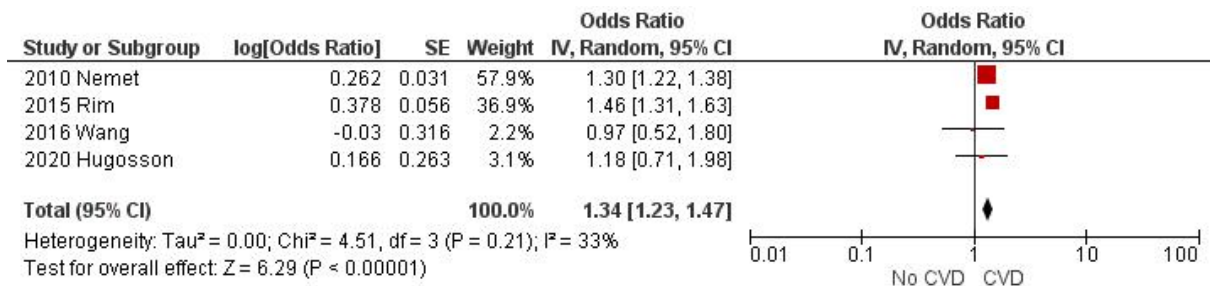


Figure 1: Forest plot of the odds ratio of cataract with CVD

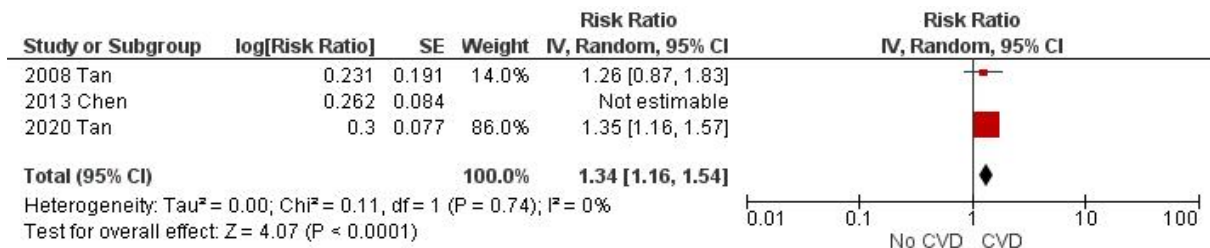


Figure 2: Forest plot of the relative risk of incident cataract with CVD subtype (stroke)

Conclusion

Adults with established CVD, particularly those with a history of stroke, have a higher risk of developing cataracts. Earlier ophthalmologic screening and timely cataract extraction surgery are recommended to improve vision-related quality of life in this population.

References

1. De La Cruz N, Shabaneh O, Appiah D. The Association of Ideal Cardiovascular Health and Ocular Diseases Among US Adults. *Am J Med.* 2021;134(2):252-9.e1.

2. Moher D, Shamseer L, Clarke M, et al. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Syst Rev*. 2015;**4**(1):1.
3. Wells GA, Shea B, O'Connell D, et al. The Newcastle-Ottawa Scale (NOS) for assessing the quality of nonrandomised studies in meta-analyses. 2000.
4. Joshi R, Turnbull F. Validity of self-reported cardiovascular disease. *Intern Med J*. 2009;**39**(1):5-6.
5. Gali HE, Sella R, Afshari NA. Cataract grading systems: a review of past and present. *Curr Opin Ophthalmol*. 2019;**30**(1):13-8.

EPIDPP04 / 209

Multimorbidity among Reproductive-Aged Women: A Nationwide Cross-Sectional Study in Malaysia

Siti Hafizah Zulkipli

Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

Corresponding author: sitihafizah.z@moh.gov.my

Summary

Multimorbidity is defined as the presence of more than two chronic diseases. Understanding the factors associated with multimorbidity is important as it can impact quality of life, particularly during old age, mental health, and increase in healthcare costs (1). This study is a secondary data analysis of the National Health and Morbidity Survey (NHMS) 2019. Findings indicate that women of reproductive age have a high prevalence of overweight, obesity, and hypercholesterolaemia. Older age, Malay ethnicity, low education level and high body mass index are the factors significantly associated with multimorbidity among women of reproductive age. Hence, preventive strategies are warranted, especially during pre-pregnancy and postnatal assessment.

Keywords:

Non-communicable disease, reproductive age, multimorbidity

Introduction

Non-communicable diseases (NCDs) are the leading health burden in Malaysia; however, the burden varies by sex. Although women generally have greater life expectancies than men, they bear a considerable burden of NCDs, especially during their reproductive years, which can have far-reaching consequences for pregnancy and offspring health. For example, gestational diabetes mellitus is associated with foetal growth anomalies and stillbirth (2). Additionally, women have been associated with multimorbidity compared to men, as factors such as early childbearing and high parity are associated with multimorbidity. Therefore, this study aims to examine the prevalence and factors associated with multimorbidity among women of reproductive age (15-49 years) in Malaysia.

Materials and method

A secondary data analysis was conducted using the National Health and Morbidity Survey (NHMS) 2019, including 3648 women of reproductive age (15-49 years). The independent variables were sociodemographic (age, marital status, ethnicity, education level, and income level) and NCD risk factors (physical activity, smoking status, body mass index, and fruit and vegetable consumption). Three main NCDs analysed in this study were hypertension, diabetes, and hypercholesterolaemia. Two main outcome variables are single morbidity and multimorbidity. Multimorbidity was defined as the coexistence of two or more NCDs. Descriptive and logistic regression analyses were performed to assess the burden of NCDs and its associated risk factors.

Results and Discussion

Data from 3648 women of reproductive age were analysed. The mean age of the participants was 30.37 ± 0.23 years, with about half (49.9%) being 15-29 years. Slightly more than half of the participants (52.3%) had a secondary education level and were of Malay ethnicity (53.4%). More than half of the participants were married or living with a partner (58.0%) and were in the bottom 40% (B40) of the household income group (65.3%).

Among women of reproductive age, the highest prevalence of NCD risk factors were overweight and obesity (52.9%), while hypercholesterolaemia was the most common NCD (34.2%). The prevalence of single morbidity was 44.8%, whereas multimorbidity affected 12.9% of women. The prevalence of single morbidity among women of reproductive age in Malaysia is much higher compared to those reported among reproductive-aged women in Kenya (15.9%)(3). The mean age of women with single morbidity was 35 years, and that of those with multimorbidity was 39 years, which was higher than that reported among reproductive-aged women in India (4). However, such differences could be due to the number and types of morbidities considered in the study.

Both single and multimorbidity were significantly associated with older age, Malay ethnicity, and high body mass index. Similar findings have been reported in previous studies, highlighting a strong association between age and multimorbidity (1). This is expected, given NCDs are related to chronicity; thus, multimorbidity is more prevalent among older people. A previous review reported that overweight individuals have a 1.32 times higher risk of developing multimorbidity, while obese individuals have a 1.93 times greater risk (5). The link between Malay ethnicity and multimorbidity may be attributed to previous studies indicating a significant association between Malay ethnicity, diabetes, and overweight.

Current antenatal screening for NCD risk factors focuses primarily on hypertension and diabetes mellitus. However, there is a need to expand pre-pregnancy care to include the management of obesity and hypercholesterolaemia, given their high prevalence and potential long-term consequences for maternal and child health.

Table 1 : Factors associated with single and multiple morbidity

Variables	Single morbidity		Multimorbidity	
	OR (95% CI)	p-value	OR (95% CI)	p-value
Age				
15-29 (Ref)				
30-39	2.452 (1.944, 3.093)	<0.001**	3.454 (2.297, 5.194)	<0.001**
40-49	5.479 (4.205, 7.139)	<0.001**	5.485 (5.485, 13.545)	<0.001**
Ethnicity				
Others (Ref)				
Malay	1.822 (1.244, 2.670)	0.002*	1.957 (1.066, 3.593)	0.030*
Chinese	0.864 (0.517, 1.445)	0.578	0.958 (0.445, 2.062)	0.912
Indian	0.965 (0.555, 1.680)	0.901	2.027 (0.921, 4.459)	0.079
Other	1.303 (0.855, 1.986)	0.218	1.381 (0.697, 2.734)	0.354
Bumiputera				

Education level				
Tertiary (Ref)				
No formal	0.935 (0.475, 1.843)	0.846	1.054 (0.483, 2.296)	0.895
Primary	1.076 (0.764, 1.516)	0.675	1.554 (1.015, 2.380)	0.043*
Secondary	0.935 (0.749, 1.167)	0.553	1.276 (0.981, 1.661)	0.069
Income level				
T20 (Ref)				
M40	0.841 (0.536, 1.320)	0.451	1.503 (0.975, 2.319)	0.065
B40	0.807(0.526, 1.237)	0.324	1.291 (0.828, 2.011)	0.259
Marital status				
Divorce/ Widowed/ Separated (Ref)				
Never married	0.971 (0.635, 1.485)	0.892	0.871 (0.473, 1.606)	0.658
Married	0.738 (0.497, 1.097)	0.133	0.701 (0.422, 1.164)	0.169
Body Mass Index				
Normal (Ref)				
Underweight	0.819 (0.527, 1.273)	0.374	0.324 (0.130, 0.808)	0.016*
Overweight/ Obesity	1.985, 1.627, 2.422)	<0.001**	3.124 (2.358, 4.141)	<0.001**
Physical Activity				
Active (Ref)				
Inactive	1.101 (0.875, 1.384)	0.411	1.064 (0.789, 1.435)	0.684
Tobacco consumption				
Never (Ref)				
Ever	1.297 (1.064, 1.582)	0.010*	1.073 (0.819, 1.406)	0.608
Fruit and vegetable intake				
Adequate (Ref)				
Inadequate	1.145 (0.759, 1.728)	1.145	1.350 (0.0791, 2.305)	0.270

* Significant at $p < 0.05$

**significant at $p < 0.001$

Conclusion

This study highlights the need to prioritize NCD prevention among women of reproductive age, particularly focusing on the status of body mass index and hypercholesterolemia. Targeted strategies should be directed at those aged 30 years old and above and of Malay ethnicity.

References

1. Arokiasamy P, Uttamacharya U, Jain K, Biritwum RB, Yawson AE, Wu F, et al. The impact of multimorbidity on adult physical and mental health in low- and middle-income countries: What does the study on global ageing and adult health (SAGE) reveal? *BMC Med.* 2015;13(1):1-16.
2. Cerf ME. Maternal and Child Health, Non-Communicable Diseases and Metabolites. *Metabolites.* 2023;13(6).
3. Okyere J, Ayebeng C, Dickson KS. Burden of non-communicable diseases among women of reproductive age in Kenya: A cross-sectional study. *BMJ Open.* 2024;14(7).
4. Singh SK, Chauhan K, Puri P. Chronic non-communicable disease burden among reproductive-age women in India: evidence from recent demographic and health survey. *BMC Womens Health [Internet].* 2023;23(1):1-15. Available from: <https://doi.org/10.1186/s12905-023-02171-z>
5. Shan J, Yin R, Panuthai S. Body mass index and multimorbidity risk: A systematic review and dose-response meta-analysis. *Arch Gerontol Geriatr [Internet].* 2024;123(March):105418. Available from: <https://doi.org/10.1016/j.archger.2024.105418>

EPIDPP05 / 218

Effectiveness of WhatsApp Messaging Health Education on Uncontrolled Type 2 Diabetes Mellitus Patients - A Cluster Randomized Controlled Trial

Alif Ramli¹, Freddie Robinson², Carol Lim Kai Joo³, Nirmal Kaur³, Balachandar S. Sayapathi³, Anisah Jantim³, Ismail Lasa⁴, Norimah Yusof⁵, Mohd Hafizuddin Ahmad⁶, Noriah Mahmud¹, Mohd Anuar Abd Rahman¹

¹ Terengganu State Health Department, Ministry of Health Malaysia

² Department of Public Health Medicine, Faculty of Medical and Health Sciences, Universiti Malaysia Sabah

³ Sabah State Health Department, Ministry of Health Malaysia

⁴ Selangor State Health Department, Ministry of Health Malaysia

⁵ Faculty of Medicine, Universiti Malaya

⁶ Labuan Federal Territory Health Department, Ministry of Health Malaysia

Corresponding author's email: dr.alif@moh.gov.my

Summary

Diabetes health education intervention is essential to overcome medication non-adherence and to slow down diabetes complications. This study aimed to evaluate the effectiveness of WhatsApp health education intervention to improve diabetes medication adherence among uncontrolled type 2 diabetes mellitus patients in primary healthcare. The result showed no significant changes in diabetes medication adherence ($p > 0.05$), HbA1C ($p = 0.748$), fasting blood sugar ($p = 0.950$) and BMI ($p = 0.315$) between intervention and control group. This study demonstrated that a mobile health app is a practical innovation for utilising technology as a tool for behavioural modifications in healthcare settings.

Keywords

Uncontrolled diabetes, Diabetes medication adherence, WhatsApp messaging, Health education, Health Belief Model

Introduction

Nearly 50% of patients with type 2 diabetes mellitus (T2DM) do not adhere to their medication treatment and fail to meet recommended glycaemic targets¹. Diabetes health education intervention is essential to overcome medication non-adherence and to halt or slowing the progression of diabetes complications. Messaging apps or "Messengers," WhatsApp allows users to communicate while also sending and receiving documents and/or multimedia content (such as images, videos, and music) through chat-like tools. These latter features make WhatsApp app useful for remote information sharing for health education in the era of fourth industrial revolution. The objective of this study is to evaluate the effectiveness of WhatsApp health education based on Health Belief Model (HBM) intervention called WEDMA to improve diabetes medication adherence, haemoglobin A1c (HbA1c), fasting blood sugar and body mass index (BMI) level among uncontrolled diabetes mellitus patients in primary healthcare.

Materials and Methods

A pragmatic cluster randomized controlled trial study design was conducted among uncontrolled (HbA1c >6.5%) T2DM patients in six health clinics in West Coast Division, Sabah with adequate sample size of 287 participants in which participants were randomly assigned into intervention and control groups. The intervention module named WEDMA was developed and validated using expert review approach with the content validation study showed that the S-CVI/Ave scored 0.98 and the S-CVI/UA scored 0.83 met acceptable values. For a duration of 12 weeks, each participant in intervention group received the health education intervention via the WhatsApp messaging app once a week containing the construct of HBM and modified sections with permission from Diabetes Education Manual 2020². Data were collected at baseline, first month, and third month. The Malaysia Medication Assessment Adherence Tool (MyMAAT) questionnaire showed good internal consistency of Cronbach's alpha 0.917. Data collected from questionnaire and medical records were analysed using IBM Statistical Package for Social Science (SPSS) version 28. This study received ethical approval from the Ministry of Health Malaysia's Medical Review and Ethics Committee (ethical approval: NMRR-ID-23-0097-XP1(IIR)).

Results and Discussion

A total of 420 potential eligible research subjects who visited the participating health clinics were identified and informed about participating in the study by trained healthcare professionals. Those who did not fit the criteria or refused to take part in the study were excluded, totalling 133. This study comprised 287 people with uncontrolled T2DM (mean age = 53.31 years, female = 54.4%, mean duration of diabetes = 6.23 years). The result for primary outcome of diabetes medication adherence scores using Friedman and Kruskal-Wallis tests were significant within group in both intervention and control groups ($p = 0.021$ and $p < 0.001$) but not significant between groups ($p > 0.05$). Using repeated measure analysis of variance (RM ANOVA), the results for secondary outcomes by comparing within, between and group*time interaction were $p < 0.001$, $p = 0.748$ and $p = 0.967$ for HbA1c, $p = 0.109$, $p = 0.950$ and $p = 0.512$ for fasting blood sugar and $p = 0.251$, $p = 0.315$ and $p = 0.236$ for BMI levels. The trial was conducted for 12 weeks with the intervention group received a health education WhatsApp message weekly in addition to standard diabetes care while the control group only received standard diabetes care. The Hawthorne effect, a motivational reaction to the attention obtained by taking part in a study, could be responsible for increased diabetes medication adherence in both the intervention and control groups³. This factors might have had an impact on the participants, leading them to unintentionally select the responses they thought were most appropriate⁴. The study's short period made it difficult to gauge how long the unfavourable findings would last. Furthermore, it's possible that the short follow-up period wasn't long enough to thoroughly assess clinical parameters (HbA1c and BMI) and sustained self-care behaviours^{4,5}.

Table 1: Median (interquartile range) of diabetes medication adherence scores

Time point, Measurement (n)	Group, Median (IQR) (n)	
	Intervention	Control
Baseline (n=266)	48.00 (13) (n=126)	48.00 (15) (n=140)
First month (n=230)	50.50 (10) (n=110)	51.50 (12) (n=120)
Third month (n=156)	48.00 (14) (n=72)	55.50 (11) (n=84)

Table 2: Summary of the effects of the WhatsApp messaging app health education program

Measurement	Intervention group	Control group	Between group
Diabetes medication adherence	Significant changes over time	Significant changes over time	No significant difference
HbA1c	Significant decrease over time	Significant decrease over time	No significant difference
Fasting blood sugar	Decreasing trend; not significant	Decreasing trend; not significant	No significant difference
BMI	Decreasing trend; not significant	Decreasing trend; not significant	No significant difference

Note: significant ($p < 0.05$)

Conclusion

This study demonstrated that a mobile health app is a practical innovation for traditional methods of providing treatment and generate new knowledge to assist health policies and programme. Future studies are required to comprehend the

mechanisms that produced these outcomes as well as any potential long-term consequences of the intervention.

References

1. Atolagbe ET, Sivanandy P, Ingle PV. Effectiveness of educational intervention in improving medication adherence among patients with diabetes in Klang Valley, Malaysia. *Frontiers in Clinical Diabetes and Healthcare*. 2023;Volume 4 - 2023.
2. Malaysia Diabetes Educators Society. Diabetes Education Manual 2020. 2020. 1-151 p.
3. Fry DE. The Hawthorne Effect Revisited. *Dis Colon Rectum*. 2018;61(1):6-7.
4. Sartori AC, Rodrigues Lucena TF, Lopes CT, et al. Educational Intervention Using WhatsApp on Medication Adherence in Hypertension and Diabetes Patients: A Randomized Clinical Trial. *Telemed J E Health*. 2020;26(12):1526-32.
5. Farmer A, Hardeman W, Hughes D, et al. An explanatory randomised controlled trial of a nurse-led, consultation-based intervention to support patients with adherence to taking glucose lowering medication for type 2 diabetes. *BMC Fam Pract*. 2012;13:30.

EPIDPP06 / 219

Depression Among Malaysian Adults: A Sociodemographic Comparison Between NHMS 2019 and NHMS 2023

Mohamad Aznuddin Abd Razak¹, S Maria Awaluddin¹, Norlaila Hamid¹, Wan Sarifah Ainin Wan Jusoh¹

¹ Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: aznuddin.ar@moh.gov.my

Summary

Data from the NHMS 2019 and NHMS 2023 were analysed to compare depression prevalence among individuals aged 16 and above along with its sociodemographic trends. The prevalence doubled from 2.3% in 2019 to 4.6% in 2023, with significant differences observed across ethnicity, marital status, and employment status in both years. This sharp increase underscores the urgent need for targeted mental health interventions to address rising depression rates in Malaysia.

Keywords

Depression, Malaysian adults, NHMS, PHQ-9

Introduction

Depression is a significant public health concern, affecting individuals' well-being and productivity worldwide¹. In Malaysia, the burden of mental health disorders, including depression, has been increasing over the years^{2,3}. Understanding trends in depression prevalence across different sociodemographic groups is crucial for informing mental health policies and interventions. Comparing the prevalence of depression among adults in the National Health and Morbidity Survey (NHMS), NHMS 2019, and NHMS 2023 can help to identify changing patterns and at-risk populations. This study aims to assess differences in depression prevalence by sociodemographic characteristics over time, providing insights into evolving mental health trends in Malaysia.

Materials and Methods

This study utilized secondary data from the NHMS 2019 and NHMS 2023, which are nationally representative cross-sectional surveys conducted by the Institute for Public Health, Malaysia. Depression status was assessed using the Patient Health Questionnaire-9 (PHQ-9). Key sociodemographic variables included age, sex, ethnicity, education level, household income, and employment status. Descriptive statistics were used to summarise depression prevalence for each survey year. The Chi-square test was employed to compare the prevalence of depression across sociodemographic subgroups for each year, 2019 and 2023. All analyses were weighted to account for NHMS's complex survey design. Data were analysed using SPSS software version 29, and statistical significance was set at $p < 0.05$.

Results and Discussion

The prevalence of depression among Malaysians aged 16 and above doubled from 2.3% in 2019 to 4.6% in 2023. Ethnic differences were prominent in both years, with Bumiputera Sarawak and Bumiputera Sabah populations reporting the highest

prevalence. Bumiputera Sarawak showed a notable increase from 3.6% in 2019 to 9.5% in 2023. Differences were also observed in marital status, where single individuals consistently had the highest depression prevalence, increasing from 3.3% to 8.0% in 2023. In contrast, married individuals, who generally benefit from social and emotional support, had the lowest prevalence, though an increasing trend was still noted. The rising trend among divorced/widowed individuals aligns with patterns often associated with social isolation and emotional distress, which are commonly linked to depression⁴. Similarly, differences were also observed across employment status. In 2019, government employees had the lowest prevalence, while unemployed individuals had the highest. However, in 2023, the highest prevalence was observed among students (9.0%), followed by unemployed individuals (6.7%) and private-sector workers (4.2%). These patterns may be influenced by factors such as academic pressure, job insecurity, and economic instability⁵. In 2019, rural areas reported higher depression rates than urban areas. By 2023, prevalence was similar in both settings (4.6%), indicating a more pronounced increase in urban depression. Sex differences became statistically significant in 2023, with females reporting a higher prevalence (5.4%) than males (3.9%). Depression prevalence was highest among lower-income groups (B40) in 2019, but by 2023, similar rates were observed across all income levels.

Table 1: Comparison of Depression: NHMS 2019 vs NHMS 2023

Category	2019			2023		
	Prevalence (%)	95% CI	p-value	Prevalence (%)	95% CI	p-value
Malaysia	2.3	(1.88, 2.80)	-	4.6	(4.08, 5.22)	-
Urban	1.9	(1.52, 2.37)	0.040	4.6	(3.99, 5.31)	0.958
Rural	3.6	(2.47, 5.22)	-	4.6	(3.61, 5.95)	-
Sex						
Male	2.0	(1.44, 2.71)	0.161	3.9	(3.20, 4.70)	0.010
Female	2.6	(2.05, 3.34)	-	5.4	(4.63, 6.24)	-
Ethnicity						
Malay	2.5	(1.96, 3.13)	0.003	5.0	(4.25, 5.89)	<0.001
Chinese	0.9	(0.54, 1.67)	-	2.6	(1.69, 4.11)	-
Indian	2.7	(1.54, 4.69)	-	6.9	(4.63, 10.04)	-
Bumiputera Sabah	5.1	(2.82, 9.17)	-	5.1	(3.46, 7.38)	-
Bumiputera Sarawak	3.6	(1.57, 7.92)	-	9.5	(6.51, 13.59)	-

Others	1.8	(0.74, 4.10)	-	2.8	(1.43, 5.37)	-
Marital Status						
Single	3.3	(2.40, 4.48)	0.022	8.0	(6.64, 9.51)	<0.001
Married	1.8	(1.40, 2.31)	-	2.9	(2.35, 3.50)	-
Separated/Divorced/Widowed	2.0	(1.23, 3.23)	-	4.7	(3.19, 7.00)	-
Education						
No formal education	2.0	(0.80, 4.89)	0.311	5.5	(3.29, 8.94)	0.355
Primary education	2.0	(1.33, 3.07)	-	4.1	(3.03, 5.64)	-
Secondary education	2.7	(2.09, 3.41)	-	4.8	(4.20, 5.53)	-
Tertiary education	1.9	(1.27, 2.73)	-	3.6	(2.42, 5.25)	-
Employment						
Government	0.9	(0.46, 1.85)	0.002	3.7	(2.32, 5.96)	<0.001
Private	1.8	(1.26, 2.54)	-	4.2	(3.30, 5.23)	-
Self-employed	2.2	(1.47, 3.17)	-	3.5	(2.45, 4.88)	-
Unpaid worker	2.7	(1.88, 3.88)	-	4.0	(3.01, 5.25)	-
Retiree	1.2	(0.23, 5.70)	-	2.6	(1.57, 4.40)	-
Students	3.2	(1.58, 6.40)	-	9.0	(6.79, 11.85)	-
Unemployed	4.5	(3.00, 6.63)	-	6.7	(5.28, 8.55)	-
Income Group						
B40	2.6	(2.05, 3.26)	0.048	4.7	(4.07, 5.51)	0.811
M40	1.7	(1.13, 2.62)	-	4.3	(3.45, 5.45)	-
T20	1.2	(0.55, 2.56)	-	4.6	(3.33, 6.44)	-

Conclusion

The doubling of depression prevalence in Malaysia from 2019 to 2023 highlights an urgent need for targeted mental health interventions. Strengthening mental health services, reducing stigma, and implementing workplace and educational support systems are essential steps to address this growing public health concern.

References

1. World Health Organization. Depressive Disorder (Depression) [Internet]. 2023 [cited 2025 Mar 17]. Available from: <https://www.who.int/news-room/fact-sheets/detail/depression>
2. Institute for Public Health. National Health and Morbidity Survey 2019, Non-communicable Diseases: Risk Factors and Other Health Problem. 2020.
3. Institute for Public Health. National Health and Morbidity Survey (NHMS) 2023: Non-communicable Diseases and Healthcare Demand. Malaysia; 2024.
4. Zhai X, Tong HHY, Lam CK, et al. Association and causal mediation between marital status and depression in seven countries. *Nat Hum Behav*. 2024 Nov 4;8(12):2392-405.
5. Mokona H, Yohannes K, Ayano G. Youth unemployment and mental health: prevalence and associated factors of depression among unemployed young adults in Gedeo zone, Southern Ethiopia. *Int J Ment Health Syst*. 2020;14(1):61.

EPIDPP07 / 220

Prevalence and Determinants of Anxiety in Individuals with Type 2 Diabetes Mellitus: Evidence from a Cross-Sectional Study in Southern Malaysia

Norizzati Amsah¹, Zaleha Md Isa², Norfazilah Ahmad², Zaid Kassim³

¹ Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

² Department of Public Health Medicine, National University of Malaysia

³ Tangkak District Health Office, Johor State Health Department, Tangkak, Johor, Malaysia

Corresponding author's email: norizzati.a@moh.gov.my

Summary

This cross-sectional study examined the prevalence of anxiety and associated factors among 330 type 2 diabetes mellitus (T2DM) patients in southern Malaysia. Sociodemographic and clinical data were collected, and anxiety was measured using the Generalized Anxiety Disorder-7 (GAD-7) questionnaire. Statistical analyses, including multiple logistic regression, were conducted using IBM SPSS 27.0. The prevalence of anxiety was 45.2%, with patients with primary education having a significant association with anxiety (AOR = 1.77, 95% CI: 1.12-2.80, $p = 0.015$). These findings highlight the need for routine anxiety screening in diabetes care and targeted psychological and educational support to improve mental well-being among T2DM patients, especially those with limited education.

Keywords

Type 2 diabetes mellitus, anxiety, Malaysia, level education

Introduction

Type 2 diabetes mellitus (T2DM) is a chronic metabolic disorder associated with various complications, including an increased risk of mental health disorders such as anxiety. Anxiety in T2DM patients can negatively impact self-care behaviors, glycemic control, and overall disease management, leading to poor health outcomes. Several factors, including sociodemographic characteristics and clinical conditions, may contribute to anxiety in this population. This study aims to determine the prevalence of anxiety and identify associated factors among T2DM patients in the southern region of Malaysia.

Materials and Methods

A cross-sectional study was conducted among 330 patients with type 2 diabetes mellitus (T2DM) in the southern region of Malaysia. Respondents were recruited using a systematic sampling method. The inclusion criteria were individuals aged 18 years and above diagnosed with T2DM for at least six months. Anxiety symptoms were assessed using the Generalized Anxiety Disorder-7 (GAD-7) questionnaire. A GAD-7 score of more than 4 was used as the cutoff to define clinically significant anxiety. Descriptive statistics were performed to summarize respondents' characteristics and the prevalence of anxiety. Simple and multiple logistic regression analysis was conducted to identify factors independently associated

with anxiety, adjusting for potential confounders. Statistical analyses were performed using IBM SPSS version 27.0, with significance at $p < 0.05$.

Results and Discussion

A total of 330 T2DM patients were included in the study, with a mean age of 62.49 years (SD = 10.64). The majority of respondents were Malay ethnicity (54.5%). Most respondents had primary (45.5%) or secondary (44.9%) education, while only 9.6% had tertiary education (Table 1). The prevalence of anxiety (GAD-7 score > 4) among T2DM patients was 45.2%. Multiple logistic regression analysis identified primary education as a significant predictor of anxiety among T2DM patients (AOR = 1.77, 95% CI: 1.12-2.80, $p = 0.015$).

Table 1: Sociodemographic Characteristics of respondents among T2DM patients, n=330.

Variables		Mean (Standard Deviation)	Frequency (%)
Age (years)		62.49 (10.64)	
Gender	Men		123 (37.3)
	Women		207 (62.7)
Race	Malay		180 (54.5)
	Chinese		93 (28.2)
	India		57 (17.3)
Education level	Primary education		150 (45.5)
	Secondary education		148 (44.9)
	Tertiary education		32 (9.6)
Anxiety	No		181 (54.8)
	Yes		149 (45.2)

Table 2: A significant association between primary education and a higher level of anxiety among patients with T2DM

Variable	B	S.E	Wald (df)	Adjusted Odd Ratio	95% Confidence interval	p-value
Level of education						
Primary	0.570	0.235	5.875	1.77	1.12-2.80	0.015*
Secondary	0.248	0.397	0.307	1.09	0.50-2.36	0.837
Tertiary (Reference)				1.00		

* p <0.05 indicate significant differences

The prevalence of anxiety observed in this study is relatively high, aligning with previous research indicating that individuals with T2DM are at an increased risk of mental health disorders due to the psychological burden of disease management and complications¹. Patients with only primary education had a higher risk of experiencing anxiety compared to those with tertiary education. This suggests that individuals with lower education levels may have limited health literacy, reduced coping skills, and lower access to resources for managing stress and anxiety².

Conclusion

Anxiety was prevalent among T2DM patients, affecting 45.2% of respondents, with lower education (primary level) as a significant risk factor. These findings highlight the necessity of integrating mental health support into diabetes management. Routine anxiety screening, promoting patient education, and targeted psychological interventions are essential to improve mental well-being and overall quality of life.

References

1. Andriani S, Effendy E, Nasution NMS. Factors related to anxiety scores in diabetes mellitus outpatients at the universitas sumatera utara hospital. *Open Access Maced J Med Sci*. 2021;**9**(T3):196-200.
2. Al-Rasheedi AAS. The Role of Educational Level in Glycemic Control among Patients with Type II Diabetes Mellitus. *Int J Health Sci (Qassim)*. 2014;**8**(2):177-87.

EPIDPP08 / 223

Prevalence and Associated Factors of Metabolic Syndrome Among Teachers in Peninsular Malaysia: The CLUSTER Cohort Study

Chong Chean Tat^{1,2}, Moy Foong Ming¹

¹ Department of Social and Preventive Medicine, Faculty of Medicine, Universiti Malaya, Kuala Lumpur, Malaysia

² Institute for Public Health, National Institute of Health, Ministry of Health Malaysia, Shah Alam, Malaysia

Corresponding author's email: chean@moh.gov.my

Summary

This study investigated the prevalence and factors associated with Metabolic Syndrome (MetS) among Malaysian public-school teachers. A secondary data analysis of the CLUSTER study was conducted, involving 3,145 teachers. The prevalence of MetS was 19.1%, with significant variations across demographics and lifestyle factors. Increased age, male gender, Indian and Malay ethnicity, smoking, and family history of diabetes were significantly associated with higher MetS risk. These findings highlight the need for targeted interventions to address these specific risk factors and effectively mitigate MetS among this population.

Keywords

Metabolic Syndrome, prevalence, associated factors, teachers, Malaysia

Introduction

The global rise in obesity, as reported by the WHO, has led to an increased prevalence of metabolic syndrome (MetS) and related non-communicable diseases, including cardiovascular disease (CVD) and type 2 diabetes mellitus (T2DM)¹. Malaysia has experienced a significant increase in overweight and obesity, contributing to a substantial MetS burden². Although national surveys suggest a recent decline in MetS prevalence, it remains a significant public health concern. MetS, primarily driven by physical inactivity, smoking, and other lifestyle factors, significantly elevates CVD and T2DM risk. CVD, a leading cause of mortality globally and in Malaysia, is often exacerbated by diabetes. Occupational groups, such as teachers, face unique health challenges, including high stress and sedentary work conditions, increasing MetS risk. This study aims to determine the prevalence and the factors associated with MetS among Malaysian teachers, addressing a critical gap in understanding and mitigating this occupational health issue.

Materials and Methods

This study conducted a secondary data analysis of the CLUSTER study, focusing on Malaysian teachers from Kuala Lumpur, Selangor, and Johor. The original study (2013-2015) used multi-stage sampling across six states, but this analysis narrowed it to three due to dietary data availability. Data collection included sociodemographic (age, sex, marital status, ethnicity, smoking status, family history of non-communicable diseases), dietary intake (Healthy Eating Index via Food Frequency Questionnaire), physical activity (International Physical Activity

Questionnaire), and metabolic health markers. MetS was defined using the 2009 Joint Interim Statement criteria, including waist circumference, blood pressure, fasting glucose, triglycerides, and HDL-C levels. Statistical analysis, including descriptive statistics, Pearson's χ^2 test, and binary logistic regression, was conducted in SPSS version 28, with missing data handled via multiple imputation. The study aimed to identify factors associated with MetS among teachers, with statistical significance set at $p < 0.05$.

Results and Discussion

A total of 3,145 public school teachers were included in this study. The overall MetS prevalence was 19.1%. Older age (≥ 50 years) had a significantly higher MetS prevalence (28.0%) compared to younger individuals (7.8% in those aged 20-29). Males had a higher prevalence (28.1%) than females (17.1%). Ethnicity played a crucial role, with Indian respondents exhibiting the highest MetS prevalence (31.6%), followed by Malay (21.4%) and Chinese (10.5%). Marital status also influenced prevalence, with married individuals (20.6%) showing higher rates than single (10.7%) or widowed/divorced individuals (17.8%). Lifestyle factors such as smoking (35.5% vs. 18.6% in non-smokers) and a family history of diabetes mellitus (24.8%) were also significantly linked to higher prevalence of MetS.

Multivariate analysis confirmed these associations (Table 1), with older age (aged ≥ 50 year, AOR 4.26, 95%CI: 2.70, 6.72), male gender (AOR 1.67, 95%CI: 1.33, 2.11), and ethnicity (Indians, AOR 3.54, 95%CI: 2.42, 5.17; Malays, AOR 2.16, 95%CI: 1.66, 2.81) significantly increasing MetS risk. Smoking also raised the odds (AOR 1.68, 95%CI: 1.01, 2.79). Although crude analysis suggested an association between lower Healthy Eating Index scores and MetS, this association disappeared after adjusting for confounders. Family history of diabetes (AOR 1.63, 95%CI: 1.33, 2.06) remained significant, whereas family history of hypertension (HPT) and hyperlipidemia (HPL) did not. Physical activity also did not show a significant association.

Table 1: Factors Associated with MetS

Variables	MetS			
	Crude Odd Ratio	P value	Adjusted Odd Ratio	P value
Age (years)				
• 20- 29	Ref		Ref	
• 30-39	1.82 (1.21, 2.73)	0.004	1.64 (1.07, 2.53)	0.025
• 40-49	3.57 (2.40, 5.31)	<0.001	3.16 (2.06, 4.84)	<0.001
• ≥ 50	4.28 (2.83, 6.49)	<0.001	4.26 (2.70, 6.72)	<0.001
Sex				
• Male	1.86 (1.51, 2.29)	<0.001	1.67 (1.33, 2.11)	<0.001
• Female	Ref		Ref	
Ethnicity				
• Malay	2.25 (1.76, 2.87)	<0.001	2.16 (1.66, 2.81)	<0.001
• Indian	3.72 (2.59, 5.35)	<0.001	3.54 (2.42, 5.17)	<0.001
• Chinese	Ref		Ref	

Marital Status				
• Single	Ref		Ref	
• Married	2.17 (1.59, 2.94)	<0.001	1.15 (0.82, 1.62)	0.410
• Widowed/Divorced	1.88 (0.95, 3.72)	0.070	0.90(0.45, 1.81)	0.766
Physical activity level				
• Low				
• Moderate	1.01 (0.78, 1.31)	0.931	NA	NA
• High	1.10 (0.82, 1.46)	0.536		
	Ref			
Healthy Eating Index				
• Q1	0.69 (0.53, 0.89)	0.005	0.79 (0.60, 1.05)	0.104
• Q2	0.91 (0.71, 1.16)	0.440	0.98 (0.76, 1.28)	0.907
• Q3	0.97 (0.77, 1.24)	0.829	1.10 (0.85, 1.42)	0.480
• Q4	Ref		Ref	
Smoker				
• No	Ref		Ref	
• Yes	2.49 (1.57, 3.97)	<0.001	1.68 (1.01, 2.79)	0.047
Family History of DM				
• No	Ref		Ref	
• Yes	1.78 (1.46, 2.17)	<0.001	1.63 (1.33, 2.06)	<0.001
Family History of HPT				
• No	Ref		Ref	
• Yes	1.37 (1.14, 1.66)	0.001	1.15 (0.93, 1.41)	0.190
Family History of HPL				
• No	Ref		NA	NA
• Yes	1.12 (0.90, 1.39)	0.301		

These findings highlight key MetS risk factors, emphasizing the need for targeted interventions, particularly among older, male, Malay, and Indian individuals, as well as smokers and those with a family history of diabetes. The lack of correlation between diet and physical activity with MetS may have been due to the use of a self-reported questionnaire which is prone to recall bias. Despite inconclusive results regarding diet and physical activity, promoting healthier lifestyles remains essential³. These indicated a need for a targeted intervention approach to mitigate MetS among the teachers in Malaysia^{4,5}. Further research is needed to explore protective factors and refine strategies to mitigate MetS risk in this population.

Conclusion

This study highlights MetS risk factors among Malaysian teachers, including older age, male gender, Indian and Malay ethnicity, smoking, and family history of diabetes. Targeted interventions are crucial to mitigate these risks. Future research should explore protective factors and causal pathways to develop effective, evidence-based prevention and intervention strategies.

References

1. Schlaich M, Straznicky N, Lambert E, et al. Metabolic syndrome: a sympathetic disease?. *The lancet Diabetes & endocrinology*. 2015;3(2):148-57.

2. Institute for Public Health (IKU). National Health and Morbidity Survey (NHMS) 2023: Non-Communicable Diseases and Healthcare Demand: Technical Report; 2024.
3. Thor SM, Yau JW, Ramadas A. Nutritional and lifestyle intervention strategies for metabolic syndrome in Southeast Asia: A scoping review of recent evidence. *PLoS One*. 2021;**16**(9):e0257433.
4. Wang H, Dai Y, Huang S, et al. A new perspective on special effective interventions for metabolic syndrome risk factors: a systematic review and meta-analysis. *Frontiers in Public Health*. 2023;**11**:1133614.
5. Mahadzir MD, Quek KF, Ramadas A. Group-based lifestyle intervention strategies for metabolic syndrome: A scoping review and strategic framework for future research. *Medicina*. 2021;**57**(11):1169.

EPIDPP09 / 224

Epidemiology and Predicting Mortality in Melioidosis Patients in Sandakan, Malaysia

Mohamad Hafiz Mohamad Nasir¹, Mohd Faiz Gahamat¹, Nafsah Dulajis¹, Aima Bungsu¹, Saint Alvendy Daraim¹, Rowena Jamilus¹, Hafiez Syam Basrin¹, Muhammad Jikal²

¹ Sandakan District Health Office

² Sabah State Health Department

Corresponding author's email: delishazahra2019@gmail.com

Summary

This study shines a spotlight on the factors that influence survival outcomes in melioidosis patients in Sandakan, Malaysia, based on a comprehensive analysis of cases spanning 2017 to 2024. Researchers examined 128 cases, most of which involved Malaysian individuals exposed to *Burkholderia pseudomallei* through their occupations, such as farming or fishing. Pneumonia emerged as the most common symptom, while blood samples were the primary source for detecting the bacteria. The study also uncovered critical risk factors for mortality, with diabetes mellitus and Malaysian nationality significantly increasing the likelihood of death. Alarming, the overall case fatality rate stood at 28.13%. Using logistic regression, the researchers developed a predictive model that showed a moderate level of accuracy (AUC-ROC: 0.67). These findings underscore the urgent need for focused and localized research to develop tailored treatment strategies.

Keywords

Melioidosis, Epidemiology, Mortality, Sandakan, Sabah

Introduction

Melioidosis, an infectious disease caused by the bacterium *Burkholderia pseudomallei*, poses a serious threat to public health, particularly in tropical regions. Endemic in countries such as Malaysia, Thailand, and northern Australia, melioidosis is often underdiagnosed and poorly managed due to its varied clinical presentations and diagnostic challenges. The disease can appear in multiple forms, ranging from localised abscesses to life-threatening septicaemia, making prompt diagnosis and accurate prognosis critical for improving patient outcomes. Despite advancements in understanding the epidemiology and pathogenesis of melioidosis, significant gaps remain in identifying consistent predictors of mortality and enhancing treatment approaches. Regional studies suggest that risk factors and outcomes may vary depending on geographical, demographic, and healthcare resource differences. However, in Malaysia, where melioidosis continues to be

underreported and inadequately studied, there is an urgent need for comprehensive and locally relevant data to guide better disease management strategies.

Materials and Methods

A retrospective cohort study was done on data recorded in the Sandakan District Health Office Registry from January 2017 until June 2024. All melioidosis patients diagnosed were notified through administrative notifications and subsequently investigated using standardised investigation forms. Inclusion criteria comprised confirmed melioidosis diagnosis and complete clinical records. Among the variables collected are socio-demographic information, underlying medical conditions, clinical presentations, anatomical location, laboratory investigation results, occupational exposures as well as environmental sampling findings. Multiple logistic regression analysis was employed to identify independent predictors of mortality. The model's performance was evaluated using the area under the receiver operating characteristic curve (AUC-ROC).

Results and Discussion

Among the 128 cases reported, 105(82.03%) were Malaysian. An increasing trend of incidence rate was seen throughout the years with 1.2/ 10,000 populations in 2023. Cases were registered from 11 division areas of Sandakan with the majority of the cases reported from the areas of Sentosa, Beatrice, and Sibuga. Among the reported cases, most individuals were potentially exposed to the pathogen through occupational activities like farming, forestry, fishing (n=49, 38.28%), and gardening (n=23, 17.97%). Several clinical presentations were observed, with the majority presenting as Pneumonia (n=79, 57.66%), followed by Soft Tissue Abscess (n=16, 11.68%). The most frequently isolated clinical specimen containing *Burkholderia pseudomallei* was Blood (n=110, 85.94%), followed by Pus (n=8, 6.25%), Sputum (n=4, 3.13%), Swab (n=3, 2.59%), Tissue (n=2, 1.56%), and Fluid (Pericardial) (n=1, 0.78%). Challenges yet lie ahead in determining the source of infection. Pipe water (n=2, 1.18%) and soil (n=1, 0.39%) was the only environmental samples taken, which yielded *Burkholderia pseudomallei*. Mortality among those cases was also reported to be high (CFR: 28.13%) and 72 (56.25% of the cases were registered as Melioidosis had pre-existing Diabetes Mellitus. Significant predictors of mortality identified in the multivariate model included presence of Diabetes Mellitus (OR: 2.71 mortality compared to patients without diabetes mellitus, 95% CI: 1.23-5.99), and being a Malaysian (OR: 3.31 mortality compared to Non Malaysian, 95% CI: 1.19-9.13). The predictive model demonstrated acceptable discriminative ability with an AUC-ROC of 0.67 (95% CI: 0.57-0.78).

Conclusion

This study sheds light on how diabetes mellitus and being Malaysian influence the chances of survival among melioidosis patients. By recognising these factors, we can better personalise treatments and enhance patient care, potentially saving

lives. This research supports existing studies, revealing that diabetes mellitus and Malaysian nationality heighten the risk of death in Melioidosis patients. Future research should delve deeper into how these factors interact and devise specific approaches to better protect those most at risk.

References

1. Chrispal A, Rajan SJ, Sathyendra S. The clinical profile and predictors of mortality in patients with melioidosis in South India. *Tropical Doctor*. 2010;**40**(1):36-38. DOI: 10.1258/td.2009.090093.
2. Mardhiah K, Wan-Arfah N, Naing NN, et al. Predictors of in-hospital mortality by logistic regression analysis among melioidosis patients in Northern Malaysia: A retrospective study. *Asian Pacific Journal of Tropical Medicine*. 2021;**14**(8):356-363.
3. Sopian M, Mahani SMAS, Akmalina H, et al. Communicable Disease Control in the 2014 Pahang Flood. *Journal of Health Management*. 2022;**1**(1):81-102.
4. Mardhiah K, Wan-Arfah N, Naing NN, et al. The Cox model of predicting mortality among melioidosis patients in Northern Malaysia: A retrospective study. *Medicine (Baltimore)*. 2021;**100**(25):e26160.
5. Menon R, Baby P, Kumar VA, et al. Risk factors for mortality in melioidosis: A single-centre, 10-year retrospective cohort study. *ScientificWorldJournal*. 2021;**2021**:8154810.
6. Limmathurotsakul D, Wongratanacheewin S, Teerawattanasook N, et al. Increasing incidence of human melioidosis in Northeast Thailand. *American Journal of Tropical Medicine and Hygiene*. 2010;**82**(6):1113-1117.
7. Wagner GE, Förderl-Höbenreich E, Assig K, et al. Melioidosis DS rapid test: A standardized serological dipstick assay with increased sensitivity and reliability due to multiplex detection. *PLOS Neglected Tropical Diseases*. 2020;**14**(7):e0008452.

EPIDPP10 / 232

A case study of the Implication of World Health Organization (WHO) Position on TAK-003 Dengue Vaccine to Malaysia

Chong Zhuo Lin¹

¹ Institute for Public Health, National Institutes of Health, Ministry of Health, Malaysia.

Email: chongzl@moh.gov.my

Summary

TAK-003 is the second dengue vaccine ever licensed. Its efficacy against dengue virus serotype 3 and 4 was underpowered to rule out the risk of severe dengue among previously uninfected vaccine recipients. WHO could only recommend a targeted subnational public vaccination program in high dengue transmission settings. Petaling district, Selangor, has one of the highest burden of dengue in Malaysia. Even then, it could not fulfil the WHO criteria for TAK-003 vaccination. Other districts with similar or lower dengue burden would be less likely to meet the criteria. Programmatic adoption of TAK-003 in Malaysia is not fully indicated currently.

Keywords

Dengue, vaccination, TAK-003, WHO position, Malaysia

Introduction

Dengue is a significant public health threat. There are four dengue virus serotypes (DENV-1 to DENV-4). Infection by one serotype confers sustained protection against it, but partial cross-protection against other serotypes. As the cross-protective antibodies wane, an infection by another serotype could be severe, causing hospitalization and/or mortality¹. The first licensed dengue vaccine, CYD-TDV, could increase the risk of severe dengue among seronegative vaccinees, making it indicated mainly for seropositive individuals. The second dengue vaccine, TAK-003, was licensed in recent years by multiple regulatory agencies worldwide¹. In 2024, TAK-003 was conditionally approved in Malaysia², and WHO has also released its position paper concerning the vaccine¹. This study aims to assess the implication of WHO position on TAK-003 to Malaysia.

Materials and Methods

This is a case study. The Petaling district, Selangor is used as the case and proxy for Malaysia as it has one of the highest dengue burden in Selangor state, which in turn tops the same chart in Malaysia. A public-funded dengue vaccination program is more indicated here than elsewhere. Secondly, it has the most recently published dengue seroprevalence study that was the only one in Malaysia that reported age-specific data including that of children³, which form part of the criteria for TAK-003 vaccination published in the third and latest WHO position paper on dengue vaccines released in May 2024¹. This position paper contains the endorsed WHO Strategic Advisory Group of Experts (SAGE) recommendations on the use of dengue vaccines, focusing on TAK-003 but with summary of the previous two papers on CYD-TDV.

Results and Discussion

The WHO position paper on TAK-003 and the dengue seroprevalence study in Petaling district are summarized in Box 1 & 2, respectively.

Box 1 : Summary of the WHO position paper on TAK-003 dengue vaccine

Key findings on TAK-003 dengue vaccine ▪ A live-attenuated tetravalent vaccine containing a DENV-2 strain (TDV-2) and three other recombinant strains with TDV-2 as backbone ▪ Primary series: 2 doses administered 3 months apart ▪ Licensed for aged ≥ 4 years by European and the United Kingdom's regulatory agencies ▪ Safety: well tolerated during the clinical trials ▪ Vaccine Efficacy (VE) assessed up to 57 months from the 1st dose: ○ efficacious in preventing virologically-confirmed dengue (VCD) with or without hospitalization in 4-16 years old (in clinical trials at endemic countries) and 18-60 years old (immuno-bridging studies at endemic/non-endemic settings); ○ in baseline seropositive subjects - efficacious against all DENV serotypes; ○ in baseline seronegative subjects - efficacious against DENV-1 & DENV-2; underpowered VE for DENV-3 & DENV-4- cannot rule out risk of severe dengue; ○ higher VE in higher age groups (higher baseline seropositive); ○ higher VE against DENV-2 regardless of baseline serostatus.
Key points on WHO position ▪ WHO does not recommend TAK-003 for routine immunization programs at locations with low to moderate dengue transmission intensity until the risk of severe DENV-3 and DENV-4 infection in seronegative individuals can be ruled out; but countries could consider targeted subnational introduction in high transmission settings. ▪ Dengue transmission intensity can be assessed through: ○ age-specific seroprevalence, and/or; ○ age-specific dengue hospital admissions. ▪ Countries to decide the age-specific dengue seroprevalence threshold above which vaccination is indicated. But a setting with high dengue transmission typically has: ○ a dengue seroprevalence at 9 years old (SP9) of $>60\%$; ○ a mean age of peak dengue-associated hospitalizations of <16 years. ○ In high transmission settings, WHO does not recommend TAK-003 for children <6 years. TAK-003 can be used for children aged 6-16 years, optimally about 1-2 years prior to the age-specific peak incidence of dengue-related hospital admissions.

Box 2 : Summary of the most recent dengue seroprevalence study in Petaling district

- This study aimed to determine the prevalence of past dengue infection in Petaling.
- A prospective cross-sectional study conducted at the end of 2018
- At two communities in Petaling district, Selangor: Section 7 Shah Alam (highest dengue incidence in preceding five years) & Section 10 Petaling Jaya (a few cases/five years)
- Cluster random sampling of residents aged ≥ 9 months old proportional to population size: 500 participants / 533 eligible (94% response rate)
- Serum specimens tested with haemagglutination inhibition, IgG enzyme-linked immunosorbent assay, and focus reduction neutralization test for dengue. Past dengue infection defined as present if at ≥ 2 out of 3 tests positive.
- The overall dengue seroprevalence in Petaling was 79% (95% CI 75.2-82.4). Age-specific dengue seroprevalence (95%CI) by location as below:

Age (yr)	<10	10-19	20-29	30-39	40-49	50-59	≥ 60
Sec. 7 S.A.	53% (39-67)	91% (82-96)	75% (67-82)	76% (62-86)	90% (80-95)	95% (81-99)	100%
Sec. 10 P.J.	0	9% (1-47)	64% (32-87)	67% (23-93)	67% (23-93)	85% (61-95)	94% (79-99)

Within the district with the highest dengue burden in Malaysia, the dengue transmission intensity is not homogenous between different communities. In a low transmission setting like Section 10 Petaling Jaya, the age-specific dengue seroprevalence increased over time with a steep jump between 10-19 and 20-29 years old. In contrast, in a high dengue transmission setting like Section 7 Shah Alam, the dengue seroprevalence was already elevated in the youngest age group and peaked at 10-19 years, followed by a dip due possibly to immigration of previously uninfected population³, and subsequently increased over time gradually. Despite having a higher transmission intensity in the district with one of the highest dengue burden in Malaysia, the dengue seroprevalence of <10 years old in Section 7 Shah Alam was still lower than the SP9 threshold of 60% typically considered as high transmission setting by the WHO^{1,3}, therefore making a weaker case for a targeted programmatic introduction of TAK-003. The case for the same intervention in other districts or communities with lower dengue burden is possibly even less justifiable. However, further studies are required to substantiate that, preferably using secondary age-stratified dengue hospitalization data, in view of the costs associated with a prevalence study.

Conclusion

WHO recommends TAK-003 only for targeted subnational programs in high dengue transmission settings, the criteria of which Petaling district with one of the highest

dengue burden in Malaysia could not fulfil, and possibly other communities as well. Programmatic adoption of TAK-003 in Malaysia is not fully indicated currently.

Acknowledgement

The author would like to thank the Director General of Health, Malaysia, for the permission to publish this abstract.

References

1. World Health Organization. WHO position paper on dengue vaccines - May 2024. 2024. www.who.int/publications/i/item/who-wer-9918-203-224
2. National Pharmaceutical Regulatory Agency, Malaysia. Facts about Qdenga (Dengue tetravalent vaccine (live, attenuated)). 2024. www.npra.gov.my/media/attachments/2024/05/21/dengue-vaccine-qdenga--frequently-asked-questions.pdf
3. Ng RJ, Chong ZL, Abdul Mutalip MH, Ng CW. Dengue Seroprevalence and Factors Associated with Dengue Seropositivity in Petaling District, Malaysia. *International journal of environmental research and public health*. 2022;**19**(12).

EPIDPP11 / 235

Prevalence and associated factors among overweight and obese adults with hypertension in Malaysia

Nor Azian Mohd Zaki¹, Khairul Hasnan Amali¹, Syafinaz Sallehuddin¹, Kishwen Kanna Yoga Ratnam¹

¹ Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: norazianmz@moh.gov.my

Summary

This study aimed to determine the prevalence and associated factors among overweight and obese adults with hypertension in Malaysia using data from the National Health & Morbidity Survey 2023 (NHMS 2023). Descriptive statistics and multivariable logistic regression analyses were conducted using IBM SPSS version 26.0. The findings indicate that the prevalence of overweight and obese adults with hypertension was 21.6%. Multivariable logistic regression analysis identified age, diabetes and hypercholesterolaemia as significant factors associated with being overweight and obese among adults with hypertension. These findings underscore the need for targeted public health interventions to reduce the impact of obesity-related hypertension in Malaysia.

Keywords

Overweight, Obesity, Hypertension, Body Mass Index, NHMS

Introduction

Overweight and obesity rates are closely linked to an increased incidence of non-communicable diseases (NCDs), notably hypertension¹. The increasing prevalence of these conditions poses significant challenges for Malaysia's healthcare system, highlighting the need for population-based studies to assess their distribution and associated risk factors. This study aimed to determine the prevalence and associated factors among overweight and obese adults with hypertension aged 18 years and above in Malaysia.

Materials and Methods

Data was obtained from the National Health & Morbidity Survey (NHMS 2023), a cross-sectional population-based study using a two-stage stratified random sampling design. Overweight and obesity were defined as body mass index (BMI) of 25.0-29.9 kg/m² and ≥ 30.0 kg/m², respectively. A respondent was classified as hypertensive if they had previously been diagnosed with hypertension by a physician and had a systolic blood pressure of >140 mmHg and/or a diastolic blood pressure of >90 mmHg based on clinical measurements taken during the survey. Complex sample analysis procedures were utilised to generate descriptive statistics and to perform multivariable logistic regression using IBM SPSS version 26.0.

Results and Discussion

The prevalence of overweight and obese adults with hypertension was 21.6% (95% CI: 20.2-23.0), with a higher prevalence observed in rural areas (23.9%) compared

to urban settings (20.9%). Females (23.1%) were more affected than males (20.2%). Among ethnic groups, Bumiputera Sarawak had the highest prevalence (29.8%), while the lowest was recorded in the Others category (13.0%). Further analysis showed that increasing age (aOR = 1.04, $p < 0.001$), Bumiputera Sarawak ethnicity (aOR = 1.23, $p = 0.004$), being married (aOR = 1.41, $p = 0.010$), diabetes (aOR = 2.81, $p < 0.001$), and hypercholesterolaemia (aOR = 2.09, $p < 0.001$) were significantly associated with higher odds of being overweight and obese with hypertension. These findings align with a study conducted in China, which reported a prevalence of obesity-related hypertension of 22.8%, with the highest rates observed among women². Additionally, age has been identified as an independent risk factor for hypertension among overweight and obese individuals³. The positive correlation between overweight and obesity with hypertension, diabetes and hypercholesterolaemia may be attributed to underlying mechanisms such as insulin resistance and chronic inflammation⁴.

Table 1: Prevalence of overweight and obese adults with hypertension in Malaysia (n=2688)

Characteristic		n	%	95% CI	
				Lower	Upper
Overall		2688	21.6	20.2	23.0
Age*			51.9 (23.3)*		
Locality	Urban	1991	20.9	19.4	22.5
	Rural	677	23.9	20.8	27.2
Gender	Male	1150	20.2	18.3	22.1
	Female	1518	23.1	21.6	24.8
Ethnic	Malay	1652	22.9	21.4	24.5
	Chinese	350	20.5	16.5	25.2
	Indian	178	23.0	19.1	27.5
	Bumiputera Sabah	250	19.8	16.6	23.5
	Bumiputera Sarawak	129	29.8	24.5	35.6
	Others	109	13.0	9.5	17.6
Marital status	Never married	207	8.4	6.9	10.3
	Married	1983	25.6	23.9	27.4
	Separated/ Widow	475	36.4	32.9	40.0
Education	No formal/Primary	817	29.8	26.7	33.2
	Secondary	1617	20.7	19.2	22.2
	Tertiary	227	2.2	1.8	2.7
Diabetes	No	1554	15.9	14.8	17.2
	Yes	1114	51.1	47.8	54.4
Hypercholesterolaemia	No	957	13.2	11.9	14.5
	Yes	1711	37.4	35.2	39.5

*Data in mean (SD)

Table 2: Associated factors among overweight and obese adults with hypertension

Characteristic		cOR	95% CI		p-value	aOR	95% CI		p-value
			Lower	Upper			Lower	Upper	
Age		1.06	1.05	1.07	<0.001	1.04	1.03	1.05	<0.001
Locality	Urban	1.00	-	-		1.00	-	-	
	Rural	1.19	0.97	1.45	0.095	1.07	0.87	1.31	0.542
Gender	Male	1.00	-	-		1.00			
	Female	1.19	1.05	1.36	0.009	1.06	0.92	1.22	0.401
Ethnic	Malay	1.99	1.39	2.85	<0.001	1.27	0.89	1.82	0.177
	Chinese	1.73	1.11	2.68	0.015	0.96	0.63	1.47	0.860
	Indian	1.99	1.31	3.05	0.061	1.03	0.07	1.58	0.882
	Bumiputera Sabah	1.65	1.11	2.45	0.014	1.26	0.85	1.87	0.246
	Bumiputera Sarawak	2.83	1.88	4.41	<0.001	1.91	1.23	2.94	0.004
	Others	1.00	-	-		1.00	-	-	
Marital status	Never married	1.00	-	-		1.00	-	-	
	Married	3.74	2.97	4.72	<0.001	1.41	1.08	1.84	0.010
	Separated/ Widow	6.22	4.79	8.05	<0.001	1.21	0.89	1.66	0.230
Education	No formal /Primary	2.41	1.85	3.15	<0.001	1.12	0.83	1.49	0.467
	Secondary	1.48	1.18	1.85	<0.001	1.26	1.01	1.59	0.054
	Tertiary	1.00	-	-		1.00	-	-	
Diabetes	No	1.00	-	-		1.00	-	-	
	Yes	5.51	4.76	6.38	<0.001	2.81	2.39	3.30	<0.001
Hyperchole strolaemia	No	1.00				1.00	-	-	
	Yes	3.94	3.46	4.47	<0.001	2.09	1.83	2.38	<0.001

cOR: Crude odd ratio, aOR: Adjusted odd ratio

Conclusion

The prevalence of overweight and obese adults with hypertension is high in Malaysia. Targeted public health interventions are urgently needed to prevent and manage overweight and obesity-related hypertension. Community-based awareness programmes and strengthened healthcare strategies can help mitigate the growing burden of these interrelated conditions in Malaysia.

References

1. Chu DT, Singh V. Obesity and hypertension in Asia: Current status and challenges. *The Lancet Regional Health-Western Pacific*. 2021;**15**.
2. Zhang Y, Hou LS, Tang WW, et al. High prevalence of obesity-related hypertension among adults aged 40 to 79 years in Southwest China. *Scientific reports*. 2019;**9**(1):15838.
3. Li L, Cheng S, Xu G. Identification of risk factors for hypertension in overweight and obese people and analysis of risk factor interactions: an R-based analysis. *Front Cardiovasc Med*. 2023;**10**:1180698.
4. Battineni G, Sagaro GG, Chintalapudi N, et al. Impact of obesity-induced inflammation on cardiovascular diseases (CVD). *International Journal of Molecular Sciences*. 2021;**22**(9):4798.

EPIDPP12 / 237

Assessing Cardiovascular Diseases Mortality in Malaysia, 2023

Nazirah Alias¹, Nur Hamizah Nasaruddin¹, Khaw Wan-Fei¹, Tham Sin Wan¹, Wan Kim Sui¹, Shubash Shander Ganapathy¹, Mohd Azahadi Omar²

¹ Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

² Sector of Biostatistics & Data Repository, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: nazirah.alias@moh.gov.my

Summary

Cardiovascular diseases (CVDs) are the leading cause of death worldwide. Understanding CVDs mortality is essential to reduce the CVD-related burden. This study aims to identify the leading causes of CVDs deaths in Malaysia in 2023 and their respective death rates. CVDs accounted for one-third of total deaths in 2023, with the increasing mortality rate in age 40 years and above. Accurate data, targeted preventive measures, and public health initiatives are crucial to reduce CVD-related deaths and improving Malaysia's overall well-being.

Keywords

Cardiovascular diseases (CVDs), premature mortality, deaths, age-standardized death rate, burden of disease

Introduction

Cardiovascular diseases (CVDs) are the leading cause of death globally, responsible for 38% of premature deaths under the age of 70 among all noncommunicable diseases¹. In Malaysia, CVDs also contributed to the highest premature mortality rates in both males and females². This substantial burden highlights the importance of understanding CVDs mortality for effective prevention, early detection, and management strategies to reduce mortality. This study aims to identify the leading causes of CVD deaths in Malaysia in 2023 and their respective death rates, providing insights to mitigate the impact of CVDs.

Materials and Methods

This cross-sectional study utilised all mortality data in 2023, obtained from the Department of Statistics Malaysia. Deaths in Malaysia were classified into medically certified deaths and non-medically certified deaths, categorised into 162 specific causes of death based on their International Classification of Diseases 10th Revision (ICD-10) codes, following methods from the Malaysian Burden of Disease and Injury Study. Ill-defined causes of death were redistributed either into specific causes, categories or groups to improve data accuracy. The final estimated causes of death for CVDs category were further analysed to determine the specific leading causes by sex and age groups. The World Standard Population (2000-2025) from the World Health Organization was used as a reference population to calculate the age-standardised death rate, using the direct method of age-standardisation.

Results and Discussion

In 2023, CVDs accounted for 73,482 deaths (37.3%) of the total 196,965 deaths in Malaysia. Deaths were higher in males (38.3%) compared to females (35.9%). The

three leading causes of CVD-related deaths were ischaemic heart disease (53.9%), stroke (31.2%), and hypertensive heart disease (3.5%). The mortality rate increased with age, particularly from the age of 40 years and above. Ischaemic heart disease and stroke were the primary contributors to CVDs burden among the 25-49 years age group and, with even higher rates among older age groups³. Over the past decade, Malaysia has experienced a significant increase in the prevalence of metabolic disorders such as obesity, diabetes, hypertension, and hypercholesterolaemia, which are the significant risk factors contributing to the increasing age-standardised mortality rate from CVDs⁴. The age-standardised death rate of 253.3 per 100,000 population, which is higher than the global rate (235.2 per 100,000 population) provides a clearer picture of the CVD burden by eliminating the effects of population aging⁵. These findings emphasise the urgent need for more substantial public health initiatives, including lifestyle modifications, enhanced disease management, and improved access to cardiovascular care. Implementing targeted preventive measures can significantly reduce CVD-related mortality and improve overall health outcomes in Malaysia.

Table 1: Age-standardized mortality rate for CVDs in Malaysia, 2023

Cause of death	Number of deaths	Crude death rate per 100,000 population	Age-standardized mortality rate per 100,000 population
All causes	196,965	589.7	675.6
Overall CVDs	73,482	220.0	253.3
Ischaemic heart disease	39,572	118.5	133.2
Stroke	22,953	68.7	81.7
Hypertensive heart disease	2,567	7.7	9.8

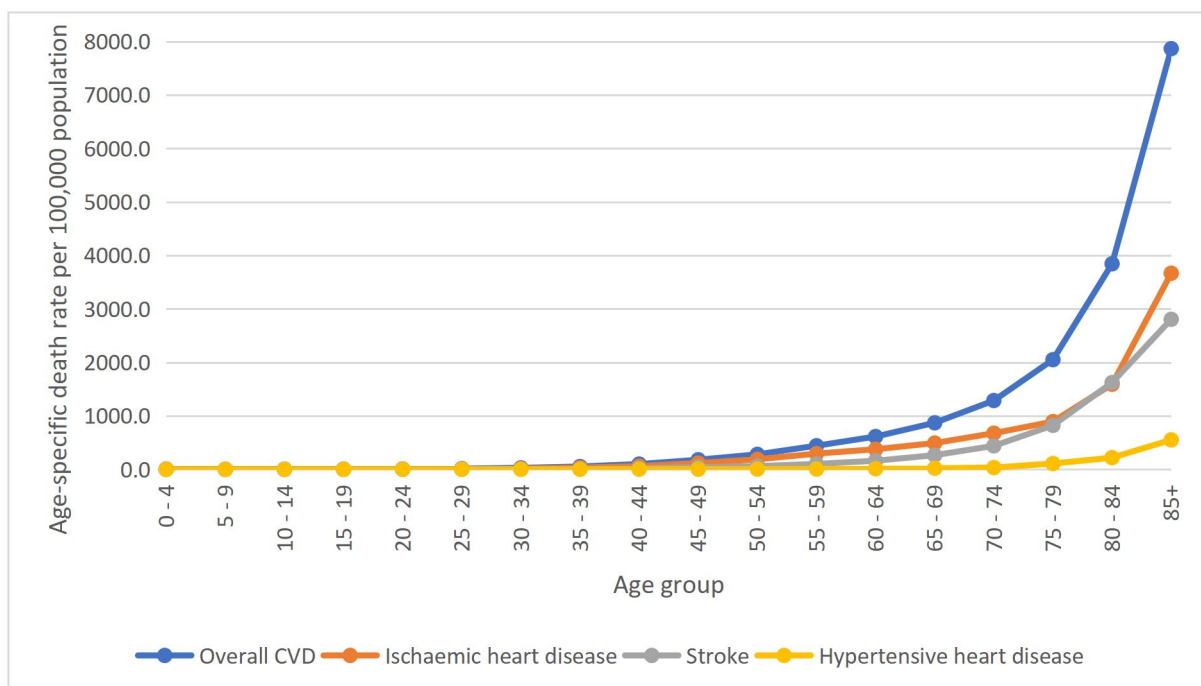


Figure 1: Age-specific death rate per 100,000 population by age group, both sexes, in Malaysia, 2023

Conclusion

CVD remain the leading cause of premature mortality in Malaysia, accounting for one-third of all deaths in 2023. Accurate and timely CVD statistics are essential for prioritizing prevention efforts, improving disease management, and raising public awareness of healthy lifestyles to reduce the growing burden of CVD-related deaths.

References

1. World Health Organization (2025). *Cardiovascular diseases (CVDs)*. Retrieved March 11, 2025, from [https://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-\(cvds\)](https://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds)).
2. Khaw WF, Chan YM, Nasaruddin NH, et al. Malaysian burden of disease: years of life lost due to premature deaths. *BMC Public Health*. 2023;23(1):1383.
3. Global burden of 369 diseases and injuries in 204 countries and territories, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019. *Lancet*. 2020;396(10258):1204-22.
4. Hasani WSR, Musa KI, Cheng KY, et al. Exploring the trend of age-standardized mortality rates from cardiovascular disease in Malaysia: a joinpoint analysis (2010-2021). *BMC Public Health*. 2024;24(1):2519.
5. Xia X, Tian X, Xu Q, et al. Global trends and regional differences in mortality of cardiovascular disease and its impact on longevity, 1980-2021: Age-period-cohort analyses and life expectancy decomposition based on the Global Burden of Disease study 2021. *Ageing Res Rev*. 2025;103:102597.

EPIDPP13 / 240

Prevalence and Determinants of Obesity Among Individuals with Diabetes in Malaysia: Findings from the National Health and Morbidity Survey 2023

Hasimah Ismail¹, Thamil Arasu Saminathan¹, Zamtira Seman², Halizah Mat Rifin¹, Tania Gayle Robert Lourdes¹, Hamizatul Akmal Abd Hamid¹, Mohd Ruhaizie Riyadhzi¹, Azli Baharudin¹, Muhammad Fadhli Mohd Yusoff¹

¹ Institute for Public Health, National Institutes of Health, Ministry of Health, Malaysia

² Sector of Statistics and Data Repository, National Institutes of Health, Ministry of Health, Malaysia

Corresponding author's email: hasimah.i@moh.gov.my

Summary

Obesity and diabetes mellitus (DM), whether they occur independently or in combination, significantly increase morbidity and mortality risks. This study analysed data from the National Health and Morbidity Survey (NHMS) 2023 to determine the prevalence and determinants of obesity among individuals with diabetes in Malaysia. The NHMS 2023 employed a multistage stratified sampling design based on population census data from the Department of Statistics Malaysia (DOSM), ensuring national representativeness. Diabetes was identified through fasting capillary blood glucose (FBG) ≥ 7.0 mmol/L or random blood glucose ≥ 11.1 mmol/L. Obesity was defined as a body mass index (BMI) ≥ 30 kg/m². The prevalence of obesity among individuals with diabetes in Malaysia is 30.4%. Multivariable logistic regression revealed that gender, age, diabetes duration, and hypertension were significantly associated. These findings underscore the importance of early, targeted interventions to prevent and manage obesity among Malaysians living with diabetes.

Keywords

Prevalence, determinants, obesity, diabetes, Malaysia

Introduction

Non-communicable diseases (NCDs) are one of the leading causes of mortality worldwide, with obesity significantly contributing to their burden, particularly in relation to DM. Obesity elevates the risk of hypertension, dyslipidaemia, stroke, cancer, coronary heart disease, and obstructive sleep apnoea¹. It is also a key modifiable risk factor for type 2 DM due to its role in insulin resistance². Understanding the prevalence and determinants of obesity among individuals with diabetes is essential for targeted interventions.

Materials and Methods

Data were derived from NHMS 2023, a nationally representative survey using a multistage stratified sampling design. The sampling framework was based on DOSM census data, stratified by state and urban/rural areas. Enumeration blocks (EBs) were selected as primary sampling units (PSUs), followed by random selection of living quarters (LQs) as secondary sampling units (SSUs), and individuals within selected LQs. Probability proportional to size (PPS) sampling ensured adequate

representation across states and urban/rural strata. Sampling weights accounted for non-response and post-stratification adjustments.

The total weighted population was 22,797,280, with 3,555,276 (15.6%) classified as diabetic and 19,242,004 (84.4%) as non-diabetics. This study focused on individuals with diabetes and stratification based on obesity status to assess its prevalence and determinants.

All statistical analyses were conducted using SPSS version 29.0, accommodating complex survey data. Descriptive statistics summarized the data with weighted prevalence estimates and 95% confidence intervals (CIs). A complex sample logistic regression model determined independent obesity determinants, with adjustment for confounders of age, gender, ethnicity, education, employment, income, physical activity, smoking, diabetes duration, hypertension, and hypercholesterolemia. Variables with $p < 0.25$ in bivariate analysis were included in the multivariable model, which has been assessed for goodness-of-fit using the Hosmer-Lemeshow test. Multicollinearity and interaction effects were examined.

Results and Discussion

Among the 2,308 individuals with diabetes, 643 (30.4%) were classified as obese. Descriptive analysis ($n=2,160$) showed obesity was more prevalent among females (38.6%), individuals aged 40-59 years (34.6%), rural residents (34.5%), other indigenous (40%), those within T20 income group (36%), physically active individuals (31.6%), non-smokers (31.8%), and individuals with diabetes for less than five years (32.3%). Additionally, obesity was more prevalent among individuals with normal blood pressure (33.7%) and lower hypercholesterolemia levels (39.9%).

Logistic regression analysis reported that females had significantly higher odds of obesity (aOR = 2.50, 95% CI: 1.74-3.59) compared to males, consistent with a Tanzanian study³. On the other hand, individuals aged 18-39 years had the highest odds of obesity (aOR = 2.56, 95% CI: 1.15-5.69), followed by those aged 40-59 years (aOR = 1.64, 95% CI: 1.14-2.37). These findings were in line with a previous study, which documented a significant association between obesity and age ≤ 60 years⁴. Individuals with diabetes for less than five years had higher odds of obesity (aOR = 1.43, 95% CI: 1.02-2.02) compared to those with longer disease duration. Hypertension was strongly associated with obesity (aOR = 3.62, 95% CI: 2.27-5.78), indicating hypertensive individuals were over three times as likely to be obese. This finding is consistent with studies from Indonesia and Turkey^{4,5}.

Table 1: The association of sociodemographic, lifestyle, and comorbidity history toward obesity status using complex sample logistic regression

Variable	COR (95%CI)	p-value	AOR (95%CI)	P-value
Gender				
Female	2.21 (1.68, 2.92)	<0.001	2.50 (1.74, 3.59)	<0.001
Male	1		1	
Age group				
18 - 39	2.9 (1.82, 4.60)	<0.001	2.56 (1.15, 5.69)	0.021
40 - 59	2.13 (1.66, 2.73)	<0.001	1.64 (1.14, 2.37)	0.008

60+	1		1	
Strata				
Urban	0.78 (0.57, 1.07)	0.119	0.85 (0.59, 1.23)	0.393
Rural	1		1	
Ethnicity				
Chinese	1		1	
Malay	2.00 (1.23, 3.26)	0.005	1.68 (0.90, 3.14)	0.101
Indian	1.48 (0.78, 2.81)	0.230	1.64 (0.81, 3.29)	0.166
Other Indigenous	2.53 (1.33, 4.82)	0.005	1.86 (0.73, 4.74)	0.191
Others	0.75 (0.30, 1.87)	0.540	1.19 (0.32, 4.39)	0.792
Household income				
B40	0.76 (0.50, 1.16)	0.201	-	
M40	0.76 (0.48, 1.19)	0.229	-	
T20	1			
Physical activity				
Active	1.17 (0.86, 1.59)	0.311	-	
Inactive	1			
Smoking				
No	1.49 (1.06, 2.11)	0.023	0.77 (0.46, 1.30)	0.329
Yes	1		1	
Current drinker				
Yes	0.96 (0.52, 1.78)	0.903	-	
No	1			
Diabetes duration				
Less than 5 years	1.50 (1.10, 2.06)	0.011	1.43 (1.02, 2.02)	0.039
5 years or more	1		1	
Hypertension				
Yes	1.67 (1.21, 2.30)	0.002	3.62 (2.27, 5.78)	<0.001
No	1		1	
Hypercholesterolaemia				
Yes	0.84 (0.60, 1.16)	0.283	1.08 (0.73, 1.60)	0.691
No	1		1	

Classification table, 74.2%, Nagelkerke R Square, 16.5%. No multicollinearity or interaction was found.

Conclusion

Nearly one in three Malaysian adults with diabetes is obese. Females, younger adults aged 18-39 years, and those diagnosed with diabetes within the past five years were at significantly greater risk. These findings call for urgent, targeted interventions to address the dual burden of obesity and diabetes in this population.

References

1. World Health Organization. Global Status Report on Noncommunicable Diseases. 2014.
2. Abdullah A, Peeters A, de Courten M, et al. The magnitude of association between overweight and obesity and the risk of diabetes: A meta-analysis of prospective cohort studies. *Diabetes Res Clin Pract.* 2010; **89**(3): 309-319.
3. Damian DJ, Kimaro K, Mselle G, et al. Prevalence of overweight and obesity among type 2 diabetic patients attending diabetes clinics in northern Tanzania. *BMC Res Notes.* 2017; **10**(1): 1-6.

4. Azam M, Sakinah LF, Kartasurya MI, et al. Prevalence and determinants of obesity among individuals with diabetes in Indonesia. *F1000Research*. 2023; **11**:1063.
5. Erem C, Yildiz R, Kavgaci H, et al. Prevalence of diabetes, obesity, and hypertension in a Turkish population (Trabzon city). *Diabetes Res Clin Pract*. 2001; **54**(3): 203-208.

EPIDPP14 / 242

Prevalence of Abdominal Obesity and Its Associated Factors Among Malaysian Adults: Insight from the National Health and Morbidity Survey (NHMS) 2023

Azli Bin Baharudin¹, Khairul Hasnan Bin Amali¹, Hamizatul Akmal Binti Abd Hamid¹, Nor Azian Binti Mohd Zaki¹, Muhammad Fadhli bin Mohd Yusoff¹, Thamil Arasu Saminathan¹, Hasimah Binti Ismail¹, Syafinaz Binti Mohd Sallehuddin¹, Lalitha Palaniveloo¹

¹ Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: ps_azlibaharudin@moh.gov.my

Summary

The rising prevalence of abdominal obesity (AO) in Malaysia poses a significant public health concern, contributing to non-communicable diseases such as diabetes, hypertension, dyslipidaemia, cardiovascular diseases, and certain cancers. Over the past decade, the prevalence of AO had increased from 45.4% in 2011 to 54.5% in 2023. This study assessed the current prevalence of AO and its associated factors among Malaysian adults aged 18 years and above.

Keywords

Abdominal obesity, adults, Malaysia, National Health and Morbidity Survey, waist circumference

Introduction

AO is a growing public health issue in Malaysia, with increasing trend over the past decade, reflecting changes in lifestyle, dietary patterns, and socioeconomic factors. According to the National Health and Morbidity Survey (NHMS) 2019, 52.6% of Malaysian adults were reported to have abdominal obesity, a significant rise compared to previous years¹. Furthermore, a study focusing on Malaysians aged 40 years and above found a prevalence of 63.1%². AO was notably higher among older adults, Indian Malaysians, and lower-income groups³. Key factors contributing to AO include unhealthy dietary habits, sedentary lifestyles, and socioeconomic disparities⁴. Urbanisation and cultural norms also influence lifestyle choices and physical activity levels⁴. AO had been linked to severe health risks, including metabolic syndrome and certain cancers⁵. Targeted public health strategies promoting healthy eating, physical activity, and screenings are essential to reduce AO.

Materials and Methods

This study utilised data from the National Health and Morbidity Survey (NHMS) 2023, a nationwide cross-sectional study employing a two-stage stratified sampling technique. A representative sample of 13,616 Malaysian adults was analysed. Waist circumference measurements were taken to determine abdominal obesity, with cut off set at ≥ 90 cm for men and ≥ 80 cm for women, based on World Health Organization (WHO 2000) guidelines. Data collection was conducted between July and September 2023, achieving an overall response rate of 83.2%. Descriptive

statistics and multiple logistic regression analyses, adjusted for complex survey design, were used to examine associations between abdominal obesity and various sociodemographic, lifestyle, and health-related factors.

Results and Discussion

The study revealed that 54.5% of Malaysian adults have AO. Multiple logistic regression analysis revealed several significant risk factors: urban residency (aOR=1.26, 95% CI: 1.13-1.41), female (aOR=2.64, 95% CI: 2.38-2.92), age 40-49 years (aOR=1.31, 95% CI: 1.10-1.56), and Indian ethnicity (aOR=1.99, 95% CI: 1.53-2.59). AO was also strongly associated with chronic health conditions, including hypertension (aOR=2.52, 95% CI: 2.25-2.81), hypercholesterolaemia (95% CI: 1.09-1.33), and diabetes mellitus (aOR=1.80, 95% CI: 1.58-2.04). Contrary to expectations, individuals without formal education were less likely to have AO compared to those with tertiary education (aOR=0.96, 95% CI: 0.77-1.20). The high prevalence of AO could be influenced by urbanisation, lifestyle changes, and socioeconomic disparities, with urban residents facing greater exposure to processed foods and sedentary lifestyles while Indian Malaysians were at higher risk due to genetic predispositions and high-carbohydrate dietary habits (3). Women were more affected due to hormonal changes and cultural norms restricting physical activity (4). AO is strongly linked to chronic diseases like hypertension, diabetes, and dyslipidaemia, increasing cardiometabolic risks (5). Effective public health interventions should target high-risk groups, promoting healthy eating, physical activity, and regular health screenings to reduce AO and its related health complications in Malaysia.

Table 1: The factors associated with abdominal obesity (WHO 2000) among older adults (aged ≥ 18 years old) in Malaysia.

Socio-demographic characteristics	Crude OR	Adjusted OR	p-value
Strata			0.001*
Urban	1.16 (1.06, 1.28)	1.26 (1.13, 1.41)	
Rural	1.00	1.00	
Sex			<0.001**
Female	2.61 (2.41, 2.84)	2.64 (2.38, 2.92)	
Male	1.00	1.00	
Age groups			<0.001**
18-19	0.20 (0.16, 0.26)	0.61 (0.43, 0.85)	
20-29	0.32 (0.28, 0.37)	0.82 (0.66, 1.01)	
30-39	0.65 (0.57, 0.73)	1.26 (1.05, 1.51)	
40-49	0.85 (0.75, 0.96)	1.31 (1.10, 1.56)	
50-59	1.07 (0.94, 1.21)	1.22 (1.04, 1.43)	
60 and above	1.00	1.00	
Ethnicity			<0.001**
Malay	1.85 (1.57, 2.18)	1.48 (1.22, 1.80)	
Chinese	1.34 (1.11, 1.61)	1.00 (0.81, 1.25)	

Indian	2.63 (2.09, 3.01)	1.99 (1.53, 2.59)	
Bumiputera Sabah	1.76 (1.44, 2.15)	1.54 (1.22, 1.93)	
Bumiputera Sarawak	1.36 (1.06, 1.74)	1.03 (0.78, 1.37)	
Others	1.00	1.00	
Highest Education Level			<0.001**
No Formal Education	1.34 (1.13, 1.59)	0.96 (0.77, 1.20)	
Primary Education	1.29 (1.10, 1.51)	1.06 (0.86, 1.29)	
Secondary Education	1.21 (0.99, 1.27)	1.11 (0.96, 1.28)	
Tertiary Education	1.00	1.00	
Diagnosed hypertension			<0.001**
Yes	3.17 (2.90, 3.46)	2.52 (2.25, 2.81)	
No	1.00	1.00	
Diagnosed hypercholesterolemia			<0.001**
Yes	1.74 (1.60, 1.90)	1.20 (1.09, 1.33)	
No	1.00	1.00	
Diagnosed diabetes mellitus			<0.001**
Yes	2.40 (2.14, 2.69)	1.80 (1.58, 2.04)	
No	1.00	1.00	
Physical Activity Status			0.075
Inactive	1.08 (0.99, 1.18)	0.96 (0.87, 1.06)	
Active	1.00	1.00	

Conclusion

The high prevalence of AO among Malaysian adults highlighted the need for targeted public health interventions. Prioritizing high-risk groups, such as urban residents, women, and lower-income individuals, is crucial. Promoting healthy diets, physical activity, and screenings through community-based initiatives and policies can help mitigate AO and related health risks.

References

1. Institute for Health Behavioural Research. *National Health and Morbidity Survey (NHMS) 2019: Non communicable diseases, healthcare demand and health literacy* [Fact sheet]. https://iprk.moh.gov.my/images/technical_report/2020/FactSheet_BI_AUG2020.pdf?
2. Apalasamy YD, Awang H, Mansor N, et al. Factors Associated With Obesity and Abdominal Obesity Among Malaysian Older Adults. *Asia Pac J Public Health*. 2021;**33**(5):547-54.
3. Lee YY, Wan Muda WA. Dietary intakes and obesity of Malaysian adults. *Nutr Res Pract*. 2019;**13**(2):159-168.
4. Cai Lian T, Bonn G, Si Han Y, et al. Physical Activity and Its Correlates among Adults in Malaysia: A Cross-Sectional Descriptive Study. *PLoS One*. 2016;**11**(6):e0157730.
5. Ulaganathan V, Kandiah M, Shariff ZM. A case-control study on the association of abdominal obesity and hypercholesterolemia with the risk of colorectal cancer. *J Carcinog*. 2018;**17**:4.

EPIDPP15 / 243

Ethnic Disparities and Intervention Gaps in Glycemic Control: A Cross-Sectional Study of Known Diabetes Cases

Nurul Huda Ibrahim¹, Halizah Mat Rifin¹, Wan Kim Sui¹, Hamizatul Akmal Abd Hamid¹, Hasimah Ismail¹, Thamil Arasu Saminathan¹, Muhammad Fadhli Mohd Yusoff¹

¹Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia
Corresponding author's email: nurul_hudai@moh.gov.my

Summary

Diabetes mellitus is a major public health concern, with poor glycaemic control increasing the risk of complications. This study examined the prevalence of high blood glucose among individuals with known diabetes and identified sociodemographic and intervention-related determinants. A cross-sectional analysis of 1,449 individuals revealed its high prevalence (57.1%), with significant ethnic disparities. Malays, Indians, and those classified as "Others" had higher odds of poor glycaemic control. Despite receiving dietary and exercise advice, a substantial proportion of individuals failed to achieve optimal glucose levels. These findings highlight the need for culturally tailored interventions to improve diabetes management outcomes.

Keywords

Diabetes mellitus, High blood glucose, Glycaemic control, Ethnic disparities, Lifestyle interventions

Introduction

Diabetes mellitus (DM) is a chronic disease characterised by persistent hyperglycaemia, increasing the risk of severe complications such as cardiovascular disease, nephropathy, and neuropathy¹. Despite advancements in diabetes care, glycaemic control remains poor, with over 50% of individuals failing to maintain optimal glucose levels, particularly in low- and middle-income countries^{2,3}. Various factors, including ethnicity, socioeconomic status, and adherence to treatment may influence blood glucose regulation (Ramachandran et al., 2018). This study examines the prevalence of high blood glucose among individuals with known diabetes and explores sociodemographic and intervention-related determinants of poor glycaemic control.

Materials and Methods

This study analysed data from the National Health and Morbidity Survey: Non-Communicable Diseases 2023 (NHMS 2023), a nationally representative cross-sectional survey with a complex sampling design. Respondents with known diabetes were included, and data collection involved structured questionnaires and capillary blood glucose measurement using the Accu-Chek® portable blood test system. High blood glucose prevalence was determined based on the Clinical Practice Guidelines in Managing Type 2 Diabetes (6th edition), >11.1 mmol/l for random blood glucose and >7.0mmol/l for fasting blood glucose. Descriptive

statistics estimated prevalence, while multiple logistic regression identified sociodemographic and intervention-related factors.

Results and Discussion

A total of 1,449 respondents were included in the study, with majority aged above 60 years. The overall prevalence of high blood glucose was 57.1% (95% CI: 53.5 - 60.6). Respondents from others ethnic had the highest prevalence of high blood glucose at 79.7%, while the highest prevalence among age groups was observed in aged 40-49 years (63.4%) (Table 2). Multivariable analysis revealed that ethnicity was a significant determinant of high blood glucose. Compared to Bumiputera Sabah & Sarawak, Malays (aOR = 2.195, $p = 0.001$), Indians (aOR = 2.703, $p = 0.002$), and "Others" (aOR = 5.643, $p < 0.001$) had significantly higher odds of poor glycemic control.

Table 1: Socio-demographic for Known Diabetes (N=1,449)

Characteristics	Unweighted Count	%
Gender		
Male	611	42.2
Female	838	57.8
Age Group (Years)		
<40	57	3.9
40 - 49	155	10.7
50 - 59	344	23.7
≥60	893	61.6
Ethnicity		
Malay	912	62.9
Chinese	201	13.9
Indian	170	11.7
Bumiputera Sabah & Sarawak	139	9.6
Others	27	1.9

Table 2: Prevalence of High Blood Glucose among Known Diabetes and Association Factors

Characteristics	Unweighted Count	Estimated population	Prevalence (%)	95% CI	aOR	95% CI	p-value
Malaysia	628	864,898	57.1%	53.5 - 60.6			
Age Group (Years)							
<40	32	74,500	50.1%	31.5 - 68.5	Ref		
40 - 49	100	160,445	63.4%	53.3 - 72.5	1.730	0.722 - 4.146	0.219

50 - 59	215	404,615	62.5%	56.1 - 68.5	1.661	0.731 - 3.774	0.225
≥60	474	510,886	52.9%	48.4 - 57.4	1.121	0.504 - 2.492	0.779
Ethnicity							
Malay	539	717,728	60.4%	56.1 - 64.5	2.195	1.378 - 3.496	0.001
Chinese	97	168,448	46.3%	36.3 - 56	1.242	0.683 - 2.261	0.477
Indian	104	160,170	65.3%	54.7 - 74.5	2.703	1.450 - 5.038	0.002
Bumiputera Sabah & Sarawak	66	73,742	41.0%	31.0 - 51.8	Ref		
Others	15	30,358	79.7%	63.9 - 89.7	5.643	2.284 - 13.944	0.000
SMBG							
Yes	344	480,453	61.0%	55.0 - 66.6	1.180	0.840 - 1.658	0.468
No	475	665,139	54.5%	50.0 - 59.0	Ref		

Despite receiving various interventions, poor glycaemic control remains prevalent, indicating challenges in adherence and intervention effectiveness. The lack of significant association between self-monitoring of blood glucose (SMBG) and glycaemic control suggests difficulties in interpreting and utilising glucose readings⁴. Ethnic disparities further highlight the need for culturally tailored diabetes management strategies⁵. Addressing healthcare system barriers, medication affordability, and patient engagement is crucial. Future interventions should emphasise personalised education, behavioural support, and targeted strategies to improve adherence and overall diabetes management outcomes.

Conclusion

High blood glucose remains prevalent among individuals with known diabetes, with significant ethnic disparities observed. Despite receiving lifestyle interventions, many individuals fail to achieve optimal glycaemic control. Ethnicity emerged as a key determinant, emphasising the need for culturally tailored diabetes management programmes to improve long-term health outcomes and reduce diabetes-related complications

References

1. American Diabetes Association (ADA). Standards of medical care in diabetes—2022. *Diabetes Care*. 2022;**45**(Suppl 1):S1-S10.

2. International Diabetes Federation (IDF). *IDF Diabetes Atlas, 10th edition*. 2021. Available from: <https://www.diabetesatlas.org>
3. Chan JCN, Lim LL, Wareham NJ, et al. The Lancet Commission on diabetes. *Lancet*. 2020;**396**(10265):2019-58.
4. Shrivastava SR, Shrivastava PS, Ramasamy J. Role of self-care in diabetes management. *J Diabetes Metab Disord*. 2019;**18**(1):5-13.
5. Goh SY, Toh MPHS, Leong H. Ethnic differences in diabetes prevalence and management. *Diabetes Metab Syndr Obes*. 2021;**14**:1377-90.

EPIDPP16 / 244

Delayed Dengue Diagnosis in Batang Padang District, Perak: A 2024 Study

Muhamad Isa Abdul Aziz¹, S Maria Awaluddin¹, Chong Zhuo Lin¹, Mohd Hatta Abdul Motalip¹, Tuan Mohd Amin Tuan Lah¹, V C Anuratha², Nur Fatimah Shaharuddin².

¹ Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

² Batang Padang District Health Office, Tapah, Perak.

Corresponding author's email: isa.aziz@moh.gov.my

Summary

This 2024 study in Batang Padang District, Perak, Malaysia, analysed 166 dengue cases to identify factors associated with delayed diagnosis, defined as confirmation occurring ≥ 4 days after symptom onset². 39.2% of patients experienced delayed diagnosis. The average time from symptom onset to diagnosis was significantly longer for delayed cases (5.4 days) compared to those diagnosed earlier (2 days) ($p < 0.001$). Rapid test results were significantly associated with delayed diagnosis, with negative NS1 and positive IgM tests showing higher proportions of delay. Notably, sociodemographic factors (gender, ethnicity, residence, working status, healthcare facility type and the type of dengue case) did not significantly influence diagnostic delay. These findings highlight the impact of diagnostic limitations on timely dengue confirmation.

Keywords

Dengue, delayed diagnosis, secondary data, prevalence, Batang Padang.

Introduction

Dengue fever is a major public health concern in Malaysia, where recurring outbreaks place a significant burden on healthcare systems. The disease is caused by the dengue virus and transmitted to humans through the bite of infected *Aedes* mosquitoes. Dengue can range from mild, self-limiting febrile illness to severe, life-threatening complications such as dengue haemorrhagic fever and dengue shock syndrome. Early diagnosis is crucial for effective disease management and reducing the risk of severe complications¹. Batang Padang District recorded almost 40% of dengue cases with delayed diagnosis in 2024, and this figure is steadily increasing annually. The tendency of patients to delay seeking treatment at healthcare facilities and self-medicate contributes to this issue. Identifying factors influencing delayed diagnosis can aid in developing targeted interventions to improve timely dengue detection and management. This study aims to assess the prevalence and determinants of delayed diagnosis among dengue patients in Batang Padang District, Perak, a region with endemic dengue transmission. The findings will contribute to a better understanding of the challenges in dengue diagnosis and inform strategies to improve public health outcomes.

Materials and Methods

This study was a **retrospective cross-sectional analysis** using secondary data from the Batang Padang District E-Dengue system to investigate factors associated with delayed dengue diagnosis in 2024. The study included dengue patients with a

confirmed diagnosis and recorded symptom onset date. Delayed diagnosis was defined as laboratory confirmation received four or more days after the reported onset of symptoms². The analysis included sociodemographic variables (gender, age, ethnicity, residence, working status, healthcare facility type) and diagnostic factors, specifically NS1 and IgM rapid test results. Descriptive statistics were used to determine the prevalence of delayed diagnosis. Chi-square tests were employed to examine the relationships between delayed diagnosis and the various independent variables. Additionally, an independent t-test was used to analysed continuous variables. A p-value of less than 0.05 was considered statistically significant. All data analysis was conducted using IBM SPSS version 29.0.

Results and Discussion

This study, based on 2024 E-Dengue data from Batang Padang District, Perak, Malaysia, found that among 166 confirmed dengue cases, 39.2% experienced delayed diagnosis. The mean time to confirmation for delayed cases was 5.4 ± 1.7 days, significantly longer than 2.0 ± 0.9 days for early diagnoses ($p < 0.001$). Rapid test results were significantly associated with diagnostic delay. Patients with negative NS1 results had a higher likelihood of delayed diagnosis (50.0%) compared to those with positive NS1 results (32.7%; $p = 0.025$). Likewise, patients who tested positive for IgM had a significantly greater proportion of delayed diagnosis (57.5%) than those who tested negative (25.8%; $p < 0.001$). These findings suggest challenges in test interpretation, particularly when results are discordant or inconclusive. Importantly, sociodemographic factors—such as gender, ethnicity, place of residence, employment status, and type of healthcare facility—as well as the classification of the dengue case (outbreak-related vs. isolated), were not significantly associated with diagnostic delay. The timing of testing plays a critical role: testing too early may yield false-negative IgM results, while testing too late may miss the NS1 detection window. In individuals with previous dengue exposure, altered immune responses may also impact the accuracy of both NS1 and IgM test results. These results underscore the impact of diagnostic limitations on timely dengue confirmation. Further research is warranted to understand the underlying reasons for these challenges and to develop strategies to mitigate them. Potential solutions include alternative diagnostic approaches—such as combining NS1 antigen and IgM antibody tests—to increase detection across different stages of infection, and improved training for healthcare providers to enhance test interpretation skills. In addition, public health efforts aimed at encouraging early medical consultation for febrile illnesses could help reduce diagnostic delays^{3,4}. These may involve community education campaigns to raise awareness about the importance of prompt medical attention during suspected dengue infections, particularly during outbreaks. Improving access to healthcare and reducing barriers to utilization are also essential for facilitating early diagnosis and timely treatment.

Table 1: Descriptive and bivariate analysis of delayed diagnosis among patients with Dengue, registered in e-Dengue for Batang District, Perak, in 2024. n=166

Variables	Overall n (%)	Delayed diagnosis		p-value
		No n (%)	Yes n (%)	
From onset to diagnosis (day)	166	101	65	
Mean ($\pm$ SD)	3.4(0.2)	2.0 (0.9)	5.4 (1.7)	<0.001
Type of case				
Outbreak	102 (61.4)	59 (57.8)	43 (42.2)	
Isolated	64 (38.6)	41 (64.1)	23 (35.9)	0.425
Place of residence				
Urban	119 (71.7)	73 (61.3)	46 (38.7)	
Rural	47 (28.3)	27 (57.4)	20 (42.6)	0.644
Gender				
Male	105 (63.3)	63 (60.0)	42 (40.0)	
Female	61 (36.7)	37 (60.7)	24 (39.3)	0.934
Age group (years)				
≤ 19	45 (27.1)	24 (53.3)	21(46.7)	
20-59	95 (57.2)	59 (62.1)	36 (37.9)	
≥ 60	26 (15.7)	17 (65.4)	9 (34.6)	0.516
Ethnicity				
Malay	58 (34.9)	34 (58.6)	24 (41.4)	
Chinese	41 (24.7)	30 (73.2)	11 (26.8)	
Indian	41 (24.7)	24 (58.5)	17 (41.5)	
Orang Asli	18 (10.8)	7 (38.9)	11 (61.1)	
Others	8 (4.8)	5 (62.5)	3 (37.5)	0.170
Working status				
Working	89 (53.6)	55 (61.8)	34 (38.2)	
Not Working	77 (46.4)	45 (58.4)	32 (41.6)	0.659
Place of treatment				
Public clinic & Hospital	105 (63.3)	58 (55.2)	47 (44.8)	
Private clinic & Hospital	61 (36.7)	42 (68.9)	19 (31.1)	0.084
Rapid Test (NS1)				
Negative	68 (41.0)	34 (50.0)	34 (50.0)	
Positive	98 (59.0)	66 (67.3)	32 (32.7)	0.025
Rapid Test (IgM)				
Negative	93 (56.0)	69 (74.2)	24 (25.8)	
Positive	73 (44.0)	31 (42.5)	42 (57.5)	<0.001

Conclusion

Delayed diagnosis of dengue remains a concern in Batang Padang District, affecting nearly 40% of cases. The findings suggest that diagnostic challenges, particularly reliance on NS1 and IgM tests, contribute to delays. Improving early detection requires a more integrated diagnostic approach, such as combining rapid tests with *clinical assessments or PCR testing*. Public health efforts should focus on raising awareness and improving access to timely healthcare. Further research is needed to address healthcare system barriers and strengthen dengue case management strategies for better patient outcomes in Malaysia.

References

1. Mallhi TH, Khan AH, Sarrieff A, et al. Patients related diagnostic delay in dengue: An important cause of morbidity and mortality. *Clin Epidemiol Glob Heal*. 2016;4(4):200-1.
2. Sektor Penyakit Bawaan Vektor. Pelan Strategik Pencegahan dan Kawalan Denggi Kebangsaan 2022-2026. Putrajaya, Malaysia; 2022.
3. Piroonamornpun P, Looareesuwan P, Luvira V, et al. Treatment-Seeking Behaviors and Knowledge, Attitude and Practices among Suspected Dengue Adult Patients at the Hospital for Tropical Diseases, Bangkok, Thailand. *Int J Environ Res Public Health*. 2022;19(11).
4. Ng TC, Teo CH, Toh JY, et al. Factors influencing healthcare seeking in patients with dengue: Systematic review. *Trop Med Int Heal*. 2022;27(1):13-27.

EPIDPP17 / 250

Depression and Its Links to Physical Activity, Sedentary Behaviour, and Weight Status in Malaysian Adolescents: A Cross-Sectional Study

Norhafizah Sahril¹, Norliza Shamsuddin¹, Wan Sarifah Ainin Wan Jusoh¹, Norlaila Hamid¹, Ahmad Ali Zainuddin¹, Noor Ani Ahmad¹

¹ Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: norhafizah_s@moh.gov.my

Summary

This study examines the relationship between weight status, physical activity, sedentary behaviour, and depression among Malaysian adolescents. Using data from the 2022 National Health and Morbidity Survey (NHMS), a cross-sectional analysis of 33,523 secondary school students was conducted. The prevalence of depression was 26.9%, with higher odds among female and older adolescents. Increased sedentary behaviour and obesity were significantly associated with depressive symptoms. Conversely, Chinese and Indian adolescents exhibited lower depression risk. These findings highlight the need for targeted public health interventions and clinical guidelines to address adolescent mental health, emphasizing the role of physical activity and healthy lifestyle habits.

Keywords

Depression, sedentary behaviour, obesity, adolescents, NHMS

Introduction

Adolescence is a critical developmental stage characterised by increased vulnerability to common health issues, such as obesity and mental health disorders. Recent estimates suggest that approximately 21.3% of children and adolescents experience depression or depressive symptoms, a figure that has steadily risen over time¹. This study examines the relationship between weight status, physical activity, sedentary behaviour, and depression in adolescents.

Materials and Methods

The study analysed data from the 2022 National Health and Morbidity Survey (NHMS): Adolescent Health Survey, employing a nationwide cross-sectional design with two-stage stratified random sampling. The sample comprised secondary school students. Depression was assessed using the Patient Health Questionnaire (PHQ-9), with a score of 10 or higher indicating depression. Physical activity was defined as engaging in at least 60 minutes of physical activity per day, a minimum of five days per week, summing up all the time spent in any kind of physical activity each day. Sedentary behaviour was characterised as spending three or more hours per day on leisure activities such as watching television, playing computer games, socialising, or browsing the internet. Weight status was determined through anthropometric measurements and classified based on WHO 2007 Growth Reference Data. Data analysis involved descriptive and complex sample logistic regression using SPSS version 26.0.

Results and Discussion

The study included 33,523 adolescents, with a depression prevalence of 26.9%. Depression was more prevalent among females (36.1%, 95% CI: 34.58-37.68) compared to males (17.7%, 95% CI: 16.69-18.67). Higher depression prevalence was also observed among physically inactive individuals (27.8%, 95% CI: 26.71-28.99) and those exhibiting sedentary behaviour (31.0%, 95% CI: 29.79-32.25). Additionally, overweight adolescents had an elevated prevalence of depression (28.3%, 95% CI: 26.41-30.30). Multiple logistic regression analysis indicated that female adolescents (AOR: 2.66, 95% CI: 2.46-2.87) and older adolescents exhibited a higher likelihood of experiencing depression. Conversely, Chinese (AOR: 0.58, 95% CI: 0.48-0.69) and Indian adolescents (AOR: 0.67, 95% CI: 0.54-0.82) demonstrated a lower probability of depression. Furthermore, depression was positively associated with increased sedentary behaviour (AOR: 2.01, 95% CI: 1.85-2.18) and obesity (AOR: 1.12, 95% CI:

Table 1: Prevalence of depression by Socio-demographic, Physical activity, Sedentary and Weight Status (n=9103)

Socio-demographic characteristic	Count (n)	Estimated Population	Prevalence (%)	95% Confidence Interval	
				Lower	Upper
Overall	9103	556498	26.9	25.84	27.96
Sex					
Male	2682	182847	17.7	16.69	18.67
Female	6421	373651	36.1	34.58	37.68
Age					
13	1704	101399	22.6	21.18	24.02
14	1882	117524	27.2	25.58	28.83
15	1802	112513	27.0	25.08	28.94
16	1882	110606	28.4	26.61	30.16
17	1833	114456	30.1	28.22	31.95
Ethnicity					
Malay	6504	373425	28.7	27.46	29.89
Chinese	1065	77209	20.6	18.31	23.05
Indian	328	24848	20.2	17.59	23.04
Other Bumiputeras	977	67843	30.5	27.07	34.13
Others	229	13172	28.6	23.44	34.38
Physically active					
Yes	1697	103936	23.5	22.13	24.93
No	7398	452143	27.8	26.71	28.99
Sedentary Behaviour					
Yes	6988	426798	31.0	29.79	32.25
No	2099	128549	18.7	17.53	19.91

Weight Status					
Thinness	581	37921	22.0	19.86	24.28
Normal	5591	344164	27.2	26.02	28.46
Overweight	1539	94794	28.3	26.41	30.30
Obese	1371	78987	26.9	25.10	28.79

1.01-1.23). The heightened risk of depression among female and older adolescents aligns with previous research findings^{2,3}. Additionally, sedentary behaviour exhibited a strong association with depressive symptoms among Malaysian adolescents, consistent with a prior study involving 67,077 adolescents from low- and middle-income countries, which reported a 20% increased likelihood of depressive symptoms among those engaging in sedentary activities for three or more hours daily⁴. Moreover, the present study identified a significant positive association between obesity and depression, corroborating previous Malaysian studies that have similarly demonstrated a strong association between obesity and depression, with a higher body mass index (BMI) linked to increased depressive symptoms among schoolchildren⁵. Notably, depression may not only result from obesity but may also contribute to its development, emphasising the bidirectional nature of their relationship.

Table 2: Factor Associated with depression among School-going Adolescents in Malaysia

Socio-demographic characteristic	Crude OR			<i>p-value</i>	Adjusted OR			<i>p-value</i>
	Exp(B)	95% Confidence Interval			Exp(B)	95% Confidence Interval		
		Lower	Upper			Lower	Upper	
Sex								
Male	1				1			
Female	2.64	2.44	2.84	<0.001	2.66	2.46	2.87	<0.001
Age								
13	1				1			
14	1.47	1.32	1.64	<0.001	1.19	1.08	1.32	<0.001
15	1.28	1.16	1.42	<0.001	1.13	1.00	1.27	<0.001
16	1.27	1.13	1.42	<0.001	1.19	1.06	1.33	0.042
17	1.36	1.22	1.51	<0.001	1.29	1.16	1.44	0.003
Ethnicity								
Malay	1				1			
Chinese	0.64	0.55	0.76	<0.001	0.58	0.48	0.69	<0.001
Indian	0.63	0.52	0.75	<0.001	0.67	0.54	0.82	<0.001
Other Bumiputeras	1.09	0.92	1.30	0.318	1.09	0.92	1.29	0.295
Others	1.00	0.76	1.31	0.982	1.02	0.78	1.34	0.874
Physically active								
Yes	1				1			
No	1.26	1.17	1.35	<0.001	1.05	0.97	1.13	0.208

Sedentary Behaviour								
Yes	1.96	1.80	2.12	<0.001	2.01	1.85	2.18	<0.001
No	1				1			
Weight Status								
Thinness	0.75	0.66	0.85	<0.001	0.91	0.81	1.03	0.138
Normal	1				1			
Overweight	1.06	0.96	1.16	0.269	1.10	0.99	1.22	0.064
Obese	0.98	0.89	1.08	0.741	1.12	1.01	1.23	0.030

Conclusion

One in four Malaysian adolescent experiences depression, with risk factors including gender, age, sedentary behaviour, and obesity. These findings underscore the importance of public health interventions targeting these factors, along with the development of clinical practice guidelines for adolescent health.

References

1. Lu B, Lin L, Su X. Global burden of depression or depressive symptoms in children and adolescents: A systematic review and meta-analysis. *Journal of Affective Disorders*. 2024.
2. Malooly AM, Flannery KM, Ohannessian CM. Coping mediates the association between gender and depressive symptomatology in adolescence. *International Journal of Behavioral Development*. 2017;**41**(2):185-97.
3. Xu H, Guo J, Wan Y, et al. Association between screen time, fast foods, sugar-sweetened beverages and depressive symptoms in Chinese adolescents. *Frontiers in Psychiatry*. 2020;**11**:458.
4. Vancampfort D, Stubbs B, Firth J, et al. Sedentary behavior and depressive symptoms among 67,077 adolescents aged 12-15 years from 30 low- and middle-income countries. *Int J Behav Nutr Phys Act*. 2018;**15**(1):73.
5. Nurumal M, Abidin R, Ibrahim W, et al. Obesity is associated with depression in Malaysian Obesity is associated with depression in Malaysian schoolchildren: A cross-sectional study. *Makara Journal of Health Research*. 2020;**24**:8-12.

EPIDPP18 / 258

How Age and Employment Status Influence on E-Cigarette Use in Malaysia?

Mohd Hazrin Hasim @ Hashim¹, Mohd Ruhaizie Riyadzi¹, Tuan Mohd Amin Tuan Lah¹,
Thamil Arasu Saminathan¹, Muhammad Fadhli Mohd Yusoff¹, Norlana Ismail², Mohd
Hairul Nizam Abd Hamid², Umami Nadiah Yusoff², Noraryana Hassan³, Nizam
Baharom⁴

¹ Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

² Sector of Tobacco Control and FCTC Secretariat, Disease Control Division, Ministry of Health Malaysia

³ Division of Non-Communicable Diseases, Disease Control Division, Ministry of Health Malaysia

⁴ Faculty of Medicine and Health Sciences, Universiti Sains Islam Malaysia, Negeri Sembilan

Corresponding author's email: hazrin@moh.gov.my

Summary

This study investigates the impact of age and employment status on e-cigarette use in Malaysia. The findings reveal that younger age groups are more likely to use e-cigarettes than older groups. Additionally, unemployed individuals and students exhibit significantly higher odds of e-cigarette use. These insights emphasise the need for targeted public health strategies and regulatory interventions to address the growing trend of vaping among vulnerable populations.

Keywords

E-cigarettes, Age, Employment Status, Malaysia, Health Behaviour

Introduction

E-cigarette use has become increasingly prevalent in Malaysia, especially among younger individuals. These devices are often marketed as a safer alternative to traditional cigarettes, yet they deliver nicotine and other harmful substances through aerosol, posing significant health risks¹. The popularity of e-cigarettes among adolescents and young adults is partly driven by social influence, perceived harm reduction, and easy availability². Demographic factors, particularly age and employment status, have been found to influence e-cigarette usage. Younger individuals, especially those who are unemployed or in non-permanent job situations, are more prone to initiate and maintain e-cigarette use³. Understanding these associations is critical to informing targeted health interventions and public policy. This study aims to investigate how age and employment status predict e-cigarette use among the Malaysian population using data from a national health survey.

Materials and Methods

This study analysed data from the NHMS 2023, a cross-sectional survey of 1,951 participants aged 15 years and older. Stratified sampling ensured representation across demographics and regions. The primary variables were age (grouped as 15-24, 25-34, 35-44, and above) and employment status (full-time, part-time, unemployed, and students). Binary logistic regression was used to assess the

relationship between these variables and current e-cigarette use. Statistical significance was set at $p < 0.05$, and SPSS version 22.0 was used for all analyses.

Results and Discussion

Statistical analysis revealed that age and employment status were significantly associated with current e-cigarette use. Respondents aged 15-24 years had higher odds of e-cigarette use compared to those aged 35 and above, with an unadjusted OR of 3.95 (95% CI: 2.70, 5.78) and an adjusted OR (AOR) of 3.21 (95% CI: 2.08, 4.95, $p < 0.001$). The 25-34 age group also showed increased likelihood (OR=2.89, 95% CI: 1.96, 4.27; AOR=2.43, 95% CI: 1.61, 3.67, $p < 0.001$). In contrast, older age groups had significantly lower odds of use.

Compared to those in full-time employment, unemployed individuals had significantly higher odds of e-cigarette use (OR=2.56, 95% CI: 1.65, 3.96; AOR=2.25, 95% CI: 1.40, 3.62, $p = 0.001$). Similarly, students had increased odds (OR=2.34, 95% CI: 1.30, 4.21; AOR=2.01, 95% CI: 1.15, 3.51, $p = 0.014$). No significant association was observed for part-time or homemaker/unpaid workers after adjustment.

These findings align with global evidence linking youth unemployment and increased e-cigarette use^{4,5}. The elevated prevalence of e-cigarette uses among youth and the unemployed calls for targeted interventions. Educational campaigns focusing on the health risks of vaping, stricter advertising regulations, and support for mental health and employment opportunities are critical. Tailored approaches addressing the unique vulnerabilities of students and unemployed youth can help curb the rising trend of e-cigarette use.

Table 1: Descriptive Results of E-Cigarette Use by Age Group and Employment Status

Variable	Frequency (n)	Weighted Population	Prevalence (%)	95% CI
Age Group (years)				
15-24	196	556,878	12	10.11 - 14.29
25-34	367	1,138,576	21	18.45 - 23.84
35-44	489	1,241,276	25	22.47 - 27.62
45-54	365	822,311	24	21.51 - 26.60
55-64	337	558,005	17.3	14.97 - 20.00
65-74	162	187,130	11.3	9.30 - 13.57
75 and above	35	37,996	6.4	4.31 - 9.39
Employment Status				
Government employee	170	287,060	17.4	14.35 - 20.96
Private employee	869	2,319,793	27.4	25.09 - 29.78

Self-employed	499	1,201,931	32.5	29.24 - 35.96
Unpaid worker /Homemaker/Caregiver	35	87,787	2.3	1.48 - 3.65
Retiree	142	203,434	16.6	13.57 - 20.17
Student	17	57,037	2.6	1.54 - 4.30
Not working (Unemployed)	213	372,587	13.3	10.96 - 15.98

Table 2: Association of Age and Employment Status with E-Cigarette Use

Variable	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	p-value
Age Group (years)			
15-24	3.95 (2.70, 5.78)	3.21 (2.08, 4.95)	<0.001
25-34	2.89 (1.96, 4.27)	2.43 (1.61, 3.67)	<0.001
35 and above	1.00 (Reference)	1.00 (Reference)	-
Employment Status			
Unemployed (Not working)	2.56 (1.65, 3.96)	2.25 (1.40, 3.62)	0.001
Student	2.34 (1.30, 4.21)	2.01 (1.15, 3.51)	0.014
Part-time	1.31 (0.78, 2.21)	1.19 (0.68, 2.09)	0.540
Homemaker/Unpaid/Retired	0.94 (0.55, 1.61)	0.86 (0.48, 1.55)	0.620
Full-time (Reference)	1.00 (Reference)	1.00 (Reference)	-

Conclusion

Age and employment status are significant predictors of e-cigarette use in Malaysia, with younger individuals and the unemployed being the most affected. Targeted public health strategies, including education, regulation, and socioeconomic support, are essential to mitigate vaping's health impact on these vulnerable groups.

References

1. World Health Organization, *Electronic nicotine delivery systems and electronic non-nicotine delivery systems (ENDS/ENNDS)*, WHO, Geneva, 2021.
2. Ng R and Hamzah S. Trends and patterns of e-cigarette use among Malaysian adolescents. *Malaysian Journal of Public Health Medicine*.2021;**21**(2),12-20.
3. Ministry of Health Malaysia, *National Health and Morbidity Survey 2023: Tobacco and E-Cigarette Use*, Institute for Public Health, Kuala Lumpur, 2023.
4. Centers for Disease Control and Prevention, "Youth and tobacco use," CDC, 2022.

www.cdc.gov/tobacco/data_statistics/fact_sheets/youth_data/tobacco_use/index.htm

5. Patel M, Warner J, and Wang L. Socioeconomic disparities in vaping behavior: A cross-sectional study. *Tobacco Prevention & Cessation*. 2021;**7**,1-8.

EPIDPP19 / 261

User acceptance of the DMOSS Dengue Forecast Model in Malaysia

Sarbhan Singh¹, Lim Mei Cheng¹, Nur Hafizah Md. Iderus¹, Sumarni Mohd Ghazali¹, Mohd Nadzmi Md Nadzri¹, Asrul Anuar¹, Mohd Kamarulariffin Kamarudin¹, Nur Ar Rabbiah Binti Ahmad¹, Chew Cheng Hoon¹, Balvinder Singh Gill¹, Chong Zhuo Lin², Wan Ming Keong³, Kok Keng Tee⁴, Lokman Hakim Sulaiman⁵, Teh Chien Huey¹

¹ Institute for Medical Research (IMR), National Institutes of Health (NIH), Ministry of Health Malaysia, Setia Alam, 40170, Malaysia

² Institute for Public Health (IPH), National Institutes of Health (NIH), Ministry of Health Malaysia, Setia Alam, 40170, Malaysia

³ Disease Control Division, Ministry of Health Malaysia, Putrajaya 62590, Malaysia

⁴ Department of Medicine, Faculty of Medicine, Universiti Malaya, Kuala Lumpur, Malaysia

⁵ School of Medicine Institute of Research, Development and Innovation (IRDI), International Medical University (IMU), Kuala Lumpur, 57000, Malaysia

Corresponding author's email: lssarbhan@moh.gov.my

Summary

Dengue poses an ongoing public health challenge in Malaysia, prompting the adoption of early warning tools like the Dengue Model Forecasting Satellite-based System (D-MOSS). This study assessed user acceptance of D-MOSS among 32 dengue control stakeholders via a structured survey. Results showed strong understanding of system features, with strengths including forecasting accuracy, outbreak preparedness support, and interface usability. Key concerns were forecast reliability, technical performance, and spatial resolution. Suggested enhancements included customisable resolution, improved interface, and integrated planning tools. Overall, D-MOSS was positively received as a valuable decision-support system for proactive dengue surveillance and control in Malaysia.

Keywords

Dengue fever, early warning tool, stakeholder feedback, D-MOSS, predictive analytics

Introduction

Dengue remains a major public health issue in Malaysia, with recurring outbreaks despite ongoing control measures^{1,2}. The complex interplay of climate, demographics, and socioeconomic factors makes outbreaks difficult to predict. Early warning systems, such as the D-MOSS satellite-based forecasting model, offer a proactive approach to dengue control by predicting outbreak risks and guiding timely interventions. While D-MOSS has shown success in other countries, its adoption in Malaysia remains under-evaluated³. This study assesses user acceptance of D-MOSS among public health stakeholders, focusing on its usability, strengths, limitations, and improvement areas to ensure its effective integration into national dengue surveillance efforts.

Materials and Methods

A cross-sectional study was conducted to assess user acceptance of the D-MOSS dengue forecasting system among 32 stakeholders from Malaysia's Ministry of

Health, including vector control officers at national, state, and district levels. These individuals were directly involved in dengue surveillance and response, with experience using D-MOSS in operational settings. Participants were recruited through universal sampling and completed a structured survey comprising of both close and open ended questions. The questionnaire, adapted from the System Usability Scale⁴, which covered five domains namely: system usability and comprehension, strengths and challenges, accessibility, anticipated impact, and improvement suggestions. Data was analysed descriptively alongside thematic analysis using R programming software

Results and Discussion

The study revealed high levels of user comprehension and usability for the D-MOSS dengue forecasting system. All participants accurately understood the outbreak thresholds and exceedance probabilities, while 94% found the interface easy to interpret. Nearly all users (97%) reported they could effectively use the forecast graphs and data for reporting, reflecting strong usability and system clarity. Key strengths highlighted included the model's forecasting capabilities (66%), its role in outbreak preparedness (22%), and its user-friendly interface (12%). Participants appreciated the extended forecast period, which facilitated strategic planning, and found the visual outputs—particularly the graphical data representations—valuable for interpreting outbreak trends. However, concerns about forecast reliability (54%) and system performance (27%) were noted. Users cited delays, poor responsiveness, and connectivity issues, which could affect real-time usage. The lack of localised data and inability to compare current forecasts with historical trends were also seen as limiting factors (19%).

In terms of accessibility and implementation, Health Officers (50%), Liaison Officers (30%), and Technical Staff (20%) were identified as key users. Social media and community engagement platforms were the main suggested dissemination channels. Users emphasised the model's usefulness in trend monitoring (45%), geographical risk mapping (30%), and preventive planning (25%), supporting its potential integration into Malaysia's public health infrastructure. Anticipated impacts included early intervention targeting high-risk areas, integration with vaccination campaigns, and potential alignment with existing systems such as SPWD. While 81% felt the forecasts were adequate, others suggested improvements—mainly greater spatial granularity, interface optimisation, comparative features, and tools for planning and monitoring interventions. Figure 1 describes the responses of the participants to the various domains.

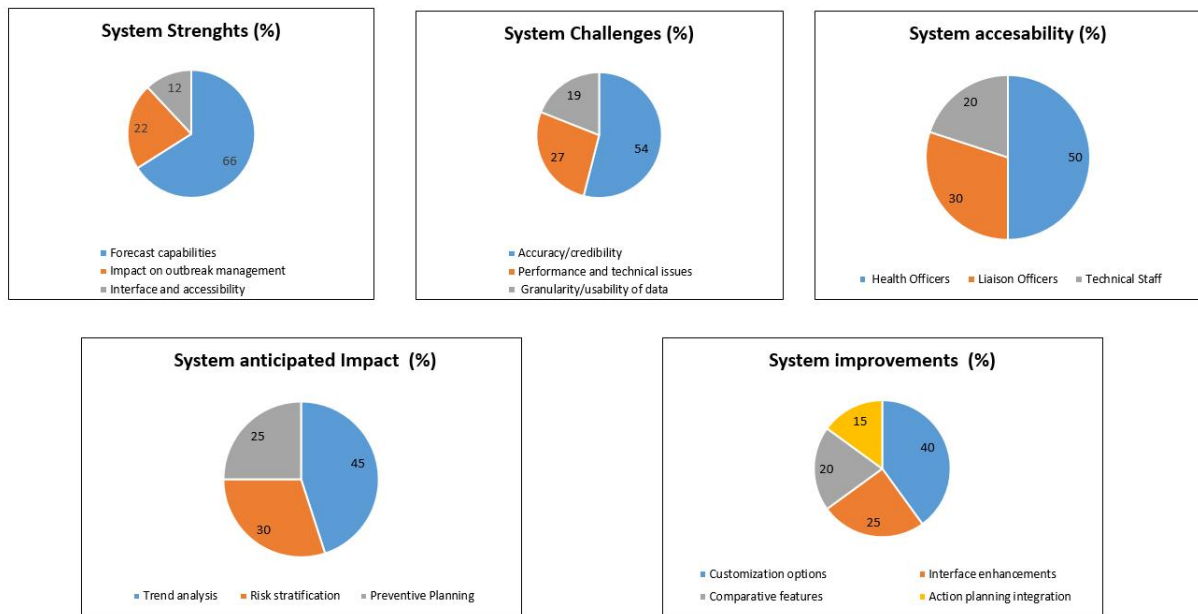


Figure 1. Participants responses towards the various domains about the D-MOSS system

Conclusion

D-MOSS was well-received by stakeholders for its usability and potential in dengue outbreak management. While users valued its forecasting features, concerns about accuracy, data granularity, and system performance highlight areas for improvement. Refining these aspects will enhance its integration into Malaysia's public health system and strengthen dengue prevention efforts.

References

1. Bhatt S, Gething PW, Brady OJ, et al. The global distribution and burden of dengue. *Nature*. 2013;**496**(7446):504-7.
2. Ministry of Health Malaysia. [Annual Dengue Surveillance Report 2024]. Available from: https://www.moh.gov.my/index.php/database_stores/store_view/17
3. D-MOSS. Dengue forecasting MOdel Satellite-based System (D-MOSS) . www.d-moss.org/. Accessed [20 January 2025].
4. Brooke J. SUS: A quick and dirty usability scale. In: Jordan PW, Thomas B, Weerdmeester B, McClelland IL, editors. *Usability Evaluation in Industry*. London: Taylor and Francis; 1996. p. 189-94.

EPIDPP20 / 264

The Prevalence of Hypertension and Its Associated Risk Factors among Indigenous Adults in Malaysia: Findings from the National Health Survey 2022.

Kishwen Kanna Yoga Ratnam¹, Mohd Azmi Suliman¹, Hamizatul Akmal¹, Mohammad Aznuddin Abd Razak¹, Wan Kim Sui¹, Khairul Hasnan Amali¹, Thamil Arasu¹, Tania Gayle¹, Halizah Mat Rifin¹

¹ Institute for Public Health, National Institutes of Health, Ministry of Health, Selangor, Malaysia.

Corresponding author's email : kishwen@moh.gov.my

Summary

This study aimed to determine the prevalence of hypertension and its associated risk factors among indigenous adults in Malaysia. Between July and September 2022, a total of 9,216 indigenous adults aged 18 years and above were assessed through home-based interviews and clinical examinations, which included blood pressure and anthropometric measurements.

Keywords

Hypertension, Risk factors, Indigenous peoples, Malaysia

Background

Hypertension is ranked as one of the three leading risk factors for global disease burden, followed by tobacco smoking and alcohol use. It is also reported to be more prevalent in low- and middle-income countries¹. Globally, indigenous peoples experience both socioeconomic and health disadvantages².

Indigenous peoples of Peninsular Malaysia, or commonly known as '*Orang Asli*', constitute less than 1% of the total population. According to the National Health and Morbidity Survey (NHMS) 2019, the prevalence of hypertension among adults in the general population in Malaysia was 30.0%³. As indigenous peoples are socioeconomic marginalized and have limited access to healthcare, it is imperative to determine the distribution of hypertension and its predictive factors among the indigenous peoples.

Methods

This study employed a cross-sectional survey with a two-stage stratified cluster sampling design. To ensure national representativeness, stratification was done by locality (the primary stratum - urban, fringe, remote) and tribe (the secondary stratum - Senoi, Proto-Malay, Negrito). Villages were randomly selected within each stratum, and all eligible respondents from the selected villages were included. Hypertension was operationally defined as either a self-reported diagnosis, or having a systolic blood pressure measurement of ≥ 140 mmHg and/or ≥ 90 mmHg for the diastolic pressure reading during the field survey. This survey utilised a face-to-face interview method using the WHO STEPS instrument. The Omron Japan Model HEM-907 was used for blood pressure assessment.

Multiple logistic regression was performed to identify factors associated with hypertension, with statistical significance set at $p \leq 0.05$. Ethics approval was granted from The Medical Research and Ethics Committee (MREC).

Results and Discussion

A total of 9,216 respondents answered the hypertension module. The prevalence of hypertension among the Indigenous adults aged 18 years and above was 31.5% (Table 1). Males had a higher prevalence of hypertension (34.0%) compared to females (29.6%). The prevalence of hypertension increased with age and peaked among those aged 70 years and above (73.7%).

The adjusted multivariate analysis (Figure 1) revealed that male sex (aOR = 1.55, 95% CI: 1.31, 1.84), increasing age (aOR for 60 years and above = 19.58, 95% CI: 14.12, 27.17), overweight (aOR = 1.29, 95% CI: 1.04, 1.61), obesity (aOR = 2.33, 95% CI: 1.95, 2.79), and abdominal obesity (aOR = 1.39, 95% CI: 1.15, 1.69) were significantly associated with hypertension. Interestingly, traditional risk factors such as diabetes, dyslipidaemia, alcohol consumption, and tobacco smoking were not statistically significant in multivariable analysis. This may suggest underlying collinearity with obesity or the presence of unmeasured confounders such as dietary salt intake, physical inactivity, or stress.

These findings underscore the need for culturally adapted interventions targeting weight management and early screening among high-risk subgroups, particularly older men.

Table 1: Hypertension Prevalence by Sociodemographic Subgroups (n = 9,216)

Variables	Respondent Count (n)	Est. Population	Est. Prevalence (95% CI)
Overall	2,916	34,077	31.50 (26.87, 36.53)
Locality			
Remote	1,282	7,701	30.94 (25.23, 35.42)
Fringe	1,376	25,996	31.66 (22.68, 41.84)
Urban	258	380	31.97 (27.12, 37.98)
Sex			
Female	1,551	18,195	29.58 (24.91, 34.71)
Male	1,365	15,882	34.03 (29.26, 39.15)
Age-group			
18-29	397	4,019	10.76 (8.35, 13.75)
30-39	596	6,151	23.01 (18.81, 27.84)
40-49	696	7,865	42.78 (36.18, 49.65)
50-59	635	8,112	56.41 (47.74, 64.70)
60+	592	7,929	70.04 (64.16, 75.32)

Tribe

Senoi	1,206	17,834	31.49 (27.81, 35.42)
Proto-Malay	1,027	15,532	31.48 (22.68, 41.84)
Negrito	683	711	32.31 (27.12, 37.98)

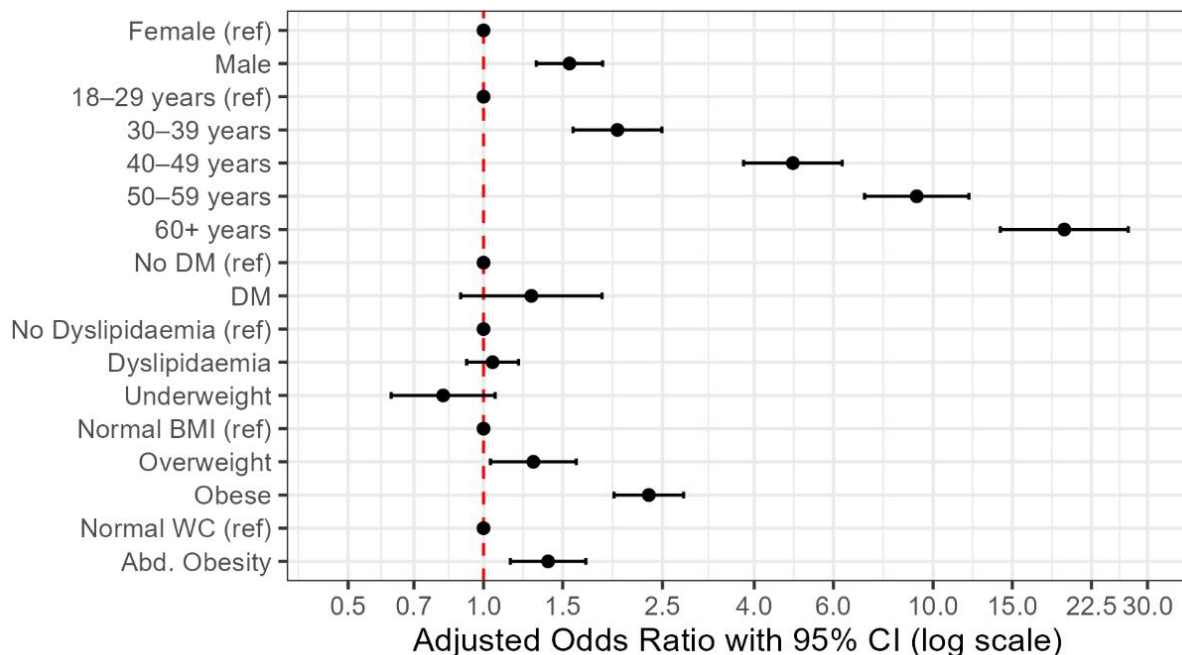


Figure 1: Factors associated with hypertension among indigenous adults living in Malaysia

Conclusion

In this national sample of indigenous adults, hypertension was primarily driven by age and obesity, with traditional lifestyle factors playing a lesser role than expected. These findings highlight the importance of shifting prevention efforts toward culturally adapted, body weight-focused interventions.

References

1. Zhou B, Perel P, Mensah GA, et al. Global epidemiology, health burden and effective interventions for elevated blood pressure and hypertension. *Nature Reviews Cardiology*. 2021;18(11):785-802.
2. Olsen MH, Angell SY, Asma S, et al. A call to action and a lifecourse strategy to address the global burden of raised blood pressure on current and future generations: the Lancet Commission on hypertension. *The Lancet*. 2016;388(10060):2665-2712.
3. Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia. National Health and Morbidity Survey (NHMS) 2019: Vol I: NCDs - Non-Communicable Diseases: Risk Factors and other Health Problems. Available from: <http://iku.gov.my/nhms-20193>.

EPIDPP21 / 266

Implementation Of Community - Base Rheumatic Heart Disease Screening At Primary Care Facilities in Penampang District : Pilot Project From Sabah, Malaysia

Pee Nai Eng¹, Sam Froze Jiee², Lim Kai Joo¹, Aini Simon Sumeh¹, Anisah Jantim¹, Siva Rao Muniandy³, and Elron Alpero⁴

¹ Penampang District Health Office, Sabah State Health Department, Ministry of Health Malaysia

² University Malaysia Sarawak, Sarawak, Malaysia

³ Queen Elizabeth Hospital II, Sabah State Health Department, Ministry of Health Malaysia

⁴ Family Health Division, Sabah State Health Department, Ministry of Health Malaysia

Corresponding author's email: pne@moh.gov.my

Summary

Rheumatic heart disease (RHD) is a potential life-threatening condition that causes long-standing public health concerns. Echocardiography is a reliable diagnostic and screening technique for many cardiovascular conditions, including RHD. It is commonly used in a tertiary care facility worldwide but less so in the community setting. The primary aim for this study was to introduce and elaborate on the echocardiography screening for RHD that was implemented by a Malaysian primary care clinic in Penampang district, we also set out to present the uptake of the service in its initial years of establishment, as well as the challenges faced. In the case of RHD, the key to reducing premature mortality and morbidity related to RHD is early detection and prompt management through an empowered health system.

Keywords

Rheumatic heart disease, echocardiographic screening, primary care, community health, Sabah, Borneo Island

Introduction

This study aimed to determine the prevalence of RHD among school-going children aged 5-20 years old from April 1, 2020, to May 31, 2021 in Penampang, Sabah, with the goal of early intervention by actively screening for cases of CRHD to prevent complications. It also serves as a platform to educate the public and raise awareness of CHRD among children and parents in Penampang, aiding in early detection and providing secondary prophylaxis to prevent the severity and progression of the disease.

Materials and Methods

In the first part of this study, document review and desk research were conducted to compile relevant information about the conceptualization and implementation of this service such as ongoing advocacy efforts involving collaboration between district health and education officials, village headmen and non-government organizations. In this program, Figure 1 shows the flow of the screening protocol. Parents or caretakers who consented to their children's participation were briefed on this study. A data collection form was used to capture the following details:

Name, Identification/Birth Certificate number, age, gender, education status, ethnic group, nationality, home address, school, as well as any history of medical illness. Following that, we obtained secondary data on the echocardiographic screening service from its first implementation in April 2020 until May 2021 to examine the uptake and patient profile. Primary care-based ECHO was started at Penampang Health Clinic and expanded to five other government health clinics throughout the Penampang district over the 13-months period. They will be further evaluated with formal echo at the Pediatric Cardiology Hospital Queen Elizabeth II. The evaluation in our Centre will be based on the 2012 World Heart Federation guidelines for echocardiographic diagnosis of RHD. The data were analyzed using the Statistical Package for Social Sciences (SPSS) 28.0, and all data were described using uni-variate descriptive statistics and frequency distributions.

Results and Discussion

From April 2020 to May 2021, a total of 189 echocardiographic screenings were conducted by primary care doctors using handheld ultrasound. Most of the screened children resided in the urban and suburban areas of Penampang. None of the screened children from the rural had a documented history of congenital heart disease. Of the 189 children screened, 19 (10.1%) were found to have cardiac anomalies and were referred for a formal echocardiogram. Of the 19 children, 12 were seen at the pediatric cardiology department of Queen Elizabeth Hospital while 7 defaulted follow-ups. 8 of the 12 children were diagnosed with definite RHD (with Mitral Regurgitation) and given monthly IM Benzathine Penicillin and follow-up appointments. Two children had borderline RHD (one had trivial Aortic Regurgitation, and one had Trivial Tricuspid Valve/Pulmonic Regurgitation). 2 showed normal findings. Malaysia has a wide coverage of primary care services. In the case of RHD, an untreated streptococcal throat infection often causes RHD. Penicillin has been proven as an effective form of primary prevention. It is easily accessible and affordable in most parts of the world. Studies have shown that benzathine penicillin G injections successfully treat streptococcal infections. Therefore, the administration of benzathine penicillin G injection can prevent the onset of rheumatic fever and subsequently RHD.

Conclusion

Prevalence of RHD among 5-20 years old students is 10.1% by using community-based handheld echocardiography screening. This community-based Echo screening pilot project for RHD represents a good start to address neglected health concerns in the community in the progress toward UHC. Community-based handheld echocardiography is able to detect early and provide secondary prophylaxis to prevent severe Rheumatic Heart Disease. Echocardiogram services provided by primary care centers in suburban and rural areas are highly beneficial for patients with poor access to specialized healthcare services due to their distance from tertiary care facilities.

References

1. Ou Z, Yu D, Liang Y, et al. Global burden of rheumatic heart disease: trend from 1990 to 2019. *Arthritis Res Ther.* 2022;24(1):138-213. doi:10.1186/s13075-022-02829-3

2. Noubiap JJ, Agbor VN, Bigna JJ, et al. Prevalence and progression of rheumatic heart disease: a global systemic review and meta-analysis of population-based echocardiographic studies. *Sci Rep.* 2019;9(1):17022-17114. doi:10.1038/s41598-019-533540-4
3. Hussin N, Jumat H, Wong M, et al. Insights from a rheumatic heart disease registry in a tertiary centre in Sabah. *Int J Public Heal Res.* 2017;7(1):757-764
4. Singh S, Goyal A. The origin of echocardiography: a tribute to Inge Edler. *Tex Heart Inst J.* 2007;34(4):431-438
5. Kumar RK, Antunes MJ, Beaton A, et al. Contemporary diagnosis and management of rheumatic heart disease: Implications for closing the gap: a scientific statement from the American Heart Association. *Circulation.* 2020;142(200):E337-E357. doi:10.1161/CIR.0000000000000921

EPIDPP22 / 278

Predicting Multimorbidity Using Machine Learning: Insights from NHMS 2019

Ainil Zafirah Abd Karim¹, Ridwan Sanaudi¹, Muhd Zulfadli Hafiz Ismail¹, Zamtira Seman¹, Evi Diana Omar¹, Hasnah Mat¹, Munerah Mohamad Zaman¹, Asyraf Syahmi Mohd Noor¹, Anis Syakira Jailani², Nabilah Hanis Zainuddin¹, Mohd Azahadi Omar¹

¹Sector for Biostatistics & Data Repository, Office of NIH Manager, National Institutes of Health, Ministry of Health Malaysia, Selangor, Malaysia

²Research Grant Unit, Office of NIH Manager, National Institutes of Health, Ministry of Health Malaysia, Selangor, Malaysia

Corresponding author's email: ainilzafirah@moh.gov.my

Summary

This study developed a machine learning model to predict multimorbidity—defined as having diabetes, hypertension, and hypercholesterolemia—using data from 9,811 Malaysian adults (NHMS 2019). Despite rising multimorbidity rates, few Malaysian studies have applied machine learning to national health data. Twenty-three demographic, socioeconomic, behavioral, and clinical variables were analyzed using RapidMiner. To address data imbalance, SMOTE was applied. Among six models, Deep Learning showed the highest accuracy (72.85%) and AUC (0.804). Permutation Feature Importance identified age, socioeconomic status, lifestyle, and body measurements as significant predictors. Findings support the use of machine learning for early detection and targeted public health interventions.

Keywords

Multimorbidity, NHMS 2019, machine learning, deep learning, feature importance

Introduction

Multimorbidity, defined as the coexistence of at least two chronic conditions, presents a significant challenge in public health due to its association with increased healthcare burden, reduced quality of life, and higher mortality rates¹. In this study, multimorbidity is specifically defined as the presence of diabetes mellitus (DM), hypertension, and hypercholesterolaemia. These three conditions were chosen due to their high prevalence and well-documented interactions that contribute to cardiovascular and metabolic complications². As multimorbidity continues to rise particularly among the Malaysian population, and given the limited research applying machine learning for prediction using nationally representative health data, this study aimed to develop a machine learning-based predictive model using data from the 2019 National Health and Morbidity Survey (NHMS 2019).

Materials and Methods

In line with previous studies showing the effectiveness of machine learning—especially decision trees and neural networks—in predicting metabolic-related conditions, this study applied similar methods to predict multimorbidity³. A total of 9,811 Malaysian adults aged 18 and above from the NHMS 2019 dataset were included. Twenty-three selected demographic, socioeconomic, behavioural, and

clinical variables were used as predictors. Data pre-processing, model training, and evaluation were conducted using RapidMiner. The dataset was randomly split into training (70%) and testing (30%) sets. Due to class imbalance, the SMOTE technique was applied to balance the training data⁴. Six machine learning models were developed: Naïve Bayes, Random Forest, Gradient Boosted Trees, Deep Learning, k-Nearest Neighbors (k-NN), and Decision Tree. Model performance was evaluated using accuracy, AUC, precision, sensitivity, specificity, and F-measure. This approach aimed to enhance early identification of individuals at risk for multimorbidity and support data-driven public health interventions in the Malaysian context.

Results and Discussion

The results in Table 1 showed that Deep Learning achieved the highest accuracy (72.85%) and AUC (0.804), making it the best-performing model for predicting multimorbidity. Gradient Boosted Trees recorded the highest sensitivity (77.52%), making it a strong alternative for identifying individuals with multimorbidity, particularly useful in screening programmes. Conversely, Decision Tree had the highest specificity (92.65%), indicating its strength in correctly identifying those without the condition. These findings highlight the unique strengths of each model, reinforcing the need to choose the appropriate method based on the intended use.

Table 1: Performance of machine-learning algorithms in multimorbidity prediction

	Naive	Random Forest	Gradient Boosted Trees	Deep Learning	k-NN	Decision Tree
Accuracy (%)	72.08	72.80	71.40	72.85	63.45	67.15
AUC	0.779	0.799	0.796	0.804	0.635	0.641
Precision (%)	57.95	63.74	56.39	58.89	46.65	58.08
F Measure (%)	63.91	56.13	65.29	64.81	41.38	28.82
Sensitivity (%)	71.23	50.14	77.52	72.05	37.18	19.16
Specificity (%)	72.53	88.84	68.15	73.28	77.41	92.65

Deep Learning outperformed other models due to its ability to learn complex, nonlinear relationships in the data. Permutation Feature Importance (PFI), which is particularly well-suited for Deep Learning models, was used to identify the most influential predictors of multimorbidity. The analysis revealed that age, socioeconomic factors (occupation, income, education), lifestyle behaviors (physical activity, smoking), and anthropometric measures (height, waist circumference) were the significant influential predictors. These findings align with prior studies and support the importance of these variables in multimorbidity risk⁵. Although Deep Learning showed the best overall performance, Gradient

Boosted Trees remains a competitive model due to its high sensitivity and improved interpretability. This makes it more practical for public health applications, especially when explainability is crucial for clinical and policy decision-making.

Conclusion

This study demonstrates the potential of machine learning in predicting multimorbidity risk, supporting early intervention and better healthcare planning. It offers valuable insights for policymakers and clinicians. Future research should validate findings across populations, integrate more risk factors, and enhance model generalisability for real-world application.

References

1. Shariff Ghazali S, Seman Z, Zainuddin NH, et al. Prevalence and factors associated with multimorbidity among older adults in Malaysia: a population-based cross-sectional study. *BMJ Open*. 2021;**11**(10):e052126.
2. Ganapathy SS, Aris TH, Ahmad NA, et al. National Health and Morbidity Survey 2019: Non-Communicable Diseases, Healthcare Demand and Health Literacy. 2019.
3. Kakudi HA, Loo CK, Moy FM. Diagnosis of Metabolic Syndrome using Machine Learning, Statistical and Risk Quantification Techniques: A Systematic Literature Review. *medRxiv*. 2020:2020.06.01.20119339.
4. Chawla N, Bowyer K, Hall L, et al. SMOTE: Synthetic Minority Over-sampling Technique. *J Artif Intell Res (JAIR)*. 2002;**16**:321-57.
5. Barnett K, Mercer SW, Norbury M, et al. Epidemiology of multimorbidity and implications for health care, research, and medical education: a cross-sectional study. *Lancet*. 2012;**380**(9836):37-43.

EPIDPP23 / 280

Mental Health Predictors Among Public Sector Workers at the National Institutes of Health, Selangor

Puteri Sofia Nadira Binti Megat Kamaruddin¹, Mona Lisa Md Rasip², Mohd Nizam Misran², Azra Abdul Aziz², Wan Afiqah Wan Sabri², Thanuja Narayanan², Rozilawati Jafri², Siti Haslina Othman², Mohd Safwan Ibrahim³, Shazana Rifham bt Abdullah¹

¹ Institute for Medical Research, National Institutes of Health, Ministry of Health Malaysia

² Occupational Safety and Health Unit, National Institutes of Health, Ministry of Health Malaysia

³ Titiwangsa District Health Office, Ministry of Health Malaysia

Corresponding author's email: puterisofia@moh.gov.my

Summary

Mental health issues, particularly anxiety and depression, are rising in Malaysia, especially post- Coronavirus Disease 2019 (COVID-19). A study of 990 public sector workers at NIH Selangor found that higher income and Type B personality traits were protective against anxiety and depression, while medical history and Indian ethnicity increased risk. Data were collected via questionnaires, physical assessments, and lab tests, and analysed using SPSS. The findings highlight the need for targeted mental health initiatives that consider socioeconomic status, medical history, and personality. Promoting awareness, reducing stigma, and supporting high-risk groups can enhance employee well-being and workplace productivity.

Keywords

mental health, depression, anxiety, public sector workers

Introduction

Mental health has become a major public health issue globally, with rising cases of anxiety and depression notably affecting vulnerable groups in Malaysia, especially in the aftermath of the COVID-19 endemic phase. Around 4.6% of Malaysians aged 15 and above experience mental health conditions, a figure that has doubled from 2019 to 2023¹. Global increases in anxiety and depression are driven by social, economic, and environmental factors². Modern workplaces, driven by digitalisation and an "always-on" culture, blur work-life boundaries, leading to chronic stress, burnout, and increased anxiety and depression³. Despite growing awareness, stigma and limited understanding still hinder people from seeking help. This study seeks to identify the factors influencing mental health among public sector workers at the National Institutes of Health (NIH) in Selangor.

Materials and Methods

This study is a secondary data analysis of a cross-sectional study involving 990 public sector workers who participated in the 2023 *Komuniti Sihat Pembangunan Negara* (KOSPEN WOW) Wellness of Workers program. Participants were selected via convenience sampling, as the program was part of routine health check-ups

with no randomisation involved. Study tools comprised of questionnaire administration, anthropometry measurements and biological samples collection. The analysis encompassed various aspects, including sociodemographic and socioeconomic backgrounds, medical and family histories, mental health scores, personality traits, anthropometric measurements, and blood test outcomes. Specifically, the Type A and Type B personality traits theory, developed by Meyer Friedman and Ray Rosenman (4), classifies individuals by stress-related behaviours, while mental health was assessed using the Depression Anxiety and Stress Scale 21 (DASS-21) scale to measure depression, anxiety, and stress (5). Statistical analysis was performed using Statistical Package for the Social Sciences (SPSS) version 29. Logistic regression analysis was employed to identify the key factors influencing mental health (anxiety and depression).

Results and Discussion

Higher household income of RM4850-10959 (Adj. OR=0.34, 95% CI: 0.18, 0.66, p value=0.001) and >RM10960 (Adj. OR=0.26, 95% CI: 0.10, 0.66, p value=0.005) and a Type B personality (Adj. OR=0.12, 95% CI: 0.06, 0.24, p value<0.001) were found to be protective against anxiety, whereas having a medical history (Adj. OR=2.30, 95% CI: 1.24, 4.27, p value=0.008) increased the likelihood of anxiety. Similarly, Indian ethnicity emerged as a significant risk factor for depression (Adj. OR=4.10, 95% CI: 1.523, 10.98, p value=0.005), while having a Type B personality served as a significant protective factor (Adj. OR=0.18, 95% CI: 0.07, 0.45, p value<0.001). Higher income may reduce anxiety by improving healthcare access and easing financial stress; while pre-existing health conditions can heighten anxiety due to health-related concerns (6). Depression is more prevalent among the Indian population in Malaysia, possibly due to socioeconomic challenges, stigma, and healthcare disparities (7). Type B personality, being more relaxed and less competitive, appears protective against both anxiety and depression.

Table 1: Factors associated with anxiety and depression among NIH public sector workers, 2023

Multiple Logistic Regression						
Variable	Anxiety			Depression		
	Adj. OR	95% CI	p value	Adj. OR	95% CI	p value
Sociodemographic						
Age						
<40 years old			Reference			
≥40 years old	0.84	0.42, 1.66	0.61	-		
Gender						
Female			Reference			

Male	0.79	0.33, 1.85	0.58	-
Ethnicity				
Non-Indian			Reference	
Indian	-		4.10	1.53, 10.98 0.005*
Socioeconomic				
Monthly household income				
≤RM4849			Reference	
RM4850 - RM10959	0.34	0.18, 0.66	0.001*	-
≥RM10960	0.26	0.1, 0.66	0.005*	-
Medical history				
No			Reference	
Yes	2.30	1.24, 4.27	0.008*	2.14 0.95, 4.81 0.07
Family history				
No			Reference	
Yes	1.43	0.62, 3.29	0.41	5.28 0.69, 40.47 0.11
Social history				
Smoking status				
No			Reference	
Yes	-			-
Alcohol status				
No			Reference	
Yes	-		1.34	0.28, 6.57 0.72
Personality Type				
A			Reference	
B	0.12	0.06, 0.24	<0.001*	0.18 0.07, 0.45 <0.001*
Anthropometry measurements				
Waist circumference				
Normal			Reference	

Obese	-	-
Body fat percentage	1.02 0.98, 1.06 0.30	-
Body Mass Index		
Underweight/normal		Reference
Overweight	-	-
Obese	-	-

Conclusion

The findings reveal that mental health outcomes are strongly influenced by socioeconomic background, medical history, and individual personality traits. This underscores the importance of designing workplace mental health initiatives that are customised to account for these specific factors. It is recommended to implement focused interventions for high-risk individuals, encourage healthy living through wellness programs, and cultivate an environment free from stigma to support mental health—ultimately improving the well-being and productivity of public sector workers.

References

1. Institute for Public Health. National Health and Morbidity Survey (NHMS) 2023: Non-communicable Diseases and Healthcare Demand - Key Findings. In: Ministry of Health Malaysia, editor. 2024.
2. Xiong J, Lipsitz O, Nasri F, et al. Impact of COVID-19 pandemic on mental health in the general population: A systematic review. *Journal of Affective Disorders*. 2020;277:55-64.
3. Kim KH, Chon M-G. When work and life boundaries are blurred: the effect of after-hours work communication through communication technology on employee outcomes. *Journal of Communication Management*. 2022;26(4):386-400.
4. Friedman HS, Booth-Kewley S. Personality, Type A behavior, and coronary heart disease: The role of emotional expression. *Journal of Personality and Social Psychology*. 1987;53(4):783-92.
5. Lovibond SH, Lovibond PF. Manual for the depression anxiety stress scales. 2nd ed. Sydney: Psychology Foundation of Australia, Sydney, N.S.W.; 1995.
6. Whitman A, Lew ND, Chappel A, Aysola V, Zuckerman R, Sommers BD. Addressing Social Determinants of Health: Examples of Successful Evidence-Based Strategies and Current Federal Efforts. Washington, America: U.S. Department of Health and Hman Services; 2022.
7. Ong SC, Shakeel S, Ooi GS. The Prevalence of Depression, Anxiety and Stress and Their Associated Factors among Malaysian Population: Original Research. *Medicine & Health*. 2022;17(1):226-45.

EPIDPP24 / 304

Multiagency Responses in Managing Leptospirosis Outbreak at A Recreational Site in Perak

Abdulloh Mazalan¹, Hairunnisa Hashami¹, Husna Maizura Ahmad Mahir¹, Raja Muhammad Raja Omar², Noor Hidayah Binti Mohd Yasin², Nurul Syariah Binti Shafiin², Ahmad Fahmi bin Rashid Redza²

¹ Perak Health Department, Ministry of Health Malaysia

² Kampar District Health Office, Ministry of Health Malaysia

Corresponding author's email: abdullah.maz@moh.gov.my

Summary

Recreational sites in Malaysia are increasingly frequented by the public, yet many lack proper environmental hygiene and rodent control, exposing visitors to zoonotic diseases such as leptospirosis. This outbreak investigation aimed to describe the epidemiological characteristics, identifying the risk factors, and control measures at one of the recreational sites in Perak. A total of 8 leptospirosis cases were reported among 42 exposed contacts, yielding an attack rate of 19.05%. Environmental sampling identified *Leptospira* spp in one water sample, supporting the hypothesis of waterborne transmission. Control measures included voluntary closure of premises, interagency engagement through Disaster Management Committee at district level, community mobilization, rodent control, and continuous health education. The findings underscore the importance of coordinated multi-agency responses and community mobilization in outbreak management.

Keywords

Leptospirosis, recreational, outbreak, environmental, zoonotic disease

Introduction

Leptospirosis is a globally distributed zoonosis caused by the *Leptospira* species, commonly transmitted through water contaminated by urine of infected animals, particularly rodents ¹. Outbreaks in tropical countries are often associated with poor sanitation and environmental conditions at recreational sites ². In July 2024, one of a District Health Office in Perak identified a cluster of leptospirosis cases linked to a popular riverside picnic area. This report presents the epidemiological profile and environmental factors contributing to the outbreak, while highlighting key lessons learned from managing the incident through a multi-agency intervention approach.

Materials and Methods

The outbreak investigation commenced upon an e-Notification of leptospirosis cases from health facilities in the responding district. The case definition included individuals presenting with febrile illness and headache, myalgia, athralgia, gastrointestinal symptoms who visited the implicated site between 4 July and 3 August 2024. Data collection included clinical interviews, active case detection (ACD), structured environmental risk assessments and laboratory results.

Environmental specimens, including water, soil and rodent samples, were analyzed for the presence of *Leptospira* spp. Public health actions included voluntary closure of the site, multi-agency vector and sanitation operations, community engagement sessions, and health promotion campaigns^{3,4}.

Results and Discussion

Eight cases were identified (4 confirmed by MAT, 4 probable with positive IgM), affecting individuals aged 2 to 49 years. All cases had visited the same site within 1 to 9 days before symptom onset. The attack rate was 19.05%. Environmental assessment revealed several risk factors including poor solid waste management, uncontrolled rodent population, and untreated wastewater discharge into the river. One of four water samples tested positive for *Leptospira* spp. Control actions such as rodent trapping, environmental clean-up, and health education successfully prevented further transmission. No new cases were detected as early as 3 weeks since an outbreak was declared, and the outbreak was declared over after 42 days.

Conclusion

This outbreak underscores the importance of early risk assessment and coordinated multi-agency response. Effective prevention in ecotourism hotspots requires strong inter-agency collaboration, active community engagement, and continuous environmental monitoring.

References

1. Haake DA, Levett PN. Leptospirosis in humans. *Curr Top Microbiol Immunol* 2015; **387**:65-97.
2. Victoriano AF, Smythe LD, Gloriani-Barzaga N, et al. Leptospirosis in the Asia Pacific region. *BMC Infect Dis* 2009; **9**:147. doi:10.1186/1471-2334-9-147
3. Ministry of Health Malaysia. Guidelines for the prevention and control of leptospirosis. Putrajaya: Disease Control Division, Ministry of Health Malaysia; 2011.
4. World Health Organization. Human leptospirosis: guidance for diagnosis, surveillance and control. Geneva: World Health Organization; 2003.

EPIDPP25 / 308

Prevalence and Factors Associated with Pre-Hypertension among Adults in Malaysia

Hamizatul Akmal Abd Hamid¹, Halizah Mat Riffin¹, Lim Kuang Kuay¹, Tania Gayle Robert Lourdes¹, Mohd Ruhaizie Riyadzi¹, Azli Baharudin¹, Muhammad Fadhli Mohd Yusoff¹

¹ Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: hamizatul_ah@moh.gov.my

Summary

Pre-hypertension, an early stage of high blood pressure, is influenced by demographic, behavioural, and metabolic factors. This study examined its prevalence and associated factors among adults in Malaysia aged 18 and above. Males and older adults (40-59 and ≥ 60 years) had significantly higher odds of pre-hypertension. Indian ethnicity was linked to a lower risk. Diabetes, high cholesterol and higher BMI, especially obesity, increased the likelihood of pre-hypertension, while current alcohol use reduced it. These findings highlight the roles of sex, age, health conditions, and behavioural in pre-hypertension risk. Early detection and targeted health education are recommended to prevent progression to full-blown hypertension.

Keywords

Pre-hypertension, high blood pressure, adult, Malaysia

Introduction

Pre-hypertension is a clinical condition characterised by blood pressure readings that are higher than normal but not yet in the hypertensive range. It serves as a critical warning stage for the development of hypertension and related cardiovascular complications. The global burden of hypertension is increasing, and early identification of pre-hypertensive individuals is essential for timely intervention and prevention. In Malaysia, the rising prevalence of non-communicable diseases such as obesity, diabetes, and dyslipidaemia has drawn attention to the early stages of blood pressure elevation. Multiple factors, including demographic (age, sex), metabolic (diabetes, high cholesterol), and behavioural (alcohol use, tobacco use), have been associated with pre-hypertension, though findings across studies remain inconsistent. Understanding the interplay of these risk factors within the Malaysian context is vital for targeted public health strategies. Therefore, this study aimed to determine the prevalence and factors associated with pre-hypertension among adults in Malaysia aged 18 years and above.

Materials and Methods

Secondary data was obtained from the National Health and Morbidity Survey (NHMS) 2023, a national household survey with a multi-stage stratified sampling technique¹. A total of 10,858 adults aged 18 and above responded by completing a self-administered questionnaire and consenting to undergo clinical assessments, including blood pressure measurement. Blood pressure measurements were taken

using a digital blood pressure monitor (OMRON 907). Pre-hypertension was defined as systolic blood pressure (SBP) of 120-139 mmHg and/or diastolic blood pressure (DBP) of 80-89 mmHg. All hypertensive individuals were excluded in the sample in order to meet the objective of the study. Complex sample design analysis was used to estimate the prevalence, and complex sampling multivariable logistic regression was used to determine factors associated with pre-hypertension. All analysis was done using SPSS version 26.0.

Results and Discussion

A total of 6,805 non-hypertensive individuals were included in the study. The overall prevalence of pre-hypertension was 56.5% (95% CI: 54.3 - 58.7), which represented 9,122,000 people based on weighted records. This study identified several factors associated with pre-hypertension among Malaysian adults. Males exhibited significantly higher odds of pre-hypertension (aOR = 2.13, 95% CI: 1.78 - 2.56), consistent with findings from the PURE Malaysia Cohort Study, which reported a higher prevalence of pre-hypertension among men compared to women². Indian ethnicity was found to be associated with a lower risk of pre-hypertension compared to the reference group. This finding contradicts a previous nationwide study, which reported no significant differences in the prevalence of hypertension among the major ethnic groups³. This study showed that being older adults (40-59 and ≥60 years), having diabetes or high cholesterol increased the likelihood of pre-hypertension. A parallel pattern has been found in an earlier study that demonstrated the positive association between age, having diabetes, high cholesterol and pre-hypertension⁴. Interestingly, findings indicate that current alcohol use is associated with a reduced likelihood of pre-hypertension (aOR = 0.72, 95% CI: 0.55 - 0.94). This is consistent with meta-analytic evidence suggesting that light to moderate alcohol consumption (1-2 drinks per day) does not significantly increase the risk of hypertension and may have neutral or even protective effects on blood pressure⁵. Obese (aOR = 3.02, 95% CI: 2.49 - 3.66) and overweight (aOR = 1.84, 95% CI: 1.56 - 2.17) individuals had significantly higher odds of pre-hypertension, aligning with the NHMS 2015, which found that obese and overweight individuals had an adjusted odds ratio (aOR) of 3.43 and 1.97 respectively for pre-hypertension compared to those with normal weight or underweight⁴.

Table 1: Factors Associated with Pre-Hypertension among Adults in Malaysia

Variables	aOR	95% CI	p-value
Sex			
Male	2.13	1.78 - 2.56	<0.001 *
Female (ref)	1.00	-	-
Age Category			
18-39 years (ref)	1.00	-	-
40-59 years	1.92	1.62 - 2.27	<0.001 *
≥60 years	3.25	2.39 - 4.41	<0.001 *

Variables	aOR	95% CI	p-value
Ethnicity			
Malay	0.78	0.52 - 1.19	0.247
Chinese	0.93	0.59 - 1.48	0.761
Indian	0.56	0.33 - 0.95	0.030 *
Other Bumiputera	1.20	0.78 - 1.86	0.407
Others (ref)	1.00	-	-
Household Income			
B40	1.24	0.98 - 1.57	0.077
M40	1.25	0.98 - 1.58	0.070
T20 (ref)	1.00	-	-
Diabetes Mellitus			
Yes	1.42	1.07 - 1.87	0.014 *
No (ref)	1.00	-	-
High Cholesterol			
Yes	1.19	1.00 - 1.42	0.047 *
No (ref)	1.00	-	-
Tobacco Use			
User	1.18	0.91 - 1.53	0.221
Non-user(ref)	1.00	-	-
Current Alcohol Use			
Yes	0.72	0.55 - 0.94	0.018 *
No (ref)	1.00	-	-
BMI (WHO 1998 Classification)			
Normal/ Underweight (ref)	1.00	-	-
Overweight	1.84	1.56 - 2.17	<0.001 *
Obese	3.02	2.49 - 3.66	<0.001 *

Note: aOR = Adjusted Odds Ratio; CI = Confidence Interval; Ref = Reference category. * Significant at $p < 0.05$.

Conclusion

This study highlights the significant influence of sex, age, metabolic and behavioural factors on pre-hypertension, underscoring the need for early

identification and intervention. Implement targeted health education and screening programs focusing on high-risk groups especially males, individuals with elevated BMI and chronic health conditions to prevent progression to hypertension.

References

1. Institute for Public Health (IKU). National Health and Morbidity Survey (NHMS) 2023: Non-Communicable Diseases and Healthcare Demand: Technical Report; 2024.
2. Ismail R, Ismail NH, Md Isa Z, Mohd Tamil A, Ja'afar MH, Mat Nasir N, et al. Prevalence and factors associated with prehypertension and hypertension among adults: Baseline findings of PURE Malaysia cohort study. *Am J Med Open*. 2023;10:100049. <https://doi.org/10.1016/j.ajmo.2023.100049>
3. Rampal L, Rampal S, Azhar M, Rahman A. Prevalence, awareness, treatment and control of hypertension in Malaysia: a national study of 16,440 subjects. *Public Health*. 2008;122(1):11-8. <https://pubmed.ncbi.nlm.nih.gov/17981310>
4. Mahadir Naidu B, Mohd Yusoff MF, Abdullah S, Musa KI, Yaacob NM, Mohamad MS, et al. Factors associated with the severity of hypertension among Malaysian adults. *PLoS One*. 2019;14(1):e0207472. <https://doi.org/10.1371/journal.pone.0207472>
5. Roerecke M, Rehm J. The effect of alcohol on blood pressure: A review and meta-analysis of randomized trials. *Alcohol Clin Exp Res*. 2012;36(4):622-638. <https://doi.org/10.1111/j.1530-0277.2011.01662.x>

EPIDPP26 / 311

A Wake-Up Call on Adolescent E-Cigarette Use in Malaysia

Muhammad Fadhli Mohd Yusoff¹, Mohd Ruhaizie Riyadzi¹, Tania Gayle Robert Lourdes¹, Hamizatul Akmal Abd Hamid¹, Tamil Arasu Saminathan¹

¹Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia.

Corresponding author's email: fadhli_my@moh.gov.my

Summary

Electronic cigarettes (e-cigarettes), also known as "vapes," have emerged as a significant public health concern. This study compares the prevalence and associated sociodemographic characteristics of e-cigarette use among adolescents in Malaysia between 2017 and 2022, based on data from two national school-based health surveys: the National Health and Morbidity Survey (NHMS) 2017 and NHMS 2022. The surveys revealed a notable increase in the prevalence of e-cigarette use among adolescents aged 13 to 17 years, rising from 9.8% in 2017 to 14.9% in 2022. This upward trend was observed across nearly all sociodemographic groups. These findings highlight the urgent need to strengthen anti-smoking initiatives targeting adolescents, with particular emphasis on preventing e-cigarette use.

Keywords

Adolescents, electronic cigarettes, e-cigarettes, National Health and Morbidity Survey, Malaysia

Introduction

Electronic cigarettes (e-cigarettes), also known as "vapes," have emerged as a significant public health threat. E-cigarette aerosol may contain nicotine and other harmful substances, such as cancer-causing chemicals, volatile organic compounds, and heavy metals¹. Prolonged nicotine exposure can lead to addiction, and research has raised concerns about the potential for e-cigarettes to serve as a gateway to cigarette smoking, particularly among adolescents². In Malaysia, the prevalence of e-cigarette use among adolescents aged 10 to 19 years was 9.1% in 2016³.

Factors such as age, male gender, and smoking status have been associated with e-cigarette use. Additionally, peer influence and parental use of tobacco products have been found to contribute to adolescent e-cigarette use⁴. Monitoring e-cigarette use is crucial for tracking usage patterns and strengthening public health strategies to address this growing concern. This study compares the prevalence of e-cigarette use and associated sociodemographic characteristics among adolescents in Malaysia between 2017 and 2022.

Materials and Methods

This study utilised data from two national health surveys conducted among school-going adolescents in Malaysia, namely the National Health and Morbidity Survey (NHMS) 2017 and NHMS 2022. The target population for both surveys consisted of adolescents aged 13 to 17 years (School Forms 1 to 5). A two-stage stratified cluster sampling design was employed to select a representative sample of school-

going adolescents across Malaysia. Both surveys used a structured questionnaire adapted from the Global Youth Tobacco Survey Questionnaire⁵. Data were collected through a self-administered questionnaire. The prevalence of e-cigarette use was determined for each survey. E-cigarette user is an individual who had used an e-cigarette in the past 30 days.

Complex sample logistic regression analysis was performed to identify factors associated with e-cigarette use among adolescents in each survey. The dependent variable was current e-cigarette use, and the independent variables included sex, school form, ethnicity, smoking status, parental smoking status, and parental e-cigarette use. Model fit was evaluated using a classification table. Data are presented with a 95% confidence interval. All statistical analyses were conducted using SPSS version 28 with the Complex Samples function.

Results and Discussion

This study examines the changes in the prevalence of e-cigarette use and the factors associated with its use among adolescents aged 13 to 17 years from 2017 to 2022, based on two national school-based health surveys in Malaysia. A total of 27,497 respondents participated in NHMS 2017, and 33,523 respondents participated in NHMS 2022, with response rates of 89.2% and 89.4%, respectively. Table 1 presents the sociodemographic characteristics of the respondents for each survey.

Table 1: Sociodemographic characteristics of respondents in NHMS 2017 and NHMS 2022

	2017		2022	
Variables	Count	%	Count	%
Location				
Urban	15899	57.8	28165	84
Rural	11598	42.2	5358	16
Sex				
Male	13135	47.8	15493	46.2
Female	14362	52.2	18030	53.8
Age (Form)				
13 (Form 1)	5704	20.8	7216	21.5
14 (Form 2)	5501	20	6902	20.6
15 (Form 3)	5837	21.2	6460	19.3
16 (Form 4)	5532	20.1	6756	20.1
17 (Form 5)	4923	17.9	6189	18.5
Ethnicity				
Malays	18713	68.1	23125	67.2
Chinese	4100	14.9	5985	17.4
Indians	1428	5.2	1556	4.5
Others	3256	11.8	3757	10.9

The surveys revealed a marked increase in the prevalence of e-cigarette use among adolescents aged 13 to 17, rising from 9.8% in 2017 to 14.9% in 2022. This increase was observed across nearly all sociodemographic groups, with the relative increase being more pronounced in certain subgroups. Specifically, the prevalence in rural areas rose from 11.2% to 20.8%, among females from 2.8% to 6.2%, among Form 5 students from 10.5% to 19.1%, among Malays from 10.3% to 16.9%, and among non-smokers from 3.1% to 7.9% (Table 2).

Table 2: Prevalence of current e-cigarette use by sociodemographic characteristics among adolescents aged 13 to 17 years in Malaysia, NHMS 2017 and NHMS 2022

Variables	Estimated Population	Prevalence (%)	95% CI		Estimated Population	Prevalence (%)	95% CI	
			Lower	Upper			Lower	Upper
Overall	211084	9.8	9	10.8	307109	14.9	13.7	16.1
Location								
Urban	106181	8.8	7.7	10	226132	13.5	12.2	14.9
Rural	104903	11.2	9.9	12.7	80977	20.8	18.1	23.7
Sex								
Male	180620	17	15.5	18.5	242849	23.5	21.6	25.6
Female	30464	2.8	2.4	3.3	64260	6.2	5.7	6.8
Age (Form)								
13 (Form 1)	38583	8.6	6.8	10.7	47928	10.7	9.3	12.3
14 (Form 2)	40545	9.5	8.1	11.1	55129	12.8	11.4	14.3
15 (Form 3)	43446	10.1	8.4	12.1	63398	15.2	13.6	17
16 (Form 4)	44040	10.6	9.1	12.5	67708	17.3	14.7	20.2
17 (Form 5)	44470	10.5	8.7	12.7	72946	19.1	16.8	21.8
Ethnicity								
Malays	138875	10.3	9.3	11.3	220305	16.9	15.5	18.5
Chinese	16176	4.5	3.5	5.8	19530	5.2	4.3	6.3
Indians	16264	10.9	7.3	16.1	13165	10.7	8.5	13.4
Others	39769	14	12.1	16.2	54109	20.2	18.1	22.5
Smoking Status								
Smoker	155595	45.5	43.3	47.8	157892	84.5	82.9	86
Non-smoker	55489	3.1	2.7	3.5	149217	7.9	7.2	8.7

Logistic regression analysis showed a substantial increase in the adjusted odds ratio (AOR) for e-cigarette use among adolescents who smoke (from 15.25 to 56.29) and among Malays (from 1.78 to 3.71). The AOR also increased with age (school form) and among students whose parents' smoke. However, the association between adolescents' e-cigarette use and their parents' e-cigarette use decreased, with the AOR dropping from 3.78 to 1.64 (Table 3).

This trend is concerning, as e-cigarette use could introduce adolescents to nicotine, potentially leading to nicotine addiction and, eventually, cigarette smoking among non-smokers.

Table 3: Comparison of factors associated with current e-cigarette use among adolescents in Malaysia between NHMS 2017 and NHMS 2022

Variables	2017			2022		
	Adjusted* Odds Ratio (AOR)	95% CI		Adjusted* Odds Ratio (AOR)	95% CI	
		Lower	Upper		Lower	Upper
Sex						
Male	4.4	3.53	5.48	3.81	3.37	4.3
Female (Ref)	1			1		
Age (Form)						
13 (Form 1) (Ref)	1			1		
14 (Form 2)	1.19	0.9	1.56	1.3	1.02	1.66
15 (Form 3)	1.14	0.81	1.6	1.83	1.46	2.29
16 (Form 4)	1.27	0.97	1.65	2.35	1.79	3.08
17 (Form 5)	1.34	0.95	1.89	2.27	1.72	3.01
Ethnicity						
Malays	1.78	1.28	2.48	3.71	3.02	4.57
Chinese (Ref)	1			1		
Indians	2.28	1.39	3.75	2.25	1.59	3.19
Others	2.05	1.41	2.97	3.83	3.02	4.87
Smoking Status						
Smoker	15.25	12.62	18.43	56.29	46.76	67.77
Non-smoker (Ref)	1			1		
Parents smoking status						
Smoker	1	0.85	1.19	1.32	1.16	1.49
Non-smoker (Ref)	1			1		
Parents ecig user						
Ecig user	3.78	3	4.77	1.64	1.42	1.89
Non-user (Ref)	1			1		

Conclusion

The prevalence of e-cigarette use among adolescents in Malaysia is rising across almost all sociodemographic groups. Anti-smoking measures targeting adolescents, particularly those related to e-cigarettes, should be strengthened.

Acknowledgement

We would like to acknowledge the Director General of Health for his permission to present the study.

References

1. Marques P, Piqueras L, Sanz MJ. An updated overview of e-cigarette impact on human health. *Respir Res.* 2021;22(1):1-14. doi:10.1186/s12931-021-01737-5
2. Bell K, Keane H. All gates lead to smoking: The 'gateway theory', e-cigarettes and the remaking of nicotine. *Soc Sci Med.* 2014;119:45-52. doi:10.1016/J.SOCSCIMED.2014.08.016
3. Institute for Public Health. *Tobacco & E-Cigarette Survey Among Malaysian Adolescents (TECMA).*; 2016. <http://www.iku.gov.my/images/IKU/Document/REPORT/TECMA2016/TabaccoandECigarette.pdf>
4. Ling MYJ, Ahmad N, Yusoff MFM, Lim KH. Current e-cigarette use among in-school adolescents in West Malaysia: Examining the interactions between sociodemographic characteristics and lifestyle risk behaviours. *PLoS One.* 2022;17(1 January):1-19. doi:10.1371/journal.pone.0263355
5. Centers for Disease Control and Prevention (CDC). GYTS Core Questionnaire with Optional Questions. *Glob Youth Tob Surv.* 2014;1.2(Vers1):1-29.

EPIDPP27 / 320

Sex Differences in Years of Life Lost in Malaysia, 2023: A Burden of Premature Mortality

Khaw Wan-Fei ¹, Nazirah Alias ¹, Tham Sin Wan ¹, Nur Hamizah Nasaruddin ¹, Nur Diyana Rosnan ¹, Wan Kim Sui ¹, Mohd Azmi Suliman ¹, Shubash Shander Ganapathy ¹, Mohd Azahadi Omar ²

¹ Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

² Sector for Biostatistics & Data Repository, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: khaw.wf@moh.gov.my

Summary

This study aimed to estimate sex differences in Years of Life Lost (YLL) for the leading causes of death in 2023. Males experienced a higher YLL burden than females, especially among young and middle-aged adults. Road injury YLL was five times higher in males, and ischaemic heart disease caused twice the YLL in males as in females. These findings highlight the need for sex-specific public health strategies, improved road safety policies, and interventions targeting behavioural risk factors. Such efforts are essential to reduce premature mortality and achieve the Sustainable Development Goal of ensuring healthy lives and promoting well-being for all ages.

Keywords

Premature mortality, Burden of disease, Population health, Sex difference, Malaysia

Introduction

Premature deaths, which refer to deaths occurring before the expected age, remain a major public health challenge in Malaysia. Traditional mortality indicators, such as death counts or crude death rates, do not account for the age at which deaths occur. Years of life lost (YLL), a key component of the Global Burden of Disease (GBD) framework¹, is used to better quantify the burden of early death by incorporating both the number of deaths and the years lost based on standard life expectancy². This measure allows for a more accurate assessment of the diseases and populations most affected by premature mortality. This analysis is part of the Malaysian Burden of Disease (MBOD) study, an ongoing project designed to assess the disease burden of Malaysians using the GBD methodology. The aim of this study was to estimate YLL in Malaysia for the year 2023, with a specific focus on sex differences in premature mortality.

Materials and Methods

This study included all registered deaths that occurred in Malaysia in 2023; death data were obtained from the Department of Statistics Malaysia (DOSM). A list of 162 specific diseases from a previous MBOD study was included³, and cause of death estimation was conducted using a redistribution method to account for ill-defined causes⁴. All analyses were performed using R statistical software. YLL was

computed by multiplying the number of deaths at each age by remaining standard life expectancy at that age and sex using life tables from DOSM. YLL rates were calculated per 1000 population and stratified by sex and eight age groups: 0-4, 5-14, 15-29, 30-44, 45-59, 60-69, 70-79, and 80 years and above. Ratios of male-to-female YLL rates were calculated to quantify sex disparities overall, by age group, and by the five leading causes of YLL.

Results and Discussion

A total of 3.64 million YLL was recorded in Malaysia in 2023. Males contributed 2.15 million YLL, while females accounted for 1.49 million YLL (Table 1). The YLL rate was 122.9 per 1000 population for males and 93.8 per 1000 for females, resulting in a male-to-female ratio of 1.3. This sex disparity in premature mortality is consistent with global trends¹, where men are more likely to experience early death due to preventable causes and risky health behaviours². Males experienced higher YLL rates in nearly all age groups, particularly in young and middle-aged populations. The largest sex disparity was observed in the 15-29 age group (ratio: 2.3), followed by those aged 30-44 (ratio: 1.7) and 45-59 (ratio: 1.6). In contrast, females had slightly higher YLL rates in the 80+ age group (ratio: 0.7), likely due to longer life expectancy and population ageing. Ischaemic heart disease was the top cause of YLL (Table 2), with rates of 26.6 per 1000 in males and 13.6 per 1000 in females (ratio: 2.0). This finding highlights the need for targeted health promotion, preventive screening, and behavioural interventions. Road injuries showed the highest disparity (12.2 vs. 2.3 per 1000; ratio: 5.3), highlighting the need for targeted road safety interventions. However, diabetes caused slightly more YLL in females than males (3.7 vs. 4.2 per 1000; ratio: 0.9). This result is possibly due to a greater chronic disease burden in older female populations, suggesting the importance of strengthening chronic disease management and geriatric care for older females.

Table 1: Years of life lost (YLL) by age group and sex in Malaysia, 2023

Age Group	YLL		YLL rate/1000		Male/female ratio
	Male	Female	Men	Female	
0-4	154176	123406	126.8	107.2	1.2
5-14	47970	29431	17.9	11.7	1.5
15-29	229954	85980	48.6	21.4	2.3
30-44	353009	184607	80.3	48.4	1.7
45-59	552957	339857	212.9	135.6	1.6
60-69	417850	303731	364.5	261.9	1.4
70-79	271642	239446	504.3	407.7	1.2
80+	119808	188060	726.1	1047.1	0.7
Total	2147366	1494518	122.9	93.8	1.3

Table 2: Years of life lost (YLL) by the five leading causes of death and sex, Malaysia, 2023

Causes of Death	YLL		YLL rate/1000		Male/female ratio
	Male	Female	Men	Female	
Ischaemic heart disease	464415	216381	26.6	13.6	2.0
Lower respiratory infection	222546	181200	12.7	11.4	1.2
Stroke	179177	149719	10.3	9.4	1.1
Road injuries	213298	36476	12.2	2.3	5.3
Diabetes mellitus	64315	67052	3.7	4.2	0.9

Conclusion

This study showed that males had a higher burden of premature mortality than females in Malaysia, particularly among young and middle-aged adults. These findings are critical for guiding national health policy and highlight the need for sex-specific health policies and targeted interventions to address behavioural risk factors, in order to reduce avoidable deaths and improve population health outcomes.

References

1. Diseases GBD, Injuries C. Global incidence, prevalence, years lived with disability (YLDs), disability-adjusted life-years (DALYs), and healthy life expectancy (HALE) for 371 diseases and injuries in 204 countries and territories and 811 subnational locations, 1990-2021: a systematic analysis for the Global Burden of Disease Study 2021. *Lancet*. 2024;**403**(10440):2133-61.
2. Khaw WF, Chan YM, Nasaruddin NH, Alias N, Tan L, Ganapathy SS. Malaysian burden of disease: years of life lost due to premature deaths. *BMC Public Health*. 2023;**23**(1):1383.
3. Institute for Public Health. Malaysian Burden of Disease and Injury Study 2019. In press.
4. Institute for Public Health. Malaysian Burden of Disease and Injury Study 2015-2017. 2019.

EPIDPP28 / 323

Epidemiological Characteristics of Hepatitis B Notifications in Kinta District, Perak, Malaysia, 2024

Lai Yeng Chow ¹, Pathma Reddy ², Gregory Xavier ²

¹ Clinical Research Centre, Hospital Raja Permaisuri Bainun Ipoh, Ministry of Health Malaysia

² Kinta District Health Office, Ministry of Health Malaysia

Corresponding author's email: chowlaiyeng1@gmail.my

Summary

In 2024, hepatitis B notifications in Kinta district, Perak, showed a notable increase compared to 2023. Among 296 notifications, 175 cases were confirmed, with a predominance of chronic hepatitis B. Chinese ethnicity and lack of vaccination were major features. Most cases were detected via pre-operative screenings. These findings highlight gaps in vaccination and diagnosis, underscoring the need for improved public health interventions to achieve hepatitis B elimination goals.

Keywords

Hepatitis B, epidemiology, vaccination, screening, Malaysia

Introduction

Globally, hepatitis B virus (HBV) remains a major health burden, with 257 million people chronically infected¹. In the Asia-Pacific region, chronic HBV continues to drive liver-related morbidity and mortality, despite vaccination programs². Malaysia faces a heterogeneous HBV prevalence, with higher rates among Chinese communities³. Previous Malaysian studies reveal low awareness and treatment uptake⁴, alongside successful low-cost screening initiatives². However, achieving the World Health Organization's 2030 elimination targets remains challenging¹. This study examines the trends, demographic characteristics, detection modes, and vaccination status of hepatitis B cases notified in Kinta district, Perak, in 2024, to inform ongoing public health efforts.

Materials and Methods

A retrospective review was conducted on hepatitis B notifications received by the Kinta District Health Office, Perak, Malaysia, from January to December 2024. Cases were confirmed based on positive hepatitis B surface antigen (HBsAg) tests. Cases were categorized as acute or chronic. Classification into acute or chronic was based on clinical documentation and serological markers, including HBsAg persistence beyond six months, following the Ministry of Health Malaysia and WHO case definitions. Data extracted included age, citizenship, ethnicity, screening modality, and vaccination status. Vaccination status was obtained through direct telephone interviews with patients or guardians, based on self-reported history. A case was considered completely vaccinated if the respondent reported having

received the full three-dose hepatitis B vaccine series. No documentary verification was performed. Comparative analysis was performed against 2023 data. Descriptive statistics were applied to summarize distributions.

Results and Discussion

A total of 296 hepatitis B notifications were recorded in 2024, with 175 cases confirmed. Compared to 2023, there was a notable rise in both notifications and confirmed cases. Chronic hepatitis B accounted for 98% of the registered cases, consistent with regional epidemiological shifts toward chronic infection dominance². Among Malaysian cases, 70% were of Chinese ethnicity, corroborating earlier prevalence findings³. This higher proportion may partly reflect more widespread empirical screening practices among the Chinese community, supported by better affordability and access to private healthcare services. In contrast, empirical screening is uncommon among the Malay community, who more often seek care at government hospitals where such screening is not routinely performed, potentially leading to under-detection among other ethnic groups. Only 2% of confirmed cases had self-reported complete hepatitis B vaccination, while 82% were unvaccinated, highlighting significant gaps in preventive coverage. (1,4) Detection predominantly occurred via pre-operative screenings (65%), followed by health and FOMEMA screenings, reflecting the effectiveness of opportunistic community-based screening efforts². The overwhelming chronicity observed, with 98% of cases classified as chronic hepatitis B, aligns with the epidemiological transition in the Asia-Pacific region where chronic HBV infection remains a major cause of morbidity and mortality⁵. Younger cases (≤ 35 years) were few, mainly among non-citizens or linked to familial or HIV-associated transmission, suggesting residual perinatal and horizontal transmission risks. These findings emphasize the need for targeted vaccination campaigns, intensified public awareness initiatives, and comprehensive follow-up systems, particularly among high-risk ethnic groups. Improving HBV case detection beyond opportunistic screening and expanding catch-up immunization are vital in accelerating progress towards national hepatitis B elimination targets.

Conclusion

The rise in hepatitis B notifications and the predominance of chronic infections in Kinta district highlight the need to strengthen public health initiatives, including vaccination, early diagnosis, and targeted awareness campaigns, and to expand screening activities, particularly among individuals born before the introduction of the national hepatitis B immunisation programme.

References

1. World Health Organization. Global hepatitis report 2017 [Internet]. Geneva: World Health Organization; 2017 [cited 2025 Apr 28]. 83 p. Available from: <https://iris.who.int/handle/10665/255016>
2. Radzi Ah M, S Tan S, Mohamed R, Jaya F, K S, C Aun A, et al. Hepatitis Screening and Treatment Campaign in Malaysia-Validation of Low-cost Point

- of Care Screening Tests and Nucleic Acid Tests for Hepatitis B and C. *Euroasian J Hepatogastroenterol*. 2018;**8**(2):101-7.
3. Zz L, Js T, Ac T, Siam TS, Mohamed R, Kl G, et al. Prevalence of Chronic Hepatitis B and C in Malaysia- results from a community-based screening campaign.
 4. Lim Z zhi, Teo JS, Tan AC, Lim TO. Awareness and treatment of chronic hepatitis B in Malaysia-findings from a community-based screening campaign. *BMC Gastroenterol*. 2022 Aug 6;**22**(1):374.
 5. Wong MCS, Huang JLW, George J, Huang J, Leung C, Eslam M, et al. The changing epidemiology of liver diseases in the Asia-Pacific region. *Nat Rev Gastroenterol Hepatol*. 2019 Jan;**16**(1):57-73.

EPIDPP29 / 331

Influenza B Outbreak Report At The Hostel Of Sekolah Menengah Kebangsaan Tinggi Setapak, Kuala Lumpur

Puteri Sofia Nadira Binti Megat Kamaruddin¹, Shazana Rifham bt Abdullah¹, Mohd Safwan bin Ibrahim²

¹ Institute for Medical Research, National Institutes of Health, Ministry of Health Malaysia

² Titiwangsa District Health Office, Ministry of Health Malaysia

Corresponding author's email: puterisofia@moh.gov.my

Summary

An Influenza B outbreak at SMK Tinggi Setapak's dormitory from 2nd to 8th May 2024 involved 49 symptomatic cases (26 confirmed) occurred, with a 47.1% attack rate among the 104 exposed individuals,, prompting PK Titiwangsa to conduct epidemiological investigations, risk assessments, and health promotion activities. Contributing factors included poor ventilation, crowded group activities, close contact among students, and the absence of symptomatic screening measures. All affected individuals received outpatient treatment and were stable. Control measures such as active case detection, health education, and symptomatic screening were implemented, and the outbreak was declared over on 18th May 2024.

Keywords

influenza, outbreak, school hostel, active case detection

Introduction

The influenza outbreak poses a serious public health risk due to its rapid spread and strain on the healthcare system. It is highly contagious and can cause symptoms such as fever, cough, sore throat, muscle aches, headache, and fatigue¹. The main preventive measure against this disease is annual vaccination, especially recommended for high-risk groups such as children, the elderly, and those with chronic illnesses². Preventive measures such as good hand hygiene, wearing a face mask when coughing or sneezing, and isolating infected individuals are also important to reduce the spread of the virus³. PK Titiwangsa investigated the outbreak after three influenza B cases were reported at SMK Tinggi Setapak's dormitory. The investigation aims to detect, monitor, and control the spread of influenza among SMK Tinggi Setapak dormitory students, teachers, and the surrounding community.

Materials and Methods

The influenza outbreak at the SMK Tinggi Setapak hostel was declared on 5th May 2024. The definition of cases, outbreak locality, and outbreak declaration have been formulated according to the Case Definition for Infectious Diseases by the Ministry of Health Malaysia⁴. Epidemiological investigation, environmental investigation, risk assessment, and health promotion were carried out. The school dormitory has two levels and is equipped with several facilities, including six dormitory rooms, four toilets, one food preparation area (kitchen), one dining area (canteen), one office room, one rest room, one isolation room, one prayer room

(surau), one laundry room, and one ironing room. The total number of students residing in the hostel is 100, along with four teachers/wardens, bringing the total population of the hostel to 104 individuals.

Results and Discussion

The index case and two students were confirmed positive for Influenza B, leading to the declaration of an outbreak at SMK Tinggi Setapak dormitory in Titiwangsa. During Active Case Detection on 6th May 2024, 39 symptomatic cases were identified, including five students who tested positive using Influenza A+B Rapid Test Kits (RTK). Additional cases brought the total to 49, comprising 48 students and one teacher, with the last case reported on 8th May 2024. The outbreak, occurring within one incubation period, suggests a point-source infection. The total number of individuals exposed was 104 (100 students and 4 teachers/wardens). This results in an Influenza B attack rate of 47.1%. All affected individuals were stable and sent home for treatment. Health education was provided, but despite a generally clean environment, factors such as poor ventilation, dormitory crowding, close-contact group activities, and the absence of a gate-keeping system contributed to the rapid transmission of influenza during the outbreak. PK Titiwangsa has implemented appropriate control and prevention measures, such as case detection activities, symptomatic screening, and health promotion to the students and the school dormitory staff.

Table 1: Characteristics of Case Distribution by Demographics and Health Status at the Sekolah Menengah Kebangsaan Tinggi Setapak's Dormitory

	Number of cases, n	(%)
Total cases	49	
Employment status		
Lower Secondary Students (13-15 years old)	29	(59%)
Upper Secondary Students (16-17 years old)	19	(39%)
Teachers	1	(2%)
Symptoms		
Fever	49	(100%)
Cough	29	(59%)
Runny nose	25	(51%)
Sore throat	46	(94%)
Influenza B case category		
Confirmed	26	(53%)
Probable	23	(47%)

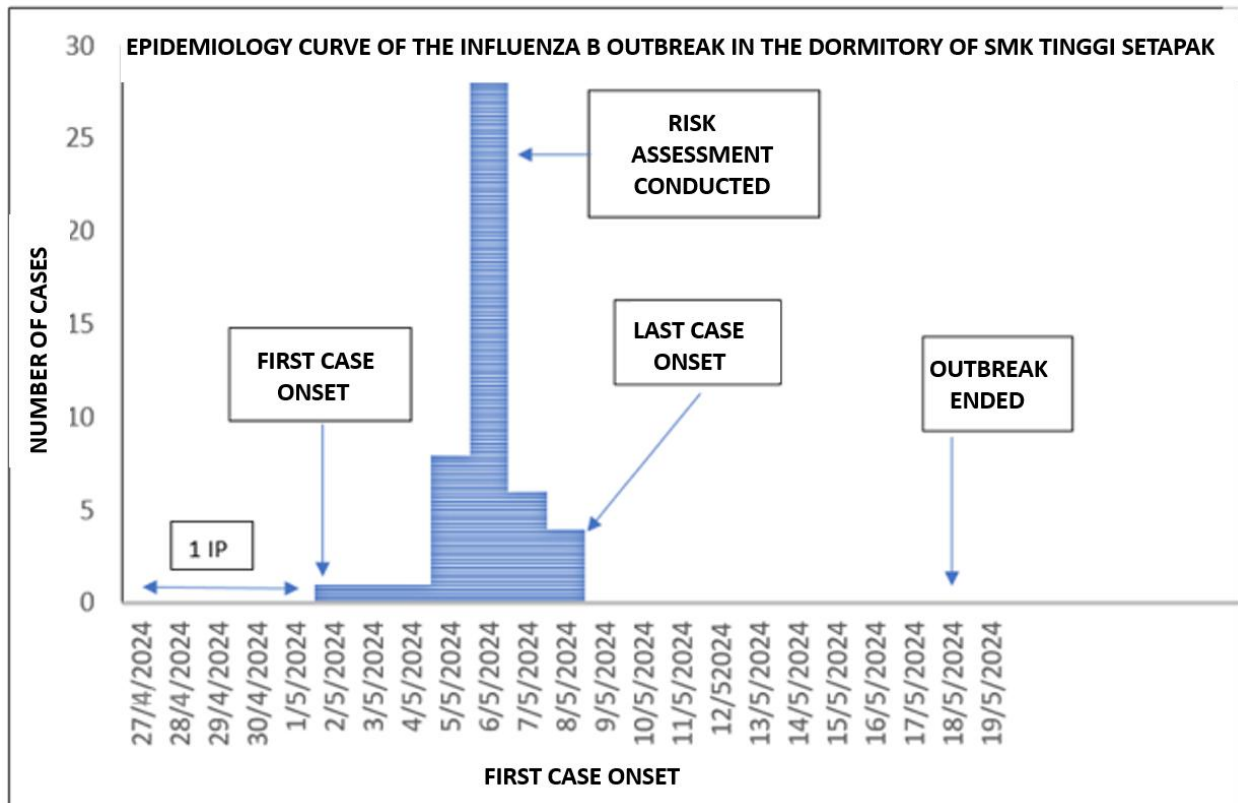


Figure 1: Epidemiological Curve of the Influenza B Outbreak At the dormitory of Sekolah Menengah Kebangsaan Tinggi Setapak

Conclusion

An outbreak of Influenza B involving 49 cases (26 confirmed and 23 probable) at SMK Tinggi Setapak from 2nd to 8th May 2024 was managed with outpatient treatment and disease control measures by PK Titiwangsa. The outbreak was declared over on 18th May 2024.

References

1. CCenters for Disease Control and Prevention. Signs and symptoms of flu [Internet]. Atlanta (GA): CDC; 2024 [cited 2024 Oct 16]. Available from: <https://www.cdc.gov/flu/signs-symptoms/index.html>
2. Kementerian Kesihatan Malaysia. *Influenza vaccination for the elderly and economic evaluation*. Putrajaya: Malaysian Health Technology Assessment Section, Medical Development Division; 2019. Report No.: 009/2019.
3. Chiu NC, Chi H, Tai YL, et al. Impact of wearing masks, hand hygiene, and social distancing on influenza, enterovirus, and all-cause pneumonia during the coronavirus pandemic: retrospective national epidemiological surveillance study. *J Med Internet Res* 2020; **22**(8):e21257.
4. Kementerian Kesihatan Malaysia. *Case definitions for infectious diseases in Malaysia*. 3rd ed. Putrajaya: Disease Control Division, Surveillance for Infectious Disease; 2016.

EPIDPP30 / 333

Urban-Rural Disparities in Overall Disability among Malaysian Adults: Findings from the National Health and Morbidity Survey 2023

Norliza Shamsuddin¹, S Maria Awaluddin¹, Siti Hafizah Zulkipli¹, Nor'Ain Ab Wahab¹, Norzawati Yeop, Hashimah Ismail, Halizah Mat Ripin¹, Muhammad Fadhli Mohd Yusoff¹

¹ Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

*Corresponding author's email: norlizas@moh.gov.my

Summary

This study aims to determine urban-rural differences in overall disability among Malaysian adults and identify key sociodemographic factors associated with disability using data from the 2023 National Health and Morbidity Survey (NHMS). The study found a significant urban-rural disparity in disability prevalence, higher in rural areas (11.8%) than urban (7.2%) ($p < 0.001$) with disparities influenced by age, education, and employment status. These findings indicate that ageing populations, particularly in rural settings, are more vulnerable to functional impairments likely due to disparities in socioeconomic status, highlighting the need for stronger geriatric healthcare support.

Keywords

Overall disability, cross-sectional, adults, urban-rural, Malaysia

Introduction

Disability is a major public health issue that affects individuals' quality of life, independence, and access to healthcare and employment¹. Understanding disparities in disability prevalence between urban and rural populations is essential for designing equitable healthcare policies. Rural communities often face challenges such as limited healthcare facilities and lower socioeconomic status, which may contribute to a higher burden of disability. This study aims to determine urban-rural differences in overall disability among Malaysian adults and identify key sociodemographic factors associated with disability.

Materials and Methods

This cross-sectional study utilised data from the 2023 National Health and Morbidity Survey (NHMS), a nationally representative health survey in Malaysia. A multistage cluster random sampling method was applied to select respondents from urban and rural areas. With the given proportions of 9.5% (urban) and 16.1% (rural) for overall disability from previous study², the minimum sample size is 398 per group, totaling 796 participants. Disability status was assessed using the Washington Group Short Set Questionnaire, which includes six functional domains: seeing, hearing, walking, remembering, self-care, and communicating. The overall disability was defined as having 'some difficulty' in two domains or 'a lot of difficulty' or 'cannot do at all' in one domain¹. In addition, sociodemographic data (age, gender, ethnicity, education level, employment status, and household income) were collected. Descriptive statistics were used to estimate the

prevalence of disability. Complex sample frequency and crosstabulation analyses were conducted to compare urban and rural groups. The Rao-Scott chi-square test was applied to determine statistical significance ($p < 0.05$). Data analysis was performed using IBM SPSS version 29.

Results and Discussion

The response rate for this study was 83.2%, with a total of 10,858 respondents, comprising 8,294 urban and 2,564 rural residents. The sociodemographic profile revealed notable differences between urban and rural residents. Urban areas had a higher proportion of younger adults aged 18-49 years (57.4%), whereas rural areas had a greater percentage of older adults aged 60 and above (32.5%), reflecting the demographic shift towards ageing in rural communities. The gender distribution was similar across both strata, with males comprising approximately 46% and females around 54%. Ethnicity-wise, Malay individuals were the majority in both urban (56.6%) and rural (63.7%) areas, while Chinese (18.4%) and Indian (8.1%) populations were more concentrated in urban regions. In contrast, Sabah/Sarawak Bumiputera accounted for a higher proportion of rural residents (21.3%) compared to urban areas (11.0%).

The study found a significant urban-rural disparity in disability prevalence, higher in rural areas (11.8%; 95% CI: 9.4, 14.8) than in urban areas (7.2%; 95% CI: 6.4, 8.1), $p < 0.001$. Age was a major factor, with prevalence increasing significantly among older age groups. In urban areas, disability affected 2.9% (95% CI: 2.3, 3.6) of adults aged 18-49, 9.3% (95% CI: 7.2, 11.8) in 50-59, and 24.1% (95% CI: 21.4, 26.9) in 60+ ($p < 0.001$). In rural areas, rates were even higher at 6.0% (95% CI: 4.2, 8.5), 14.3% (95% CI: 9.4, 21.2), and 32.7% (95% CI: 27.2, 38.7) in the respective age groups ($p < 0.001$). In urban areas, Sabah/Sarawak Bumiputera had the highest prevalence (10.7%; 95% CI: 7.3, 15.3), $p = 0.030$. In rural areas, Chinese (21.6%; 95% CI: 10.0, 40.6) and Indians (18.9%; 95% CI: 7.8, 39.2) had the highest rates ($p = 0.031$). Among urban residents, 17.4% (95% CI: 15.0, 20.0) with primary education or below had a disability, compared to 5.3% (95% CI: 4.5, 6.1) with secondary or tertiary education ($p < 0.001$). In rural areas, the gap was even wider, with 24.9% (95% CI: 18.7, 32.2) among those with lower education, versus 6.1% (95% CI: 4.8, 7.9) in those with higher education ($p < 0.001$). Disability was highest among retirees/unemployed (urban: 17.4%, 95% CI: 15.5, 19.6; rural: 24.6%, 95% CI: 19.3, 30.8) compared to those employed (urban: 3.6%, 95% CI: 2.9, 4.5; rural: 6.4%, 95% CI: 4.0, 10.1), $p < 0.001$. In urban areas, the highest prevalence was in the B40 group (8.5%; 95% CI: 7.5, 9.7), $p < 0.001$. In rural areas, disability was more common in lower-income groups but not statistically significant. This finding is in line with previous studies of higher prevalence disability among rural compared to urban residence^{1,3}. The findings highlight the need for stronger geriatric healthcare, improved education, financial aid, and better healthcare access especially in rural areas⁴.

Conclusion

This study highlights the higher prevalence of disability in rural Malaysia compared to urban areas, with disparities influenced by age, education, and employment. Given these findings, targeted interventions, including improved healthcare access, community support programmes, and policy initiatives, are essential to reduce the

burden of disability, especially in rural settings. Strengthening public health strategies to promote early detection and rehabilitation will be key to enhancing the quality of life for individuals with disabilities across Malaysia.

References

1. Ahmad NA, Mohamad Kasim N, Mahmud NA, et al. Prevalence and determinants of disability among adults in Malaysia: results from the National Health and Morbidity Survey (NHMS) 2015. *BMC Public Health* 2017; **17**(1):1-10.
2. Institute for Public Health. *National Health and Morbidity Survey (NHMS) 2019: NCDs - Non-Communicable Diseases, Risk Factors & Other Health Problems*. Setia Alam, Selangor: Ministry of Health Malaysia; 2020.
3. Qiao R, Jia S, Zhao W, et al. Prevalence and correlates of disability among urban-rural older adults in Southwest China: a large, population-based study. *BMC Geriatr* [Internet] 2022; **22**(1):1-11. Available from: <https://doi.org/10.1186/s12877-022-03193-2>
4. Abdullah JM, Ismail A, Yusoff MSB. Healthy ageing in Malaysia by 2030: needs, challenges and future directions. *Malays J Med Sci* 2024; **31**(4):1-13.

EPIDPP31 / 339

The Impact of TB Anatomy on the Duration of Treatment: An ANCOVA Approach Controlling for Age

Siti Romaino Mohd Nor^{1,2}, Nyi Nyi Naing¹, Mat Zuki Mat Jaeb³

¹ Faculty of Medicine, Universiti Sultan Zainal Abidin, Medical Campus, Kuala Terengganu, Terengganu, Malaysia,

² Clinical Research Centre Kelantan, Institute for Clinical Research, National Institute of Health, Ministry of Health

³ Respiratory Unit, Department of Medicine, Hospital Raja Perempuan Zainab II, Kota Bharu, Kelantan, Malaysia.

Corresponding author's email: sitiromaino@crc.moh.gov.my

Summary

Tuberculosis (TB) remains a significant global health challenge, particularly among TB-HIV co-infected patients. The complexity of managing TB treatment in such populations necessitates a deeper understanding of the factors that impact treatment duration. Two critical factors, TB anatomy and age, are hypothesized to influence treatment outcomes significantly¹. However, the interplay between these factors warrants detailed statistical analysis to provide unbiased insights. This study examines the influence of TB anatomy on treatment duration among TB-HIV co-infected patients in East Coast Malaysia (2016-2020), accounting for age as a covariate. Using secondary data from the MyTB database, researchers analyzed 1,223 patients using an Analysis of Covariance (ANCOVA) model. The findings reveal that patients with extrapulmonary TB (EPTB) required longer treatment (6.4 months on average) compared to those with pulmonary TB (PTB) (5.4 months on average), even after controlling for age. The study highlights the necessity of considering both anatomical and demographic factors to optimize treatment plans for TB-HIV co-infected individuals.

Keywords

TB-HIV co-infected patients, TB Anatomy, Treatment Duration, Age, ANCOVA

Introduction

Tuberculosis (TB) remains a significant global health challenge, particularly among individuals co-infected with human immunodeficiency virus (HIV). Understanding the factors influencing TB treatment duration in TB-HIV co-infected patients is essential for improving patient outcomes and guiding healthcare decisions. Among these factors, TB anatomy (pulmonary TB (PTB) vs. extrapulmonary TB (EPTB)) and age play a significant role in determining treatment duration. Accounting for age enables a more precise evaluation of the relationship between TB anatomy and treatment outcomes, leading to more effective management strategies. This study aimed to confirm the effect of TB anatomy on treatment duration among TB-HIV co-infected patients in East Coast Malaysia (2016-2020) after controlling for age.

Materials and Methods

This cross-sectional study utilized secondary data extracted from the MyTB database, conducted at the TB/Leprosy Sector, State Health Department of Kelantan, Terengganu, and Pahang from January 2016 to December 2020. The study employed a non-probability sampling method, applying a few inclusion and exclusion criteria to select the study subjects. Data were analyzed using the analysis of covariance (ANCOVA) model by IBM SPSS Statistics version 25.0, with TB anatomy assigned as the independent variable and age as a covariate to assess its effect on duration of treatment. Ethical approval for this study was granted by the UNiSZA Human Research Ethics Committee (UHREC) and the Medical Research Ethics Committee (MREC) of the Ministry of Health (MOH), ensuring adherence to ethical research standards.

Results and Discussion

The study included 1,223 TB-HIV co-infected patients aged between 18 and 77 years (mean $\pm$ SD: 38.7 $\pm$ 7.9 years). Treatment durations ranged from 0 to 21 months (mean $\pm$ SD: 5.6 $\pm$ 3.9 months). Among these patients, 978 (80%) had PTB, while 244 (20%) had EPTB. When the treatment duration was compared without controlling for other variables, there was a significant difference in mean treatment duration between patients with PTB and EPTB. A similar finding was reported after controlling for age. There was a significant difference in mean treatment duration. Patients with EPTB have a higher mean treatment duration (6.4 months) than patients with PTB (5.4 months), suggesting that EPTB cases require prolonged treatment interventions due to their complexity and varied organ involvement. The results indicate that TB anatomy significantly influences the duration of treatment, even when age is statistically controlled. These findings align with previous studies^{2,3} reporting differential treatment durations based on TB anatomy across various settings. The increased treatment duration for EPTB patients reflects the challenges associated with diagnosing and managing non-pulmonary manifestations, often requiring more extended and intensive therapeutic regimens. The study underscores the importance of considering both anatomical and demographic factors when devising treatment plans for TB-HIV co-infected patients, ensuring more effective disease management and improved patient outcomes.

Table 1: Comparison of treatment duration between PTB and EPTB with and without adjustment of age (n=1223)

TB anatomy	Mean	Mean Difference (95% CI)	t-stat/F-Stat	P-value
PTB (n = 979)	^a 5.4 (3.6)	-1.0 (-1.5, -0.5)	^b -3.6	^c <0.001
EPTB (n = 244)	^a 6.4 (4.7)			
PTB (n = 979)	5.4 (5.2, 5.6)	^d -1.0 (-1.5, -0.5)	^e 11.8	^f 0.001
EPTB (n = 244)	6.4 (5.9, 6.8)			

^a Mean (Standard Deviation)

^b t-stat

^c Independent T-test applied

^d Adjusted mean Difference (95% CI) Bonferroni adjustment applied

^e F-stat

^f ANCOVA applied (adjusted for age)

Conclusion

This study provides valuable insights into the role of TB anatomy and age in determining treatment duration among TB-HIV co-infected patients. The findings highlight the need for healthcare providers to tailor treatment strategies according to TB type while factoring in patient-specific characteristics such as age. By integrating these considerations, clinicians can enhance therapeutic effectiveness, reduce disease burden, and improve long-term patient outcomes.

References

1. Romaino SMN, Naing NN, Zuki M, Jaeb M. Factors associated with tuberculosis (TB) treatment success among tuberculosis (TB)/human immunodeficiency virus (HIV) co-infection in Kelantan. *Med J Malaysia* 2022; **77**:1-18.
2. Ranzani OT, Rodrigues LC, Waldman EA, Carvalho CRR. Estimating the impact of tuberculosis anatomical classification on treatment outcomes: a patient and surveillance perspective analysis. *PLoS One* 2017; **12**(11):1-15.
3. Yang N, Chen C, He J, et al. Treatment outcome and its associated factors among HIV-MTB co-infected patients in Sichuan, China: a retrospective study. *Medicine (Baltimore)* 2022; **101**(48):e32006.

EPIDPP32 / 340

Impact of Diagnostic Delay on Melioidosis Mortality in Sandakan: A Call for Early Detection Strategies

Nafsah Dulajis¹, Mohamad Hafiz Mohamad Nasir¹, Aizuddin Hidrus², Mohamad Faiz Gahamat¹

¹Sandakan Area Health Office, Sabah State Health Department

² Public Health Medicine Department, Faculty of Medical and Health Sciences, Universiti Malaysia Sabah

Corresponding author's email: drnafsahdulajis@gmail.com

Summary

Melioidosis remains a major public health challenge in tropical regions like Sandakan, with high mortality rates despite advances in clinical care. A key barrier to improved outcomes is the reliance on culture-based diagnostic methods, which are time-consuming and often result in delayed treatment initiation. Although delayed diagnosis has been recognized as a contributor to poor outcomes in infectious diseases, the specific impact of diagnostic delay on melioidosis mortality in endemic settings like Sandakan has not been well quantified. This study investigates the relationship between the time from disease onset to diagnosis and patient outcomes for melioidosis cases in Sandakan. A statistically significant mean difference was observed between the number of days from onset to diagnosis and whether patients survived or succumbed to the infection. Welch's t-test revealed a p-value of 0.005, with a 95% confidence interval (CI) of 1.83-10.15. These findings suggest that earlier diagnosis of melioidosis is critical in improving patient survival rates.

Keywords

Melioidosis, diagnostic delay, mortality, rapid diagnostic test, *Burkholderia pseudomallei*

Introduction

Melioidosis, caused by *Burkholderia pseudomallei*, is a life-threatening infectious disease endemic to tropical regions, including Malaysia¹. Diagnosis currently relies on culture; however, this delays appropriate antibiotics and contributes to mortality as results can take up to one week or more². Delayed diagnosis is a known risk factor for severe disease progression and mortality³. In this study, we aimed to assess the impact of time from onset of symptoms to diagnosis on patient outcomes in Sandakan. Our statistical analysis showed a significant mean difference between the time to diagnosis and patient survival, emphasizing the necessity for early detection and intervention in melioidosis management.

Materials and Methods

This retrospective study analysed recorded data from administrative notifications and investigations of melioidosis patients diagnosed in Sandakan from January 2017 to June 2024. Data on the number of days from symptom onset to confirmed diagnosis were collected, along with patient outcomes (survived or deceased). Descriptive analysis was done to determine normality of the data using SPSS version 30. Welch's t-test was employed to compare the mean difference in time to diagnosis between the two outcome groups. A significance threshold of $p < 0.05$ was used, with a 95% confidence interval calculated.

Results and Discussion

A total of 128 melioidosis cases were reported between 2017 and 2024 with the mean age of 47 years (SD ± 21.5). A number of 49 cases (38%) were associated with occupational activities such as farming, forestry, and fishing, while 23 cases (18%) were linked to gardening. Among the 128 reported cases of melioidosis, 92 patients (71.9%) survived, while 36 patients (28.1%) succumbed to the infection. Mean days from onset to diagnosis was 17 days (SD ± 14). Following unequal variances, Welch's t-test revealed a statistically significant difference in the mean days from onset to diagnosis between patients who survived and those who succumbed to the infection ($t=2.85$), $p = 0.005$, 95% CI: 1.83-10.15). This suggests that prolonged time to diagnosis is associated with higher mortality in melioidosis patients. The results highlight the urgent need for early diagnostic interventions to improve clinical outcomes underscoring point of care testing (POCT) importance. Rapid and accurate identification of *Burkholderia pseudomallei* could significantly reduce delays in treatment initiation and enhance survival rates. However, potential confounders such as severity at presentation, access to healthcare, and comorbidities were not controlled, which limits causal inference.

Table 1: Descriptive results of melioidosis cases in Sandakan

Description	Category	N	%
Sex	Male	91	71.1%
	Female	37	28.9%
Occupation	Farming, forestry, fishing	49	38%
	Gardening	23	18%
	Others	56	44%
Status	Dead	36	28.1%
	Alive	92	71.9%

Table 2: Welch's t-test for time of diagnosis and status for melioidosis cases

Variable	Mean (SD)		Mean diff. (95% CI)	t-statistics (df)	p-value*
	Dead (n = 36)	Alive (n = 92)			
Time of melioidosis diagnosis (days)	18.79 (16.79)	12.81 (6.96)	5.99 (1.83, 10.15)	2.85 (125.5)	0.005

Conclusion

Our findings underscore the critical role of early diagnosis in reducing melioidosis mortality. The significant mean difference in time to diagnosis between survivors and non-survivors indicates that delayed diagnosis contributes to poor outcomes. As a way forward, implementing a rapid diagnostic test for melioidosis in endemic regions like Sandakan could facilitate early detection and prompt treatment, ultimately improving patient survival. Future studies should focus on evaluating the effectiveness and feasibility of rapid diagnostic tools in clinical settings.

References

1. National Institute of Allergy and Infectious Diseases (NIAID). *A new rapid diagnostic for melioidosis* [Internet]. 2024 [cited 2025 Mar 21]. Available from: <https://www.niaid.nih.gov/research/new-rapid-diagnostic-melioidosis>
2. Fairley L, Smith S, Maisrikrod S, Henning L. Systematic review and meta-analysis of diagnostic tests for diagnosis of melioidosis. *Acta Trop* 2021; 214:105784.
3. Pakdeerat S, Boonklang P, Angchagun K, et al. Benchmarking CRISPR-BP34 for point-of-care melioidosis detection in low-income and middle-income countries: a molecular diagnostics study. *Lancet Microbe* [Internet] 2024; 5(4):e379-89 [cited 2025 Mar 20]. Available from: <https://www.thelancet.com/action/showFullText?pii=S2666524723003786>

EPIDPP33 / 341

Prevalence of Dual Tobacco Users and Sources of Access among Adolescents in Malaysia: Findings from the National Health and Morbidity Survey 2022

Mohd Firdaus Razali ¹, Mohd Ruhaizie Riyadhzi ¹, Hamizatul Akmal Abd Hamid ¹, Khaw Wan-Fei ¹, Lim Kuang Kuay ¹

¹ Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: mfirdaus.razali@moh.gov.my

Summary

This study investigates the prevalence of dual tobacco users (cigarette and e-cigarette) among Malaysian adolescents and identifies their sources of access. Using data from the National Health and Morbidity Survey (NHMS) 2022 Adolescent Health Survey (AHS), we found that a concerning prevalence of adolescents engaged in dual tobacco use, with significant variations by age, sex, and ethnicity. Commercial outlets and social sources emerged as the main access. The findings highlight the urgent need for targeted interventions and stronger enforcement to reduce adolescent tobacco users and limit access to tobacco products.

Keywords

Dual tobacco use, adolescent, sources of access

Introduction

Tobacco use remains a growing public health concern about nicotine addiction, gateway effects, and regulatory gaps globally¹. In recent years, dual tobacco use, defined as concurrent use of both cigarette and e-cigarette, has gained attention due to its compounded health risks. Adolescents are particularly vulnerable to tobacco initiation, and access to tobacco products remains a critical factor influencing their use patterns². In Malaysia, national surveys have periodically assessed adolescents' tobacco use, but little is known about the dual tobacco users among adolescents specifically. This study aims to determine the prevalence of dual tobacco users among Malaysian adolescents and to identify their sources of access.

Materials and Methods

Data were obtained from the NHMS 2022 AHS, a nationwide, school-based health survey involving 33,380 adolescents aged 13 to 17. A multistage stratified sampling method was used to select 240 nationally representative schools. Data collection employed a standardized, validated questionnaire that was previously employed in NHMS 2012 and NHMS 2017³, and analysis was conducted using SPSS version 28.0 with complex sampling design and 95% confidence intervals. Adolescents who reported cigarette and e-cigarette use in the past 30 days were classified as current dual tobacco users. Prevalence estimates for dual tobacco users were

stratified by socio-demographic characteristics such as age, sex, and ethnicity. Participants identified their primary sources for accessing tobacco products, including self-purchase from shops, food outlets, pharmacies, online (commercial outlets) or obtaining from friends or family (social sources).

Results and Discussion

Overall, 5.5% (95% CI: 4.88, 6.28) adolescents were dual tobacco users. Dual tobacco users were highly prevalent among those "Others" ethnic (9.7; 95% CI: 7.84,11.86), males (9.7%; 95% CI: 8.54,10.98), and aged 17 years (8.6%; 95% CI: 7.05,10.41). Prevalence increased with age, from 3.4% among 13-year-olds to 8.6% among 17-year-olds, indicating a progressive uptake as adolescents age. Male adolescents (9.7%) reported significantly higher dual use compared to female adolescents (1.4%), aligning with sex trends in adolescents' dual tobacco use observed globally (1). Ethnic disparities were also evident among adolescents' dual tobacco users. The highest prevalence was among adolescents of "Others" ethnicities (9.7%), followed by Malays (5.9%), Indians (3.5%), and Chinese (2.0%) (Table 1). Sociodemographic differences were apparent with older adolescents and males were more likely to use both tobacco products (2,3,4).

Table 1: Prevalence of current dual tobacco users among Malaysian adolescent by sociodemographic characteristics (N=33,380).

Sociodemographic Characteristics		n	N	% (95% CI)
Overall		1,728	11,4562	5.5 (4.88, 6.28)
Age				
	13 years old	209	15,044	3.4 (2.76, 4.23)
	14 years old	265	18,334	4.3 (3.51, 5.16)
	15 years old	318	23,395	5.6 (4.64, 6.63)
	16 years old	450	24,697	6.3 (5.13, 7.77)
	17 years old	486	33,093	8.6 (7.05, 10.41)
Sex				
	Male	1,506	100,080	9.7 (8.54, 10.98)
	Female	222	14,483	1.4 (1.15, 1.70)
Ethnicity				
	Malay	1,234	77,071	5.9 (5.12-6.83)
	Chinese	86	7,386	2.0 (1.36-2.83)
	Indian	55	4,257	3.5 (2.32-5.13)

Others*	353	25,849	9.7 (7.84-11.86)
---------	-----	--------	------------------

n, count; N, Estimated population; %, percentage; CI, Confidence Interval.

** Including Orang Asli, Bumiputra Sabah and Sarawak*

Regarding sources of access, 67.1% of dual tobacco users reported self-purchasing tobacco products, while 32.9% obtained them from friends or family (Table 2). Despite existing legal restrictions, the high rate of self-purchase indicates lapses in enforcement of sales bans to minors^{2,4}. Friend and familial access further reinforce the social normalization of tobacco use within adolescents' networks^{2,4}. These findings align with global patterns in adolescent dual tobacco use, where easy accessibility and social exposure fuel experimentation and continued use^{1,2}. The strategies outlined in the National Strategic Plan for the Control of Tobacco and Smoking Products (2021-2030) need to reinforce their multi-level approach by strengthening enforcement of age restrictions at retail points, enhancing retailer accountability, regulating online sales, implementing friend-led interventions and targeting family-based interventions are critical components of a comprehensive tobacco control strategies^{2,4,5}.

Table 2: Proportion of sources of access for tobacco products access among Malaysian adolescent current dual tobacco users (n=1728).

Sources of access for tobacco products	n	% (95% CI)
Self-purchase	1,160	67.1 (63.50, 68.48)
Obtaining from friends or family	568	32.9 (30.52, 46.50)

n, count; %, percentage; CI, Confidence Interval.

Conclusion

Dual tobacco use among Malaysian adolescents remains a significant public health concern, driven by easy access through both commercial outlets and social sources channels. Strengthened enforcement of age-restriction laws and comprehensive tobacco control strategies targeting adolescents' dual tobacco users are critical to prevent initiation and progression.

References

1. World Health Organization (WHO). *WHO report on the global tobacco epidemic, 2023: protect people from tobacco smoke*. Geneva: World Health Organization; 2023.
2. Usidame B, Hirschtick JL, Mattingly DT, et al. Sociodemographic patterns of exclusive and dual combustible tobacco and e-cigarette use among US adolescents—a nationally representative study (2017-2020). *Int J Environ Res Public Health* 2022; **19**(5):2965.
3. Kuay LK, Mahjom M, Awaluddin SM, et al. Methodology of National Health and Morbidity Study (NHMS): Adolescent Health, Malaysia 2022: methodology of adolescent health survey, Malaysia 2022. *Int J Public Health Res* 2023; **13**(2).

4. Birdsey J. Tobacco product use among US middle and high school students—National Youth Tobacco Survey, 2023. *MMWR Morb Mortal Wkly Rep* 2023; **72**.
5. Cho MS. Factors associated with cigarette, e-cigarette, and dual use among South Korean adolescents. *Healthcare (Basel)* 2021; **9**(10):1252.

EPIDPP35 / 344

Thalassaemia in Sabah: Insights from the Malaysian Thalassaemia Registry

Hadhinah Ahmad Puaad¹, Wen Jun Wong¹, Gek Bee Ong², Yee Leng Lee³, Su Lan Yang¹, Wen Yea Hwong¹

¹Centre for Clinical Epidemiology, Institute for Clinical Research, National Institutes of Health, Ministry of Health, Malaysia

²Paediatric Department, Women and Children's Hospital Likas, Sabah, Ministry of Health, Malaysia

³Clinical Research Centre (CRC) Hospital Queen Elizabeth Kota Kinabalu, Sabah, Ministry of Health, Malaysia

Corresponding author's email: hadhinahp@moh.gov.my

Summary

Thalassaemia remains a significant health burden in Sabah, being the state with the highest prevalence in Malaysia. This study aimed to describe the epidemiology of thalassaemia in Sabah and compare these parameters between hospitals with and without specialists. Data from 1818 patients were collected and analysed, majority of whom were transfusion dependent. While specialist hospitals showed better pre-transfusion haemoglobin levels, comparisons of mean serum ferritin and complication rates were mixed. The findings highlight ongoing challenges in resource allocation and care delivery, reinforcing the need for novel strategies, alongside targeted public health measures to effectively address thalassaemia in Sabah.

Introduction

Thalassaemia is a complex inherited autosomal recessive hemoglobinopathy with significant morbidity that often necessitates lifelong care and causes considerable strain on the national healthcare system^{1, 2}. The Malaysian Thalassaemia Registry (MTR) was launched in 2007 in response to the growing public healthcare burden of thalassaemia, to systematically collect epidemiological and clinical data to improve patient care². Since then, Sabah has been consistently highlighted as the state with the highest prevalence of thalassaemia patients compared to all other states in Malaysia^{2,3}. This study aimed to describe the epidemiology of thalassaemia in Sabah in the aspects of disease burden, treatment, complications, and outcome, and to compare these parameters between specialist and non-specialist hospitals.

Keywords

thalassaemia, epidemiology, ferritin, chelation

Materials and Methods

This was a retrospective analysis of data from the Sabah MTR which included all patients diagnosed with thalassaemia in 22 government hospitals in Sabah in 2023.

Hospitals were categorized into specialist and non-specialist hospitals based on the availability of in-house specialist(s); either haematologist, internal medicine specialist and/or paediatrician. Descriptive analyses were performed, and non-parametric tests were employed to compare the 2 groups. Data was analysed using R version 4.4.2.

Results and Discussion

A total of 1818 patients with thalassaemia were registered in the Sabah MTR for the year 2023. From that, 1149 (63.2%) were under specialist hospitals. β -thalassaemia major was the most common diagnosis (72.9%), and majority (76.8%) were clinically classified as transfusion-dependent thalassaemia (TDT). Nearly two-thirds of the patients (64.9%) were below the age of 20 years old. Patients were mainly of Pribumi Sabah ethnicity (89.5%), from which almost half of them were Kadazan-Dusun. Median serum ferritin levels for TDT patients in specialist hospitals were significantly lower than in non-specialist hospitals (3141.5 ng/mL vs 3595.0 ng/mL, $p=0.008$). Among TDT patients on chelation therapy, the most prescribed iron chelation therapy was the combination of deferoxamine with deferiprone (DFO + DFP). When comparing ferritin levels by chelation groups, patients on deferiprone (DFP) only and deferasirox (DFX) only had significantly lower median ferritin than those on deferiprone (DFO) only and other groups of combination therapies ($p<0.001$). Non-specialist hospitals also had lower pre-transfusion haemoglobin (Hb) compared to specialist hospitals (7.8 g/dL vs 8.4 g/dL, $p<0.001$). Bone disease was the most prevalent complication (31.5%), with specialist hospitals having a significantly higher prevalence compared to non-specialist hospitals (32.8% vs 29.1%, $p=0.002$). There were 43 deaths in 2023 (2.4%), of which the most common cause was infection (60.5%). The high proportion of patients under 20 indicates a significant paediatric burden in Sabah, underscoring the need for more haematology-trained paediatricians (3, 4). The young average age reflects low survival to adulthood as well as consistent newly diagnosed cases, highlighting clinical and public health challenges requiring targeted interventions ⁴, ⁵. The lower median serum ferritin and pre-transfusion Hb in non-specialist hospitals suggest potential disparities in care delivery, likely influenced by the tendency for specialist hospitals to operate within better-resourced blood bank settings ⁴, ⁵.

Table 1: Baseline characteristics of thalassaemia patients in Sabah

	Total (N=1818) n (%)	Specialist (n=1149)	Non-specialist (n=669)
Gender			
Male	929 (51.1)	572 (49.8)	357 (53.4)
Female	888 (48.8)	576 (50.1)	312 (46.6)
Age group (years)			
0-9	500 (27.5)	301 (26.2)	199 (29.7)
10-19	680 (37.4)	401 (34.9)	279 (41.7)
20-29	413 (22.7)	270 (23.5)	143 (21.4)
30-39	156 (8.6)	123 (10.7)	33 (4.9)
40-49	44 (2.4)	34 (3.0)	10 (1.5)
50-59	15 (0.8)	11 (1.0)	4 (0.6)
>60	10 (0.6)	9 (0.8)	1 (0.1)
Ethnicity			
Pribumi Sabah	1627 (89.5)	986 (85.8)	641 (95.8)
Chinese	68 (3.7)	64 (5.6)	4 (0.6)
Malay	63 (3.5)	51 (4.4)	12 (1.8)
Foreigner/Others	50 (2.8)	41 (3.6)	9 (1.3)
Diagnosis			
β-thalassaemia major	1326 (72.9)	761 (66.2)	565 (84.5)
Hb-E/ β-thalassaemia	217 (11.9)	169 (14.7)	48 (7.2)
β-thalassaemia intermedia	134 (7.4)	107 (9.3)	27 (4.0)
Hb-H disease	110 (6.1)	85 (7.4)	25 (3.7)
Others	12 (0.7)	12 (1.0)	
Clinical classification			
TDT	1397 (76.8)	844 (73.5)	553 (82.7)
Non-TDT	381 (21.0)	289 (25.2)	92 (13.8)

TDT, transfusion-dependant thalassaemia

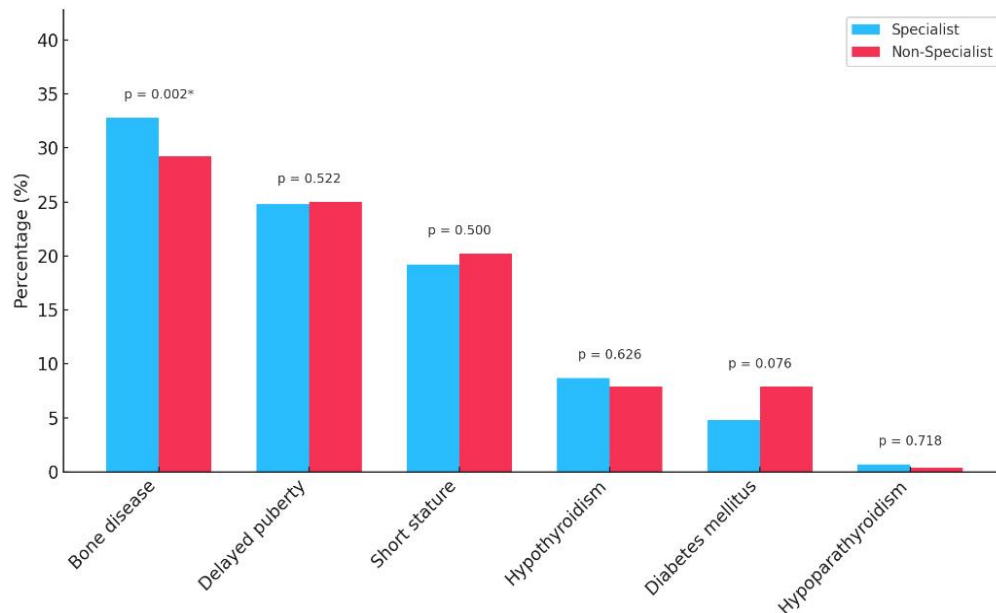


Figure 1. Prevalence of thalassaemia complications: specialist vs non-specialist hospitals

Conclusion

The Sabah MTR data highlights ongoing challenges in the management of thalassaemia. Better outcomes—particularly iron control and pre-transfusion Hb—observed in specialist hospitals reinforce the need to strengthen services in non-specialist hospitals. Overall, the burden of complications and infection-related mortality underscores the urgency for effective and equitable care strategies in Sabah.

References

1. Williams TN, Weatherall DJ. World distribution, population genetics and health burden of the hemoglobinopathies. *Cold Spring Harb Perspect Med* 2012; 2:a011692.
2. Ministry of Health Malaysia. *Annual report of the Malaysian Thalassaemia Registry 2020*. Putrajaya: Ministry of Health Malaysia; 2020.
3. Mohd Ibrahim H, Muda Z, Othman IS, et al. Observational study on the current status of thalassaemia in Malaysia: a report from the Malaysian Thalassaemia Registry. *BMJ Open* 2020; 10:e037974. Available from: <https://doi.org/10.1136/bmjopen-2020-037974>
4. Hossain MS, Raheem E, Sultana TA, et al. Thalassemias in South Asia: clinical lessons learnt from Bangladesh. *Orphanet J Rare Dis* 2017; 12:93. Available from: <https://doi.org/10.1186/s13023-017-0643-z>
5. Premawardhana AP, Mudiyanse R, De Silva ST, et al. A nationwide survey of hospital-based thalassemia patients and standards of care and a preliminary assessment of the national prevention program in Sri Lanka. *PLoS One* 2019; 14(8):e0220852. Available from: <https://doi.org/10.1371/journal.pone.0220852>

EPIDPP36 / 346

A Systematic Review on Predictors of Smoking Cessation Success Among Adults in Malaysia

Nur Fadzlyanah Khusaini¹, Chin Ri Wei Andrew¹, Mohammad Azri Bantalani¹,
Muhammad Aklil Abd Rahim¹

¹ Department of Public Health Medicine, Faculty of Medicine and Health Sciences, Universiti Malaysia Sabah

Corresponding author's email: aklil@ums.edu.my

Summary

Cigarette smoking remains a major public health issue in Malaysia, causing an estimated 10,000 deaths annually. This systematic review examined predictors of smoking cessation success among adults aged 18-59 using PRISMA 2020 guidelines. Of 30,750 articles, 24 met the inclusion criteria. Key predictors included older age, voluntary program participation, frequent clinic visits and follow-ups, prior abstinence, multiple quit attempts, use of nicotine replacement therapy, low nicotine dependence, strong intention to quit, and supportive healthcare provider engagement. Psychological, demographic, and health-related factors also played roles. Tailored, patient-centred approaches with consistent support can enhance smoking cessation outcomes in Malaysia.

Keywords

Smoking cessation, predictors, systematic review, Malaysia.

Introduction

Cigarette smoking continues to be a public health risk, despite the fact that it can be prevented. An estimated 10,000 deaths in Malaysia are attributed to smoking-related illnesses each year¹. Malaysia's tobacco control program has included support for smoking cessation. However, a wide variation in success rates has been observed across quit-smoking services. Understanding the factors influencing smoking cessation success among the adult population is crucial for targeted interventions. This review aimed to summarize the factors that predict smoking cessation success in the adult population in Malaysia.

Materials and Methods

We followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines by adhering to the four-phase flow diagram and 27-item checklist for this study. We systematically searched four databases (PubMed, Science Direct, Scopus, and ProQuest) for observational studies investigating predictors of smoking cessation among adults aged 18 - 59 years, from inception up to November 30, 2024. All studies summarizing predictors of quitting smoking, smoking cessation, quit attempts, or smoking abstinence among people aged 18-59 years old were included. Two primary outcomes, intention-to-

quit smoking and smoking cessation success, were defined. Review articles and studies that examined predictors of other tobacco products/vaping cessation were excluded. The Joanna Briggs Institute Critical Appraisal Tools were used for risk of bias assessment.

Results and Discussion

The search of academic electronic databases yielded 30,750 articles. Following the removal of duplicates and exclusion based on the pre-determined criteria, a total of 24 articles were included in the final review. The systematic review identified several significant predictors of intention-to-quit smoking and smoking cessation success among adults in Malaysia (Table 1). Key factors include age over 45 years, indicating that older smokers may be more motivated to quit. Voluntary participation in cessation programmes enhances engagement, while a frequency of clinic visits greater than two and more frequent follow-ups (10 or more) correlate with better outcomes. A longer previous smoking abstinence and having made 1-10 quit attempts also contributed positively. The use of Nicotine Replacement Therapy (both patches and oral) is effective, particularly among those living in urban areas. Previous abstinence for six months or more and smoking fewer cigarettes per day are associated with increased success rates. Additionally, a higher level of self-efficacy, an intention to quit within one month, and a lower Fagerström Test for Nicotine Dependence (FTND) score enhanced quitting prospects. Other factors include the amount of counselling received, pre-treatment stress levels, proximity to the clinic, and certain health conditions such as diabetes and high blood pressure. Ethnicity also plays a role, with Malay individuals showing distinct patterns in smoking cessation behaviours. Lastly, knowledge and attitudes towards quitting, particularly among healthcare providers, significantly influence outcomes.

Table 1: Predictors of Intention-to-Quit Smoking and Smoking Cessation Success from Articles with JBI Score of $\geq 70\%$

Factors	Intention-to-quit	Smoking cessation success
Demographic	• Being a majority ethnic group • Having a high and moderate education level	• Age > 45 years old • Older smokers • Ethnicity [Malay] • Clerical staff • Started smoking in teenage years • Urban residence • Distance from home to clinic [$<5\text{km}$] • Voluntary participation • High knowledge and attitude of smokers to quit smoking
Health-related	• Worried that smoking damages health • Higher levels of health concerns about smoking	• Lower Fagerström Test for Nicotine Dependence (FTND) score ranking (0-3) • Diabetes Mellitus, high blood pressure
Psychological	• Having higher levels of quitting self-efficacy • Role model to children • Recognizing “it’s time to quit” • Barriers to quit: coping with stress, social challenges, not scared of consequences	• Higher level of self-efficacy • High scores of withdrawal symptoms (Shiffman-Jarvik withdrawal scale; SJWS) and self-efficacy (cessation self-efficacy questionnaire; CSEQ) have significant effects on the outcomes of smoking cessation
Previous quitting experience	• Having previous shorter quit attempts (1 week or less) • Smoked fewer cigarettes per day • Stronger intention to quit (within 1 month)	• Longer previous smoking abstinence • Number of quit attempts: 1-10 • Abstinence for 6 months or more in the past • Having smoked fewer cigarettes per day • Had an intention to quit within 1 month • Longer duration of follow-up in weeks • Conflict about quitting: A unit increment in the conflict scale had a statistically significant increment in the odds of deciding to stop smoking
Healthcare provider	• Visited a healthcare professional and received advice to quit • Visited a healthcare professional but did not receive advice to	• Knowledge, attitude and practice of healthcare providers (HCP): Female, nurses, high knowledge score, attitude, smoking rules at home

	quit	
Treatment-related	Not applicable	● Method of intervention: Nicotine replacement therapy (patch and oral) ● Longer use of varenicline ● Frequency of clinic visit > 2 ● More frequent follow-up (10 and more) ● Number of counselling sessions ● Pre-Treatment Stress (Rhode Island Stress Questionnaire)

Conclusion

Smoking cessation is influenced by a variety of personal, health-related, psychological, treatment-related, previous quitting experience, and healthcare provider factors. Tailored interventions addressing individual needs, consistent follow-ups, and enhanced education on quitting can significantly improve smoking cessation success. This highlights the need for integrated, accessible, and patient-centred approaches to support smokers to quit.

References

1. Lim KH, Teh CH, Pan S, et al. Prevalence and factors associated with smoking among adults in Malaysia: findings from the National Health and Morbidity Survey (NHMS) 2015. *Tob Induc Dis* 2018; **16**:1.
2. Hock ES, Franklin M, Baxter S, et al. Covariates of success in quitting smoking: a systematic review of studies from 2008 to 2021 conducted to inform the statistical analyses of quitting outcomes of a hospital-based tobacco dependence treatment service in the United Kingdom. *NIHR Open Res* 2023; **3**.
3. Hasan SI, Kaai SC, Nordin ASA, et al. Who are more likely to have quit intentions among Malaysian adult smokers? Findings from the 2020 ITC Malaysia Survey. *Int J Environ Res Public Health* 2022; **19**(5):3035.
4. Chean KY, Goh LG, Liew KW, et al. Barriers to smoking cessation: a qualitative study from the perspective of primary care in Malaysia. *BMJ Open* 2019; **9**(7):e025491.
5. Droomers M, Schrijvers CTM, Mackenbach JP. Educational differences in the intention to stop smoking: explanations based on the Theory of Planned Behaviour. *Eur J Public Health* 2004; **14**(2):194-8.

EPIDPP37 / 352

URBAN-RURAL VARIATION IN PREDICTING DEPRESSION AMONG ELDERLY USING NAÏVE BAYES CLASSIFIER

Nabilah Hanis Zainuddin¹, Ridwan Sanaudi¹, Ainil Zafirah Abd Karim¹, Zamtira Seman¹

¹Sector for Biostatistics & Data Repository, Office of NIH Manager, National Institutes of Health, Ministry of Health Malaysia, Selangor, Malaysia

Corresponding author's email: nabilah.zainuddin5988@gmail.com

Summary

This study aimed to predict depressive symptoms among elderly individuals in urban and rural settings using the Naïve Bayes classifier. Data from 1,036 respondents aged 60 and above from the NHMS 2019 were analyzed using 24 socio-demographic and clinical variables. The model showed excellent performance with high accuracy in both settings (urban: 98.71%, rural: 98.31%). While the rural model had a slightly higher AUC (0.98), the urban model achieved better sensitivity (71.43%) and precision, making it more effective for early detection. These findings highlight the potential of interpretable machine learning models to support targeted mental health interventions in public health.

Keywords

Depression, Elderly, Machine Learning, NHMS 2029

Introduction

Depression among the elderly is a significant public health concern, often associated with chronic illnesses, cognitive decline, and social adversity. Although its prevalence may be lower compared to younger adults, depression in older individuals can lead to severe consequences, including increased disability, poorer health outcomes, and a higher risk of suicide¹. According to the World Health Organization (WHO), approximately 3.8% of the global population experiences depression, with 5.7% involving adults aged 60 years and above².

Previous studies have also highlighted variations in depression rates between urban and rural in elderly populations³. There is limitation in predictive approaches that accurately classify individuals at risk particularly using scalable and interpretable machine learning methods. Therefore, to address this gap, the aim of this study is to develop and compare predictive models using Naïve Bayes classifier, enabling early detection of depressive symptoms and informing targeted interventions across different living environments.

Materials and Method

The study utilized data from 1,036 respondents sourced from the National Health and Morbidity Survey (NHMS) 2019. The study population consisted of elderly individuals aged 60 years and above, aligning with the World Health Organization's definition of the elderly population in many Asian countries. The data was stratified based on locality, dividing the respondents into urban and rural groups to explore any potential differences in depressive symptoms across different living environments.

A self-administered questionnaire, the PHQ9 was used during the survey. It consists of 9 statements related to depression with a maximum total score of 27. A score of 10 or above was used as the threshold to define the presence of depression.⁴

RapidMiner, (version 9.9) a machine learning platform, was employed for data pre-processing, model training, and performance evaluation. In total, 24 socio-demographic and clinical variables were incorporated, including factors such as age, gender, education level, marital status, income, and the presence of chronic diseases. These variables were selected based on their potential association with depression among the elderly, as supported by previous literature³.

Naive Bayes algorithm was employed due to its strong performance on categorical and moderately sized datasets. It is well-suited for health-related data where predictor variables are often categorical. In addition, it was selected for its ability to handle imbalanced datasets efficiently while maintaining high interpretability, which is crucial for healthcare applications. The model was developed to predict depressive symptoms among elderly individuals based on socio-demographic and clinical variables.

Naive Bayes assumes conditional features are independent and isn't affected by multicollinearity like regression, since it doesn't rely on coefficient estimation.

The dataset was partitioned into 70% for training and 30% for testing during the model development.

Result and discussion

The table shows the results for both localities – urban and rural. The Naïve Bayes models demonstrated excellent overall performance, achieving high accuracy (>98%) in predicting depressive symptoms among the elderly. Accuracy measures how often the model makes the correct prediction, and these results indicate that most predictions were accurate.

When comparing sensitivity (the ability to correctly identify individuals with depression), the urban outperformed the rural (71.43% vs. 57.14%). Sensitivity is particularly important in health-related studies, as missing true positive cases (those actually experiencing depression) could have serious consequences. Therefore, the urban environment shows a better capability in capturing cases of depression.

Precision was moderate for both localities (71.43% for urban and 66.67% for rural), indicating that when the model predicted depression, approximately 67-71% of those predictions were correct.

Both localities achieved high specificity (>99%), suggesting that Naïve Bayes was extremely effective at identifying non-depressed elderly individuals correctly in both urban and rural areas. High specificity reduces the risk of false positives, which is important to avoid unnecessary psychological or medical interventions.

The AUC (Area Under the Curve) for the rural (0.98) was slightly higher than for the urban model (0.96), indicating excellent ability to distinguish between depressed and non-depressed individuals in both settings, the higher sensitivity of the urban population is more critical from a healthcare perspective.

Overall, the Naives Bayes results indicate urban locality is preferable for predicting depression among the elderly, as it better balances precision and recall – a crucial factor in healthcare prediction tasks. Although the rural area achieved a higher AUC, its lower sensitivity suggests a greater risk of missing true depression cases, which could have serious consequences in real-world healthcare settings.

This suggests that depression likely presents differently in rural versus urban areas. Rural communities may have unique cultural factors affecting how people report symptoms, and depression might manifest through different indicators in these settings. Thus, the rural localities underperformed.

	Urban	Rural
Accuracy	98.71%	98.31%
Sensitivity	71.43%	57.14%
Precision	71.43%	66.67%
Specificity	99.34%	99.31%
AUC	0.96	0.98

Conclusion

The Naïve Bayes classifier demonstrated strong predictive performance in identifying depressive symptoms among the elderly, particularly in urban settings where sensitivity was higher. These findings underscore the model's potential as a scalable and interpretable tool for early mental health screening. Integrating such predictive approaches into public health strategies could enhance early detection, guide targeted interventions, and ultimately improve quality of life for older adults across different living environments.

References

1. Alexopoulos GS. Depression in the elderly. *Lancet* 2005; **365**(9475):1961-70. doi:10.1016/S0140-6736(05)66665-2
2. World Health Organization (WHO). *Depression* [Internet]. Geneva: World Health Organization; 2023 [cited 2025 Apr 28]. Available from: <https://www.who.int/news-room/fact-sheets/detail/depression>
 Xin Y, Ren X. Predicting depression among rural and urban disabled elderly in China using a random forest classifier. *BMC Psychiatry* 2022; **22**:118. doi:10.1186/s12888-022-03742-4
3. Sherina MS, Arroll B, Goodyear-Smith F. Criterion validity of the PHQ-9 (Malay version) in a primary care clinic in Malaysia. *Med J Malaysia* 2012; **67**(3):309-15.

EPIDPP38 / 353

The Proportion and Determinants of Incomplete Treatment Among Latent Tuberculosis Infection in Tumpat District, Kelantan, Malaysia

Hasneezah Hassan ¹, Ahmad Firdaus Mohamed ^{1,2}, Mohamad Hafiz Harun ¹

¹ Tumpat District Health Office, Kelantan

² Department of Community Medicine, School of Medical Sciences, Universiti Sains Malaysia

Corresponding author's email: hasneezah@moh.gov.my

Summary

Latent tuberculosis infection (LTBI) treatment is an essential strategy in tuberculosis control. However, treatment non-completion undermines its effectiveness and poses a risk of progression to active TB. This study aimed to determine the proportion and determinants of incomplete LTBI treatment in Tumpat District, Kelantan. Among 171 patients who initiated LTBI treatment, 21.1% did not complete their regimen. Incomplete treatment was significantly associated with the year of registration and the initiating treatment facility.

Keywords

Latent tuberculosis infection, LTBI, tuberculosis, TB

Introduction

Malaysia remains a high-burden country for tuberculosis (TB), with Sabah, Sarawak, and Kelantan reporting among the highest notification rates¹. Latent tuberculosis infection (LTBI), the asymptomatic precursor to active TB, plays a critical role in sustaining community transmission. In response, the Ministry of Health Malaysia has incorporated LTBI management into national strategies, including clinical guidelines and digital surveillance via the National Tuberculosis Registry^{2,3}. Preventive treatment of LTBI has been shown to significantly reduce disease progression, yet the effectiveness is threatened by low treatment completion rates globally and locally⁴. Identifying determinants of incomplete LTBI treatment is essential to inform targeted programmatic interventions to achieve the global end TB goal.

Materials and Methods

A retrospective record review was conducted involving all LTBI patients registered in the Latent Tuberculosis Information System (LTBIS 401A registry) in Tumpat District, Kelantan, from 1st January 2020 to 31st March 2024. The LTBIS 401A is a module within the National Tuberculosis Registry (NTBR), a web-based system managed by the Ministry of Health Malaysia. Data entry is conducted by TB clinic personnel for real-time case monitoring.

Inclusion criteria consisted of patients with a confirmed LTBI diagnosis who had initiated preventive treatment. Patients who progressed to active TB, died, were transferred out, or had missing data which cannot be verified further were excluded. The outcome was LTBI treatment completion, classified as complete or

incomplete. This study employed universal sampling, where all LTBI patients registered in the LTBI 401A registry in Tumpat District from January 2020 to March 2024 who met the inclusion criteria were included. Descriptive statistics were used to determine the proportion of incomplete treatment. Simple logistic regression was used for variable screening. Variables with $p < 0.25$ were included in the multiple logistic regression model. Model fit and discrimination were assessed using the Hosmer-Lemeshow test and ROC curve analysis. All data were analysed using SPSS version 28.0.

Results and Discussion

Of the 171 patients who initiated LTBI treatment in Tumpat District, 36 (21.1%) did not complete their treatment. Multiple logistic regression analysis identified three significant determinants of incomplete treatment: being registered in the year 2021 (aOR = 30.98; 95% CI: 4.19-228.79; $p < 0.001$), initiation of treatment at Health Clinic (HC) B (aOR = 4.78; 95% CI: 1.25-18.34; $p = 0.023$), and initiation at HC I (aOR = 29.45; 95% CI: 3.62-239.68; $p = 0.002$).

The incomplete treatment rate in this study (21.1%) is consistent with international findings, where reported proportions range widely from 9% to over 50%. However, in Malaysia, available local data is limited. A similar study in Sabah recorded a lower proportion of incomplete treatment (9.2%), possibly due to effective follow-up mechanisms, stronger case management, or differences in population profiles and access to care.

Table 1 presents the determinants of incomplete treatment among LTBI patients in Tumpat. The higher odds of incomplete treatment in 2021 may reflect disruptions during the COVID-19 recovery period, whereby healthcare resources were strained, and patient follow-up systems may have been impacted by staff redeployments and reduced in-person consultations. International evidence indicates that TB detection and treatment adherence significantly declined during the pandemic due to fear of infection, lockdowns, and healthcare system redirection.

The identification of HC B and HC I as key determinants of incomplete treatment suggests the presence of systemic or operational deficiencies in these facilities. These may include inconsistent patient counselling, disruptions in medication supply chains, or inadequate treatment monitoring. Prior research has demonstrated that the quality of healthcare delivery, strength of patient-provider interactions, and accessibility of services are critical determinants of treatment adherence.

Table 1: Determinants of incomplete treatment among LTBI patients in Tumpat, using simple and multiple logistic regression (n = 171)

Variables	Crude OR ^a (95% CI)	Adjusted OR ^b (95% CI)	p-value
Facility initiated treatment			

HC A	1	1	
HC B	2.402 (0.795, 7.260)	4.781 (1.247, 18.335)	0.023
HC C	3.455 (0.927, 12.875)	2.930 (0.553, 15.525)	0.206
HC D	1.810 (0.302, 10.858)	2.826 (0.392, 20.388)	0.303
HC E	0.253 (0.029, 2.233)	0.274 (0.023, 3.206)	0.302
HC F	0.000 (0.000,-)	0.000 (0.000,)	0.999
HC G	2.533 (0.397, 16.146)	5.271 (0.704, 39.445)	0.106
HC H	2.714 (0.546, 13.489)	4.764 (0.753, 30.157)	0.097
HC I	12.667 (1.888, 84.965)	29.451 (3.619, 239.679)	0.002
HC J	0.000 (0.000,-)	0.000 (0.000,)	1.000
Hospital A	1.583 (0.150, 16.675)	2.662 (0.210, 33.716)	0.450
Year registered			
2024	1	1	
2023	0.545 (0.222, 1.339)	0.062 (0.217, 1.787)	0.379
2022	0.595 (0.193, 1.837)	1.319 (0.340, 5.118)	0.689
2021	11.250 (2.092, 60.486)	30.978 (4.194, 228.789)	<0.001
2020	0.000 (0.000,-)	0.000 (0.000,)	0.999

Constant = -2.365, Forward LR and Backward LR Multiple Logistic Regression was applied. No multicollinearity and no interaction. Model fits: Hosmer Lemeshow test, p -value = 0.867; Classification Table (overall correctly classified percentage = 82.5%); Area under the curve = 79.7%.

Abbreviation: ^a Simple Logistic Regression, ^b Multiple Logistic Regression

A key strength of this study is the use of comprehensive district-level data collected through a national surveillance system, combined with a robust study design and statistical analysis. However, these findings should be interpreted cautiously due to wide confidence intervals in some subgroups and the inability to estimate odds ratios for categories with no incomplete treatment events. This

reflects the study's limitations, including small subgroup sizes and missing estimates, which may affect the precision and generalisability of the results.

Conclusion

Approximately one in five patients with LTBI in Tumpat District did not complete their treatment regimen. The year of registration and the facility where treatment was initiated emerged as significant determinants of non-completion. These findings highlight potential programmatic challenges during specific periods—likely influenced by post-pandemic disruptions—as well as disparities in the quality of service delivery across health facilities. However, they should be interpreted cautiously, considering the study's limitations, including small subgroup sizes and missing estimates, which may impact the precision and generalisability of the results. Addressing these issues requires targeted interventions, including strengthening facility-level follow-up systems, standardising patient education and counselling, and improving access to care. These findings underscore the importance of robust LTBI management to support Malaysia's TB elimination efforts.

References

1. Avoi R, Liaw YC. Tuberculosis death epidemiology and its associated risk factors in Sabah, Malaysia. *Int J Environ Res Public Health* 2021; **18**(18).
2. Ministry of Health Malaysia. *Clinical practice guidelines (CPG): management of tuberculosis*. 4th ed. Kuala Lumpur: Ministry of Health Malaysia; 2021.
3. Ministry of Health Malaysia. *Manual Sistem Maklumat Jangkitan Tibi Laten (LTBI) Kebangsaan*. Kuala Lumpur: Ministry of Health Malaysia; 2020.
4. World Health Organization. *WHO consolidated guidelines on tuberculosis. Module 1: prevention. Tuberculosis preventive treatment*. Geneva: World Health Organization; 2020.
5. World Health Organization. *Global tuberculosis report 2021*. Geneva: World Health Organization; 2022.

EPIDPP39 / 356

Exploration of Klang's Health District Office Dengue Case Investigations in Relation to *Hospital Tengku Ampuan Rahimah* Serological Results

Hazwa Harith¹, Nur Nabila Abd Rahim², Gurpreet Kaur Karpal Singh³, Suvarna Mohan⁴

¹Institute for Health Systems Research, National Institutes of Health, Ministry of Health Malaysia.

²Institute for Medical Research, National Institutes of Health, Ministry of Health Malaysia.

³Klang District Health Office, Ministry of Health Malaysia.

⁴Public Health Unit, Hospital Tengku Ampuan Rahimah, Klang, Malaysia.

Corresponding author's email: hazwa.h@moh.gov.my

Summary

This study provides early insights into the concordance between reported dengue cases at Pejabat Kesihatan Daerah (PKD) Klang and confirmatory serological results from HTAR Klang in 2024. Of 918 reported cases, only 36.6% underwent serological testing, with low matched positivity between combo tests and confirmatory assays. Gaps in diagnostic confirmation may relate to timing of testing and cross-reactivity with other febrile illnesses. These findings support the need for further robust studies to better address false-positive issues and emphasize the importance of standardized diagnostic protocols to strengthen dengue surveillance and disease management in endemic settings.

Keywords

Dengue surveillance, diagnostic accuracy, surveillance systems, serological confirmation, Klang district

Introduction

Dengue fever continues to pose a major public health challenge in Malaysia due to its tropical climate, urban development, and the presence of *Aedes* mosquitoes. Accurate diagnosis and reporting are essential for effective disease surveillance and timely intervention. However, reliance on clinical symptoms alone in some healthcare settings may contribute to discrepancies in case reporting^{1,2}. This study evaluates the alignment between dengue cases reported by PKD Klang and serological confirmation from HTAR Klang. By examining these data, the study aims to enhance understanding of diagnostic practices and data consistency within the surveillance system. Ultimately, this research contributes to Malaysia's efforts in achieving more effective dengue control and aligning with international standards in vector-borne disease management.

Materials and Methods

A retrospective study utilizing secondary data from PKD Klang and HTAR Klang to assess the diagnostic accuracy of reported dengue cases against serologically confirmed results. Data for 2024 were extracted from the eDengue surveillance system and HTAR's laboratory database, facilitated by SchueyNet. Demographic information, diagnostic classifications (true positive, false positive), and test results were analysed. Reported cases were those clinically diagnosed and based on their Dengue Combo test results, while confirmed cases

were based on confirmatory serology tests. Cases were classified by comparing combo test and serology results. True positives were those positive on both tests; false positives were clinically diagnosed cases not confirmed serologically. Descriptive statistics summarized demographic data, and discrepancies between reported and confirmed cases were analyzed using IBM SPSS Version 26. This approach aimed to identify opportunities for improving dengue case detection and reporting within the surveillance system.

Results and Discussion

In 2024, a total of 918 dengue cases reported to PKD Klang were referred to HTAR. From table 1, the mean age was 34.9 years (SD $\pm$ 18.4), with the majority being male (63.5%) and Malaysian citizens (74.3%). Most were aged 20-29 years (30.2%), followed by 30-39 years (19.4%). Malays comprised 43.4% of cases, and 60.6% were employed. Case notifications peaked in January (19.3%), February (18.0%), and March (12.4%). Of the 918 patients, only 336 (36.6%) underwent confirmatory serological testing. Among those tested, 5.77% were NS1 positive, 10.89% IgM positive, and 10.57% IgG positive. In contrast, the Dengue Combo test yielded higher positivity rates: 57.3% for NS1, 32.0% for IgM, and 10.6% for IgG. Matched results between combo and serology tests were relatively low: 9.6% for NS1, 11.6% for IgM, and 2.7% for IgG. A large proportion (63.4%) did not proceed to serology confirmation, limiting full diagnostic concordance assessment. Heavy reliance on rapid tests and clinical features may contribute to challenges in accurately classifying dengue cases. In Malaysia, co-circulation of multiple arboviruses may further cause cross-reactivity in IgM and IgG detection³. Additionally, the diagnostic performance of NS1 and serological assays varies by serotype, timing, and disease phase^{4,5}, limiting standalone reliability. As the accuracy of serological interpretation is influenced by the interval between symptom onset and testing, capturing the timing of confirmatory tests remains an important consideration.

Conclusion

Only 36.6% of reported dengue cases underwent serological testing, with low matched positivity (NS1 9.6%, IgM 11.6%, IgG 2.7%). These findings highlight the need to strengthen diagnostic protocols and support further studies to confirm and better understand diagnostic gaps in dengue surveillance.

Figure 1: Trend of reported dengue cases to PKD Klang

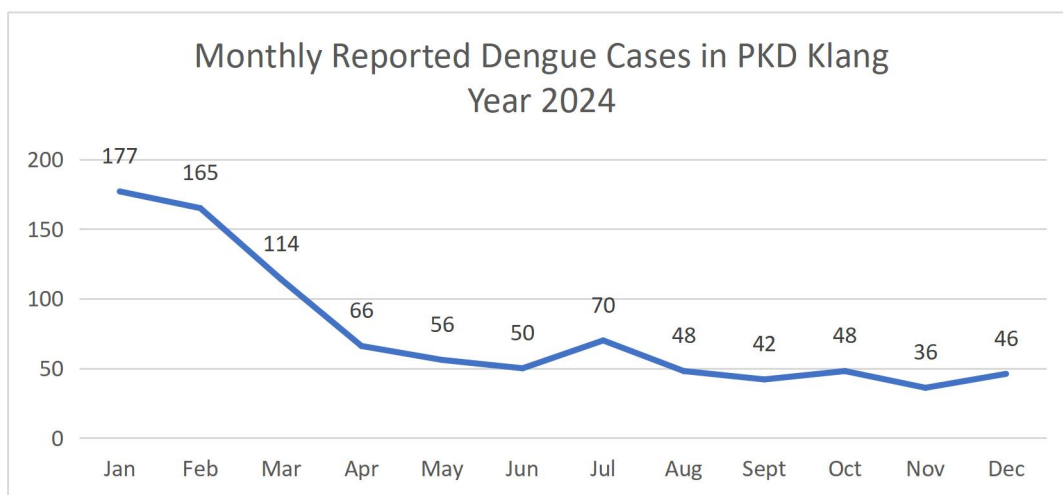


Table 1: Descriptive results of reported dengue cases to PKD Klang in 2024

Characteristics	Total (N) = 918
Age	Mean (SD)
	34.93 (18.38)
Age Group	n (%)
0-9	49 (5.33)
10-19	112 (12.20)
20-29	277 (30.17)
30-39	178 (19.39)
40-49	114 (12.42)
50-59	68 (7.41)
60-69	63 (6.86)
70-79	41 (4.47)
80-89	14 (1.52)
90-99	2 (0.22)
Gender	
Male	583 (63.51)
Female	335 (36.49)
Nationality	
Citizen	682 (74.29)
Non-Citizen	236 (25.71)
Race	
Malay	398 (43.36)
Chinese	87 (9.48)
Indian	169 (18.41)
Others	264 (28.76)
Academic / Work group	
Pre-school	26 (2.82)
Primary school	30 (3.27)
Secondary school	40 (4.36)
University student	28 (3.05)

Housewife	86 (9.37)
Employed	556 (60.57)
Unemployed	75 (8.17)
Retiree	77 (8.39)

Table 2: Comparison of combo test and confirmatory serological testing among dengue

Reported Dengue Cases in PKD Klang (N=918)		
	Combo Test (Total = 918) n (%)	Serological Test (Total = 336) n (%)
NS1		
Positive	526 (57.29)	53 (5.77)
Negative	392 (42.70)	283 (30.83)
Not Done	-	582 (63.39)
IgM		
Positive	294 (32.03)	100 (10.89)
Negative	624 (67.97)	236 (25.70)
Not Done	-	582 (63.39)
IgG		
Positive	97 (10.57)	97 (10.57)
Negative	821 (89.43)	239 (26.03)
Not Done	-	582 (63.39)
Total number of patients with confirmatory serological test (n = 336)		
Matched Results	n (%)	
Positive NS1 combo and serology	32 (9.55)	
Positive IgM combo and serology	39 (11.64)	
Positive IgG combo and serology	9 (2.69)	

cases in PKD Klang from 2024

References

1. Chong ZL, Sekaran SD, Soe HJ, et al. Diagnostic accuracy and utility of three dengue diagnostic tests for the diagnosis of acute dengue infection in Malaysia. *BMC Infect Dis* 2020; **20**(1):210. <https://doi.org/10.1186/s12879-020-4911-5>
2. Lee B. Demographic factors associated with dengue in Saint Lucia. *Int J Trop Dis Health* 2020; **41**(10):54-70. <https://doi.org/10.9734/ijtdh/2020/v41i1030329>
3. Raafat N, Loganathan S, Mukaka M, et al. Diagnostic accuracy of the WHO clinical definitions for dengue and implications for surveillance: a systematic review and meta-analysis. *PLoS Negl Trop Dis* 2021; **15**(4):e0009359. <https://doi.org/10.1371/journal.pntd.0009359>
4. Santoso MS, Yohan B, Denis D, et al. Diagnostic accuracy of five different brands of dengue virus non-structural protein 1 (NS1) antigen rapid diagnostic tests in Indonesia. *Diagn Microbiol Infect Dis* 2020; **98**(2):115116. <https://doi.org/10.1016/j.diagmicrobio.2020.115116>
5. Hang VT, Nguyet NM, Trung DT, et al. Diagnostic accuracy of NS1 ELISA and lateral flow rapid tests for dengue: sensitivity, specificity and relationship to viraemia and antibody responses. *PLoS Negl Trop Dis* 2009; **3**(1):e360. <https://doi.org/10.1371/journal.pntd.0000360>

EPIDPP40 / 358

Tuberculosis Among Orang Asli in Perak: A Cross Sectional Study from 2019-2023

Lau Kin Mun¹, Afzaninawati Suria Yusof¹, Adam Prakash Gunaselan¹, Suntharavalli Vadivalu¹, Husna Maizura Ahmad Mahir¹

¹Perak State Health Department, Ministry of Health Malaysia

Corresponding author's email: dr.laukinmun@moh.gov.my

Summary

Tuberculosis is a curable disease with an increasing prevalence and is a leading cause of disability and death worldwide. Malaysia is classified as an upper-moderate Tuberculosis burden. A 5-year review of Tuberculosis prevalence was performed to identify the characteristics of TB among 357 Orang Asli in Perak. Smear-positive pulmonary Tuberculosis remains the most prevalent. Tuberculosis screening of Orang Asli population should identify risks like male gender, age group 15-64 years, work contacts, and smokers. Tuberculosis awareness via outreach programmes and enhancement of MyChampion Orang Asli volunteers will help to assist Tuberculosis detection alongside the Department of Orang Asli Development, Perak.

Keywords

Orang Asli, Perak, Tuberculosis, health education, volunteers.

Introduction

The health care of the Orang Asli (OA) community in Peninsular Malaysia has become a priority for the Ministry of Health, Malaysia since 2012. The Orang Asli Health Survey (OAHS) in 2022 reported 3.2% of OA aged 15 years and above were infected with Tuberculosis (TB). In 2024, the Indigenous Peoples Information Data System (iDamak) provided an updated census in which a total of 62,617 OA residing in Perak and a total number of 257 OA villages. The top three OA-populated districts are Batang Padang - 17,652, Kuala Kangsar - 12,320 and Hulu Perak - 12,049. WHO reported a worsening of TB incidence of 122 per 100 000 population in Malaysia for the year 2023. The prevalence of TB in Perak remains high among the OA with fatal cases being reported despite being a curable disease and freely available treatment from the government health facilities. In Perak, OA health services has its many challenges with the foremost being the remoteness of rural residences of the OA villages. This study was done to determine the prevalence and characteristics of TB infection among OA in Perak from 2019-2023.

Materials and Methods

A retrospective cross-sectional study was done using the National Tuberculosis Registry (NTBR) database from Perak over a 5-year period (2019-2023). A total

number of 357 TB OA records were extracted to analyse the demography and to identify the factors related to TB among the OA in Perak.

Results and Discussion

The prevalence of TB among OA in Perak was 113.5 per 100 000 population in 2023. During the 5-year period, TB OA cases were highest in the three densely populated districts of Kuala Kangsar 33.9%, Hulu Perak 23.8%, and Batang Padang 15.7%. TB was predominantly detected among OA of the male gender 59.4% (212 cases) with the mean age of 36.4 (SD 9.05) years. The OA patients with TB had some form of education which ranges from primary school level to diploma studies (61.9%), were employed (56.3%) and smokers (36.1%).

Majority of the TB OA cases were diagnosed from Hospitals 81.5% (291 cases) and notably through passive detection 68.9% (246 cases). The common presenting signs and symptoms were cough > 2 weeks (6.4%), loss of weight (4.5%) and loss of appetite (3.4%). Active case detection consisted of special surveys 15.9% (57), contract screening 10.1% (36), community screening for TB 4.5% (16), medical screening for work 0.3% (1) and others 0.3% (1).

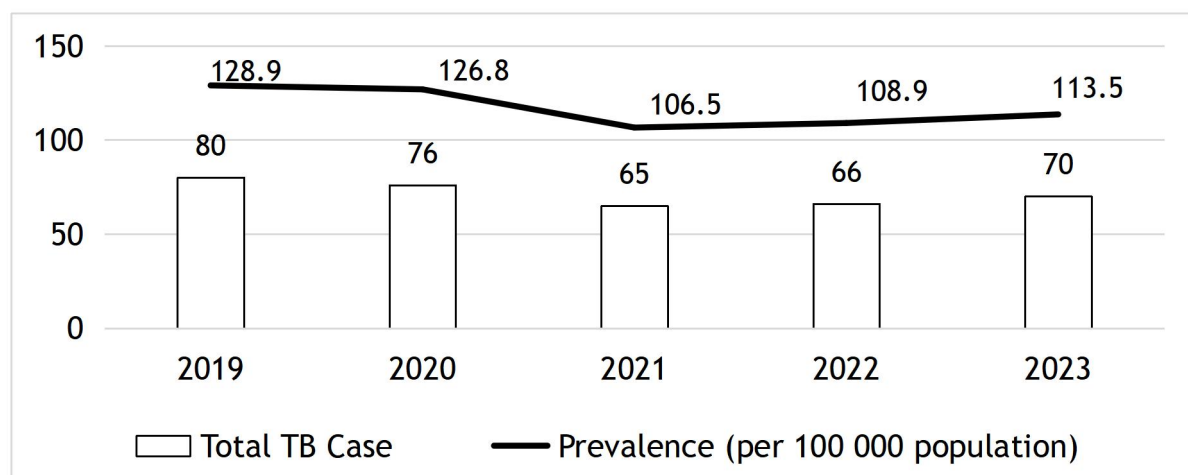


Figure 1: Five-year trend of Tuberculosis infection among Orang Asli in Perak from 2019 to 2023

BCG scar was seen in 85.2% (304) of TB OA cases. Pulmonary TB (PTB) smear positive cases among OA accounted for 70.3%, followed by PTB smear negative cases 15.7%, and extrapulmonary TB 10.1%. The prevalence of TB among OA in Perak remains high between 110-130 per 100 000 population during the 5-year period. This coincides with enhanced case detection via outreach health and screening programmes of mobile OA health teams with the initiative for outsourcing of mobile chest x-ray facility.

Table 1: Characteristics Of Tuberculosis Infection Among Orang Asli In Perak (2019-2023)

Characteristics	Frequency	Percentage
Gender		
Male	212	59.4%
Female	145	40.6%
Age Group (years)		
<1	2	0.6%
1-4	6	1.7%
5-14	19	5.3%
15-24	69	19.3%
25-34	82	23.0%
35-44	56	15.7%
45-54	67	18.8%
55-64	43	12.0%
>65	13	3.6%
Mean Age (SD)	36.4 (9.05) years old	
Minimum	<1 year old	
Maximum	79 years old	
Occupation		
Unemployed	156	43.7%
Self Employed	101	28.3%
Labourer	50	14.0%
Government Worker	7	2.0%
Private Sector Worker	26	7.3%
Student	17	4.8%
Comorbids		
Diabetes Mellitus	1	0.3%
Substance abuse	1	0.3%

Smoker	129	36.1%
Diagnosis		
PTB smear +ve	251	70.3%
PTB smear -ve	56	15.7%
Extrapulmonary TB	36	10.1%
PTB smear +ve & Extrapulmonary TB	6	1.7%
PTB smear -ve & Extrapulmonary TB	8	2.2%

Conclusion

Smear positive PTB is the most prevalent due to the high infectivity of aerosolised viable *Mycobacterium tuberculosis* bacilli. Identified characteristics of great preponderance - male gender, productive age group, employment contact, and smoker - suggest focused screening and early detection among the OA for better yield. Effective and continuous health promotion and education via MyChampion initiatives of MOH, Malaysia need to include TB awareness and treatment regime among the OA. It is vital to work cohesively with the Department of Orang Asli Development (JAKOA) in Perak for the transportation of PTB close contact for radiological screening and laboratory sampling at health facilities to achieve a reduction of TB incidence rate among OA in Perak.

References

1. World Health Organization. *Global tuberculosis report 2024*. Geneva: World Health Organization; 2024.
2. World Health Organization. *Malaysia tuberculosis data* [Internet]. Available from: <https://data.who.int/countries/458>
3. Jabatan Kemajuan Orang Asli (JAKOA). *Data penduduk Orang Asli Negeri Perak dan Kedah 2024*. Perak: JAKOA Negeri Perak dan Kedah; 2024.
4. Lodz NA, Abd Mutalip MH, Yoep N, et al. *Orang Asli Health Survey 2022 (OAHS)*. NMRR-19-3108-50999. Kuala Lumpur: Institute for Public Health, Ministry of Health Malaysia; 2022. Section 7.0 Communicable diseases, subsection 7.1 Tuberculosis, p. 124-6.

EPIDPP41 / 364

Hypertensive Drug Utilisation and Polypharmacy Among Older Adults in Malaysian Public Primary Care

Mohd Shaiful Jefri¹, Marhaini Mostapha¹, Rima Marhayu Abdul Rashid², Noor Haslinda Ismail³, Sivaraj Raman¹, Farhana Aminuddin¹, Mohd Shahri Bahari¹, Nur Amalina Zaimi¹, Tan Yui Ping¹, Ee Vien Low¹, Nor Zam Azihan Bin Hassan¹

¹ *Institute for Health Systems Research, National Institutes of Health, Ministry of Health Malaysia*

² *Primary Medical Care Sector, Family Health Development Division, Ministry of Health Malaysia*

³ *Jelevu District Health Office, Ministry of Health Malaysia*

Corresponding author's email: shaifuljefri@moh.gov.my

Summary

This study explores the prescribing pattern among older adults with hypertension in Malaysian public primary healthcare. Polypharmacy was common and significantly associated with increasing age, multiple comorbidities, ethnicity, and facility type. Despite widespread use of combination antihypertensive therapy, fixed-dose combinations (FDC) were underutilised, indicating room for improved prescribing practices.

Keywords

Drug utilisation, older adults, primary care, hypertension, polypharmacy

Introduction

Non-communicable diseases (NCDs), particularly hypertension, diabetes, and hypercholesterolemia, are highly prevalent among the older adults population in Malaysia and often require long-term pharmacological management. The co-existence of multiple NCDs in older adults contributes to increased medication use, raising the risk of polypharmacy—commonly defined as the concurrent use of five or more medications¹. Polypharmacy can lead to medication-related harm, reduced adherence, and poorer health outcomes, especially in the older adults². Optimising antihypertensive therapy, including the use of fixed-dose combination (FDC) drugs, may improve treatment efficiency and reduce pill burden³. This study aims to describe the pattern of antihypertensive and NCD drug utilisation among older adults with hypertension in public primary care and explore factors associated with polypharmacy in this population.

Materials and Methods

This cross-sectional study utilised secondary data extracted from the Teleprimary Care and Oral Health Clinical Information System (TPC-OHCIS), covering the period from February 2022 to March 2023. Data were obtained from 14 purposively sampled public primary healthcare facilities across Malaysia. All patients aged 60 years and above who were prescribed long-term antihypertensive medications at

these facilities were included in the analysis. Statistical tests were performed to assess differences in polypharmacy across sociodemographic subgroups. Depending on the nature of data, the Chi-square test, Mann-Whitney U test and Cuzick's test for trend were applied. All analyses were conducted using Stata version 14.1.

Results and Discussion

A total of 16,024 older adults with hypertension were included in the study, with a mean of 1.13 clinic visit per person to the selected primary care throughout the study period. The median age of the sample was 69 years (IQR: 10), with the majority being female (54.63%). Among the sample, 8.52% had diabetes, 34.04% had hypercholesteremia and 36.70% were diagnosed with all three non-communicable diseases (NCDs). (Table 1)

The mean number of medications dispensed per clinic visit was 4.14 (SD 2.19), of which 3.22 (SD 1.61) were NCD-related medications. Less than half (47.22%) of patients were on monotherapy for hypertension, while the remainder received combination therapy; 34.21% on dual antihypertensive drug therapy and 14.05% on triple antihypertensive regimens. The average number of antihypertensive medications per patient was 1.76 (SD 0.87). Despite widespread (more than half) use of combination antihypertensive therapy, only 2.26% of patients were prescribed fixed-dose combination (FDC) drugs. Further analysis suggests that an additional 309 patients (1.83%) already on combination therapy could potentially benefit from FDC drugs to reduce pill burden.

Polypharmacy is experienced by 39.53% of the cohort. This figure was lower compared to other local studies which reported the prevalence of polypharmacy at 45.9% and 51% (4,5). Polypharmacy was significantly associated with increasing age, a higher number of comorbidities, ethnicity, and the type of primary care facility. (Table 1)

Table 1: Sociodemographic of sample and factors associated with polypharmacy (N=16,024)

Variables	n (%)	Median (IQR)	p value
Age ¹		69 (10)	<0.001
Gender ²			
Female	8,754 (54.63)		0.881
Ethnicity ²			
Malay	4,442 (27.72)		<0.001

Other Bumiputera	2,576 (16.07)	
Chinese	6,877 (42.91)	
Indian	2,038 (12.72)	
Others	91 (0.57)	
Comorbidity³		<0.001
Hypertension alone	3,323 (20.74)	
Hypertension with diabetes	1,366 (8.52)	
Hypertension with hypercholesterolemia	5,454 (34.04)	
Hypertension with diabetes and hypercholesterolemia	5,881 (36.70)	
Type of Facility³		<0.001
Type I	7,231 (45.12)	
Type II	4,448 (27.76)	
Type III	3,487 (21.76)	
Type IV	684 (4.27)	
Type V	80 (0.50)	
Type VI	91 (0.57)	
Type VII	4 (0.02)	

¹ Mann-Whitney U Test² Chi-square Test³ Cuzick's Test

Conclusion

Polypharmacy is common among older adults with hypertension and is associated with age, comorbidities, ethnicity, and facility type. Despite combination therapy being widely used, FDCs remain underutilized, potentially due to factors such as clinical complexity and resource constraints. Incorporating AI-driven decision support may enhance rational prescribing, optimize FDC use where appropriate, reduce pill burden, support medication adherence and improve clinical outcomes.

References

1. Hoel RW, Giddings Connolly RM, Takahashi PY. Polypharmacy management in older patients. *Mayo Clin Proc* 2021; **96**:242-56.
2. Fried TR, O'Leary J, Towle V, et al. Health outcomes associated with polypharmacy in community-dwelling older adults: a systematic review. *J Am Geriatr Soc* 2014; **62**(12):2261-72.
3. Kawalec P, Holko P, Gawin M, Pilc A. Effectiveness of fixed-dose combination therapy in hypertension: systematic review and meta-analysis. *Arch Med Sci* 2018; **14**:1125-36.
4. Lim LM, McStea M, Chung WW, et al. Prevalence, risk factors and health outcomes associated with polypharmacy among urban community-dwelling older adults in multi-ethnic Malaysia. *PLoS One* 2017; **12**:e0173466.
5. Manirajan P, Sivanandy P. Drug utilisation review among geriatric patients with noncommunicable diseases in a primary care setting in Malaysia. *Healthcare (Basel)* 2023; **11**:1665. <https://doi.org/10.3390/healthcare11121665>

EPIDPP42 / 368

Overweight And Obesity Among Orang Asli Proto Malay Adults In Malaysia

Khairul Hasnan Amali¹, Azli Baharuddin¹, Ahmad Ali Zainuddin¹, Muhamad Khairul Nazrin Khalil¹

¹Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: khairulhasnan@moh.gov.my

Summary

This study investigated the prevalence and associated factors of overweight and obesity among the Malay-Proto tribe in Peninsular Malaysia. A total of 3,259 adults participated in this cross-sectional survey, which used anthropometric measurements and face-to-face interviews. Overweight and obesity were more prevalent among females, urban residents, middle-aged adults, homemakers, and individuals with at least primary education. Logistic regression identified sex, age, education, and occupation as significant predictors. Household income, marital status, and locality were not significantly associated. These findings highlight the need for targeted interventions focusing on nutrition education and physical activity among high-risk groups within the Malay-Proto population.

Keywords

Overweight, Obesity, Adults, Orang Asli, Proto Malay

Introduction

Overweight and obesity have emerged as significant public health concerns globally, affecting both urban and rural populations. The Malay-Proto is one of the three main tribes in Malaysia, with the majority living in the southern area of Peninsular Malaysia. Previously, they lived in coastal areas, river confluences, or valleys, and recently, they have settled in permanent villages^{1,2}. While all three main tribes have communities in rural and fringe village locations, only the Proto-Malay tribe has urban villages. This shift in settlement patterns coincides with broader nutrition and lifestyle transitions, including increased access to processed foods and reduced traditional subsistence activities. Combined with reduced physical activity and increased sedentary behaviours, these changes likely contributed to the rising obesity burden in this population. This study aims to determine the prevalence of overweight and obesity and its associated factors among the Malay-Proto Tribe in Malaysia.

Materials and Methods

This was a sub-analysis of a cross-sectional study conducted among Proto-Malay tribe adults in Peninsular Malaysia. Trained researchers conducted weight and height measurements according to the standard protocol, and face-to-face interview questionnaires were administered to collect socio-demographic

information. The measurements were taken twice, and the average value was utilized for data entry. The Body Mass Index (BMI) was calculated by dividing weight in kilograms by the square of your height in meters (kg/m^2). A BMI of $25.0 \text{ kg}/\text{m}^2$ and above was considered overweight and obesity based on the World Health Organization (WHO) 1998 guidelines. Descriptive statistics were employed to summarise the characteristics of the study population. Multiple logistic regression analysis was utilized to investigate the factors associated with overweight and obesity. Statistical analysis was conducted using IBM® SPSS® Version 27.0, and p-values less than 0.05 were considered statistically significant. Further details of this study's methodology are provided in the technical report ¹.

Results & Discussion

There were 3,259 respondents, with more females (56.2%) than males (43.8%). Table 1 shows the sociodemographic profile characteristics and prevalence of overweight and obesity. Overweight and obesity were more common in females (55.3%) than males (41.9%). Urban residents (55.2%) had the highest prevalence. Among subtribes, Seletar (100%) and Kuala (67.8%) had the highest prevalence. Prevalence increased with age, peaking at 60.4% in 40-49 years and declining in older adults. Married/living-with-partner individuals (53.0%) had a higher prevalence than unmarried individuals (39.7%). Completed primary education (55.1%) was more prevalent than no/incomplete education (43.5%). Higher-income ($\geq \text{RM}2,000/\text{month}$) was associated with greater prevalence (65.8%). Housewives/homemakers (59.7%) had the highest prevalence, while students (34.2%) had the lowest. Table 2 highlights factors associated with overweight and obesity. Sex, age, education, and occupation were significantly associated with overweight and obesity. Females had 49.0% lower odds compared to males. This result contrasts with national trends, where females often show a higher prevalence of overweight and obesity. Respondents aged 18-29 were less likely than those aged 60 and above (AOR = 0.38, 95% CI: 0.27-0.53) which in line with previous research, which shows that aging is frequently linked to decreased physical activity, metabolic changes, and accumulated lifestyle risk factors—all of which raise an older adult's body weight ^{3,4,5} Individuals with at least primary education had over double the odds compared to those without formal education (AOR = 2.28, 95% CI: 1.43-3.63). In terms of occupational status, housewives or homemakers had a significantly higher likelihood of being overweight or obese compared to those not working, including retirees, older adults, and individuals with health issues (AOR = 1.55, 95% CI: 1.11-2.16).

Conclusion

This study shows a high prevalence of overweight and obesity among Malay-Proto females, aged 40-49, those with primary education, and housewives. Policies should promote healthier food environments and active living in Orang Asli settlements to address the high prevalence of overweight and obesity in this vulnerable population.

Table 1: Sociodemographic profile and prevalence of overweight and obesity among respondents (N=3259)

Sociodemographic characteristic	Count	Percentage (%)	Prevalence of overweight and obesity (95% CI)
Sex			
Male	1421	43.8	41.9 (28.86, 56.18)
Female	1838	56.2	55.3 (41.99, 67.86)
Locality			
Urban	808	2.4	55.2 (49.20, 61.12)
Fringe	1244	84.1	50.2 (35.22, 65.09)
Remote	1207	13.5	42.6 (23.67, 64.00)
Subtribe			
Temuan	1279	41.2	63.5 (54.20, 71.86)
Kuala	135	0.4	67.8 (60.13, 74.64)
Kanaq	36	2.4	36.1 (36.11, 36.11)
Seletar	1	0.0	100 (100.00, 100.00)
Jakun	1387	50.9	37.1 (32.38, 42.09)
Semelai	421	5.1	63.7 (52.46, 73.58)
Age Group			
18-29	1135	33.8	36.4 (29.38, 44.11)
30-39	772	23.9	57.1 (43.56, 69.71)
40-49	555	16.2	60.4 (41.48, 76.60)
50-59	442	14.7	55.0 (38.35, 70.53)
60 and above	352	11.4	45.8 (27.56, 65.29)
Marital Status			

Unmarried	616	22.0	39.7 (26.72, 54.27)
Married/Live with a partner	2931	78.0	53.0 (38.45, 67.05)
Education Level			
No formal education/incomplete primary education	1500	51.3	43.5 (28.21, 60.23)
Minimum completed primary education	1741	48.7	55.1 (45.41, 64.45)
Occupation Status			
Employed	1926	62.6	46.9 (35.43, 58.77)
Housewife/Homemaker	872	25.6	59.7 (43.22, 74.32)
Student/children	34	0.7	34.2 (21.26, 49.97)
Not working ^a	410	11.1	38.6 (23.01, 56.88)
Monthly Household Income			
Less than RM500	1184	42.7	45.2 (27.96, 63.62)
RM500-RM999	652	23.4	47.4 (36.16, 58.84)
RM1,000-RM1,999	1074	26.4	52.1 (40.90, 63.11)
RM2,000 or more	337	7.5	65.8 (49.11, 79.28)

^a-not working include unemployed, old age, health issues, and retirees

Table 2: Factors associated with overweight and obesity

Sociodemographic characteristic	Crude OR (95%CI)	P-value	Adjusted OR (95%CI)	P-value
Sex				
Male	1		1	
Female	1.71 (1.48,1.98)	<0.001	0.51 (0.37, 0.72)	<0.001
Locality				
Urban	1.66 (0.67, 4.11)	0.249	1.59 (0.67, 3.75)	0.267
Fringe	1.36 (0.47, 3.95)	0.551	1.58 (0.68, 3.71)	0.268
Remote	1		1	
Age Group				
18-29	0.68 (0.40, 1.14)	0.132	0.38 (0.27, 0.53)	<0.001

30-39	1.58 (1.11, 2.23)	0.014	1.23 (0.79, 1.90)	0.329
40-49	1.80 (1.16, 2.80)	0.013	1.35 (0.81, 2.24)	0.224
50-59	1.44 (1.16, 1.79)	0.003	1.24 (0.94, 1.62)	0.119
60 and above	1		1	
Marital Status				
Unmarried	1		1	
Married/Live with a partner	1.71 (0.92, 3.20)	0.086	1.28 (0.70, 2.34)	0.396
Education Level				
No formal education/incomplete primary education	1		1	
Minimum completed primary education	1.59 (0.87, 2.90)	0.119	2.28 (1.43, 3.63)	0.002
Occupation Status*				
Employed	1.41 (0.95, 2.10)	0.086	1.16 (0.76, 1.77)	0.474
Housewife/ Homemaker	2.36 (1.58, 3.54)	<0.001	1.55 (1.11, 2.16)	0.014
Student/children	0.83 (0.29, 2.33)	0.74	1.05 (0.52, 2.13)	0.876
Not working ^a	1		1	
Monthly Household Income (MYR)				
Less than RMR500	1		1	
RM500-RM999	1.09 (0.72, 1.65)	0.655	0.94 (0.55, 1.60)	0.797
RM1,000-RM1,999	1.32 (0.77, 2.27)	0.289	1.11 (0.61, 2.01)	0.722
RM2,000 or more	2.33 (0.64, 8.45)	0.180	1.61 (0.38, 6.85)	0.493

^a-not working include unemployed, old age, health issues, and retiree

References

1. Institute for Public Health (IPH). *Technical report: Orang Asli Health Survey (OAHS) 2022*. Kuala Lumpur: Institute for Public Health; 2024.
2. Jabatan Kemajuan Orang Asli (JAKOA). *Orang Asli portal* [Internet]. Available from: <https://www.jakoa.gov.my/orang-asli/>
3. Wells JCK, Marphatia AA, Cole TJ, McCoy D. Associations of economic and gender inequality with global obesity prevalence: understanding the female excess. *Soc Sci Med* 2012; **75**(3):482-90. <https://doi.org/10.1016/j.socscimed.2012.03.029>

4. Popkin BM, Adair LS, Ng SW. Global nutrition transition and the pandemic of obesity in developing countries. *Nutr Rev* 2012; **70**(1):3-21. <https://doi.org/10.1111/j.1753-4887.2011.00456.x>
5. McLaren L. Socioeconomic status and obesity. *Epidemiol Rev* 2007; **29**(1):29-48. <https://doi.org/10.1093/epirev/mxm001>

EPIDPP43 / 370

Determinants of Known Asthma Among Adults in Malaysia: Findings from the National Health and Morbidity Survey (NHMS) 2023

Joan Sonny Limbowoi Saimin¹, Shubash Shander Ganapathy¹, Halizah Mat Rifin¹, Wan Kim Sui¹, Kishwen Kanna Yoga Ratnam¹, Lim Kuang Kuay¹, Mohd Ruhaizie Riyadzi¹, Mohamad Aznuddin Abd Razak¹, Khairul Hasnan Amali¹, Muhammad Hanafi Bin Bakri¹, Nurul Haniyah Binti Rosslan¹, Nur Faraeein Binti Zainal Abidin¹

¹ Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: joan.sonny@moh.gov.my

Summary

Despite the rising prevalence of known asthma in Malaysia, local evidence on its key determinants is still limited. Using data from NHMS 2023, this study identified factors associated with known asthma among Malaysian adults. A total of 10,840 respondents were assessed. Multivariate logistic regression revealed significant associations between asthma and ethnicity, depression, and obesity. Indian ethnicity, depression, and being obese were linked to higher odds of known asthma. In contrast, Chinese and other ethnicities had lower odds. These findings highlight the need for holistic asthma management strategies that address mental health, weight control, and culturally sensitive education for high-risk communities.

Keywords

Known Asthma, adult, NHMS, depression, obesity

Introduction

Asthma is a chronic respiratory condition that poses a significant public health challenge in Malaysia, affecting quality of life and healthcare resources. The prevalence of known asthma among adults increased from 4.5% in the NHMS 2006 to 6.2% in NHMS 2023, reflecting a rising burden¹. Its prevalence is influenced by multiple factors, including gender, ethnicity, obesity, and mental health status²⁻⁵. While international studies have highlighted these associations, local evidence remains limited. Understanding the sociodemographic and health-related determinants of asthma is crucial for designing effective, culturally sensitive interventions. This study aims to determine the prevalence of known asthma among Malaysian adults and examine its association with ethnicity, obesity, and depression.

Materials and Methods

Known asthma was defined as a prior clinical diagnosis of asthma documented in the patient's medical records before the study period. This study utilised data from the National Health and Morbidity Survey (NHMS) 2023, a nationwide cross-sectional study employing a two-stage stratified sampling technique. This module was assessed among all respondents aged 18 years old and above via face-to-face

interviews conducted by trained research assistants. Self-reported data was collected using a questionnaire. The instrument used comprised 18 items adapted from the European Community Respiratory Health Survey (ECRHS) questionnaire. All data were collected using a structured, validated questionnaire. Descriptive statistics and multiple logistic regression analyses, adjusted for complex survey design, were used to examine the prevalence and factors associated with known asthma and various sociodemographic, lifestyle, and health-related factors.

Results and Discussion

A total of 10,840 respondents participated in the study, with a response rate of 83.2%. Most participants were from urban areas (76.3%), and the majority were female (53.9%). More than half of the participants were Malays (58.3%), and 27.4% were aged 60 years and above. The overall prevalence of known asthma was 6.2%, and it was higher among females (7.1%) and Indian participants (10.2%). Individuals with obesity (9.1%), hypertension (8.1%), and depression (11.7%) also had higher asthma prevalence. Multiple logistic regression analysis showed that Indian ethnicity was associated with higher odds of asthma (AOR: 1.66, 95% CI: 1.18-2.35, $p = 0.004$), while Malays had the lowest odds (AOR: 1.00). Obesity was seen to be a significant predictor of asthma (AOR: 1.63, 95% CI: 1.20-2.21, $p = 0.002$), with obese individuals being 1.63 times more likely to have asthma than those with a normal BMI. Depression was another significant factor, which increased the odds of asthma by 1.83 times (AOR: 1.83, 95% CI: 1.17-2.84, $p = 0.008$). These findings are consistent with global patterns, where asthma is often more common in adult women due to hormonal and immunological influences². The disparity among different ethnicities could be due to genetic predisposition, environmental exposures, socioeconomic status, or cultural differences in health-seeking behaviour. Such variations align with other multi-ethnic studies that highlight ethnic differences in asthma risk³. The association between obesity and asthma is supported by existing evidence demonstrating that excess body weight contributes to inflammation and reduced lung function⁴. Additionally, depression significantly increased asthma risk. This supports previous research indicating a bidirectional link between mental health and asthma, where depression can worsen asthma outcomes due to physiological stress responses and reduced treatment adherence⁵.

Table 1: Multivariate Logistic Regression for Factors Associated with Known Asthma among Malaysian Adult (n=10,840)

Socio-demographic characteristic	Adjusted OR	95% Confidence Interval		p-value
		Lower	Upper	
Sex				
Male	1.00			
Female	1.15	0.91	1.47	0.239
Age				

18 - 29	1.00			
30 - 39	0.86	0.59	1.25	0.429
40 - 49	0.82	0.57	1.17	0.273
50 - 59	0.67	0.44	1.00	0.051
60 and above	0.81	0.54	1.20	0.290
Ethnicity				
Malay	1.00			
Chinese	0.62	0.41	0.94	0.025
Indian	1.66	1.18	2.35	0.004
Bumiputera Sabah & Sarawak	0.83	0.59	1.16	0.271
Others	0.39	0.19	0.80	0.010
Occupation				
Government	1.00			
Private	0.70	0.46	1.07	0.103
Self-employed	0.82	0.60	1.13	0.229
Not working	0.95	0.68	1.32	0.758
Diabetes				
Yes	0.96	0.70	1.30	0.772
No	1.00			
Depression				
Depressed	1.83	1.17	2.84	0.008
Not depressed	1.00			
Hypertension				
Yes	1.31	0.94	1.84	0.113
No	1.00			
BMI Category				
Underweight	0.70	0.38	1.30	0.259
Normal	1.00			
Overweight	1.29	0.97	1.72	0.076
Obese	1.63	1.20	2.21	0.002

Conclusion

This study highlights a rising trend in asthma prevalence among Malaysian adults, with significant associations found between asthma and Indian ethnicity, obesity, and depression. These findings emphasize the need for integrated, culturally sensitive asthma management strategies that address physical and mental health to effectively reduce the disease burden.

References

1. Institute for Public Health (IKU). *National Health and Morbidity Survey (NHMS) 2023: Non-communicable diseases & healthcare demand*. Kuala Lumpur: Ministry of Health Malaysia; 2024. Available from: <https://iku.nih.gov.my/images/nhms2023/report-nhms-2023.pdf>

2. Fuseini H, Newcomb DC. Mechanisms driving gender differences in asthma. *Curr Allergy Asthma Rep* 2017; 17(3):19. <https://doi.org/10.1007/s11882-017-0686-1>
3. Loftus PA, Wise SK. Epidemiology of asthma. *Int Forum Allergy Rhinol* 2016; 6(Suppl 1):S2-5. <https://doi.org/10.1002/alr.21677>
4. Peters U, Dixon AE, Forno E. Obesity and asthma. *J Allergy Clin Immunol* 2018; 141(4):1169-79. <https://doi.org/10.1016/j.jaci.2018.02.004>
5. Opolski M, Wilson I. Asthma and depression: a pragmatic review of the literature and recommendations for future research. *Clin Pract Epidemiol Ment Health* 2005; 1(1):18. <https://doi.org/10.1186/1745-0179-1-18>

EPIDPP44 / 375

An Appraisal Of Urban Malaria In Johor Bahru: Gametocyte Cases In 2024

Noor Adillah Dawad ¹, Luqmanul Hakim Junaiden ¹, Akashah Abdullah ¹, Haidar Rizal Toha ¹

¹ Johor Bahru District Health Office, Johor Bahru, Johor, Malaysia

Corresponding author's email: dr.nooradillah@moh.gov.my

Summary

Malaria elimination remains a public health priority in Malaysia. However, imported Malaria cases, particularly those involving the presence of gametocytes pose a risk for reintroduction in urban areas. This study reviews Malaria cases reported in Johor Bahru in 2024, with a focus on gametocyte presence and the associated transmission potential. Epidemiological and entomological surveillance were conducted to assess the risk. This appraisal aims to understand urban Malaria infection and guide appropriate management strategies.

Keywords

Urban Malaria, Imported Malaria, Gametocyte, Malaria elimination.

Introduction

Despite Malaysia's progress in Malaria elimination with zero indigenous human Malaria cases reported since 2018, urban areas remain vulnerable due to imported cases¹. Johor Bahru, a rapidly urbanising district with high foreign workforce presence, continues to face imported Malaria threats. In 2024, eight Malaria cases were recorded in the district, with five being positive for gametocytes. Gametocytes are the transmissible sexual form of Plasmodium parasites, capable of infecting mosquitoes and perpetuating transmission even from asymptomatic carriers². Their presence, especially in urban settings with competent Anopheles vectors, raises concern for re-establishment of local transmission. Factors such as delayed diagnosis and inadequate surveillance may increase the risk of reintroduction. Understanding the travel timelines and entomological data associated with these cases is essential. This appraisal is crucial for sustaining Malaria elimination in Johor Bahru by identifying silent transmission risks, informing strategic surveillance, and guiding tailored interventions for urban Malaria threats.

Materials and Methods

A case series involving descriptive analysis was conducted based on epidemiological and entomological data of Malaria cases with gametocyte reported in Johor Bahru in 2024. Data were retrieved from district health office records, including patient demographics, parasite species, gametocyte presence, and case timelines (arrival, onset, diagnosis). Entomological surveillance was performed

within a 2 km radius of each case locality using larval surveys and Human Landing Catch (HLC) methods. Species identification and dissection for parity assessment were conducted. Receptivity, vulnerability, and Malaria re-introduction risk scores were calculated for each locality. Timeline intervals were reviewed to evaluate potential windows for transmission.

Results and Discussion

There were eight cases of Malaria in Johor Bahru in 2024, all of which have recovered, as presented in Table 1. All cases were imported, with seven involving foreigners and one Malaysian citizen who travelled to the Malaria-endemic country of Ghana. All five gametocyte cases were *P. vivax*. Entomological studies in the residential area of the gametocyte cases were conducted as presented in Table 2.

Table 1: Epidemiological Profile and Gametocyte Status of Imported Malaria Cases in Johor Bahru, 2024

No.	Diagnosis	Age (years)	Sex	Country of origin	Gametocyte presence and case timeline
1.	P. Vivax 30/01/2024	36	Male	Pakistan	Yes Arrived in Malaysia: 14/11/2023 Onset: 01/01/2024
2.	P. Falciparum 29/03/2024	26	Male	Sudan	No
3.	P. Vivax 11/07/2024	63	Male	Sudan	Yes Arrived in Malaysia: 13/03/2024 Onset: 28/06/2024
4.	P. Falciparum 01/08/2024	39	Male	China	No
5.	P. Vivax 13/08/2024	29	Male	Myanmar	Yes Arrived in Malaysia: February 2024 Onset: 06/08/2024
6.	P. Vivax 14/08/2024	21	Male	Pakistan	Yes Arrived in Malaysia: 17/06/2024 Onset: 08/08/2024
7.	P. Vivax 18/09/2024	25	Male	Myanmar	Yes Arrived in Malaysia: 30/08/2024 Onset: 10/09/2024
8.	P. Falciparum 10/12/2024	28	Male	Malaysia	No

Table 2: Malaria Re-introduction Risk Level Process

No	Locality	Entomological study	Risk assessment
1.	Taman Pasir Putih	- Larva survey: <i>An. hyrcanus</i>, <i>An. separatus</i> - HLC: <i>An. sinensis</i>, <i>An. separatus</i> - Dissection: Parous & nulliparous	R = 2 (low) V = 10 (low) RV = 1 (low)

2.	Kipark Apartment Tampoi	• Larva survey: <i>An.hyrceanus</i> • HLC: <i>An. sinensis</i> • Dissection: Parous & nulliparous	R = 2 (low) V = 19 (low) RV = 1 (low)
3.	Taman Daya, Kawasan Perindustrian	• Larva survey: Not found • HLC: Not found	R = 2 (low) V = 19 (low) RV = 1 (low)
4.	Jalan Sungai Tiram Batu 15	• Larva survey: Not found • HLC: <i>An. sinensis</i> • Dissection: Parous	R = 2 (low) V = 25 (moderate) RV = 2 (low)
5.	Flat Taman Leisure Farm	• Larva survey: <i>An.hyrceanus</i> • HLC: <i>An. maculatus</i>, <i>An. sinensis</i>, <i>An. separatus</i> • Dissection: Parous	R = 10 (moderate) V = 8 (low) RV = 2 (low)

HLC: Human Landing Catch

R: Receptivity, V: Vulnerability, RV: Malaria re-introduction risk

The Malaria re-introduction risk for these localities is rated as low. The *An. maculatus*, the primary vector for Malaria (specifically for *P. vivax*), was found in the Flat Taman Leisure Farm locality. However, *Anopheles* samples obtained during the entomological study were found to be non-vectors for Malaria in the Taman Pasir Putih, Kipark Apartment Tampoi, and Jalan Sungai Tiram Batu 15 localities. No larvae or adult mosquitoes were found in the Taman Daya locality.

Evidence-based decision making in Malaria control must be guided by epidemiological and entomological surveillance. Based on case timelines from arrival in Malaysia, date of onset, and diagnosis in Johor Bahru, such delays increase the risk of gametocyte persistence and potential local transmission, particularly in receptive areas. This information, combined with entomological data such as local *Anopheles* mosquito presence and breeding site mapping, informs targeted vector control measures and clinical management.

Malaysia requires the implementation of strategies to address the ongoing threat of Malaria importation. Regular and systematic screenings for Malaria among asymptomatic individuals are required, especially those at high risk based on the country of origin, even in the absence of apparent symptoms. The use of Rapid Diagnostic Tests (RDTs) have greatly expanded the ability to diagnose Malaria, particularly in resource-limited regions. However, their sensitivity decreases with low parasitaemia, genetic variability, and the prozone effect³. Malaysia has to develop the policy to identify asymptomatic carriers of the Malaria parasite among these high-risk groups.

Conclusion

The evidence-based decision-making process, guided by entomological and epidemiological surveillance, is fundamental for understanding urban Malaria

infection patterns and effectively managing vector control. Collaboration within the health sector is vital for addressing urban Malaria to identify and manage Malaria risks among vulnerable populations.

References

1. Chin AZ, Maluda MCM, Jelip J, et al. Malaria elimination in Malaysia and the rising threat of *Plasmodium knowlesi*. *J Physiol Anthropol* 2020; **39**(1):1-9.
2. Touray AO, Mobegi VA, Wamunyokoli F, et al. Prevalence of asymptomatic *P. falciparum* gametocyte carriage among school children in Mbita, Western Kenya and assessment of the association between gametocyte density, multiplicity of infection and mosquito infection prevalence. *Wellcome Open Res* 2020; **5**:259.
3. Kavanaugh MJ, Azzam SE, Rockabrand DM, et al. Malaria rapid diagnostic tests: literary review and recommendation for a quality assurance, quality control algorithm. *Diagnostics (Basel)* 2021; **11**(5):768.

EPIDPP45 / 379

Factors Associated with Tuberculosis (TB) Treatment Success among TB Patients in Kelantan; 3 Years Record Review 2021-2023

Siti Romaino Mohd Nor¹

¹ Clinical Research Centre (CRC) Kelantan, Hospital Raja Perempuan Zainab II, 15586 Kota Bharu, Kelantan.

Corresponding author's email: sitiromaino@crc.moh.gov.my

Summary

The study evaluates tuberculosis (TB) treatment success among TB patients in Kelantan from 2021 to 2023 using secondary data from the MyTB database. Among 3,063 TB cases, 2,441 were analyzed. The overall treatment success rate was 78.1%, with 41.3% cured and 36.8% completed. In comparison, the unsuccessful outcomes were 21.9%, including 1.4% treatment failures, 2.5% defaults, and 18.0% deaths. The successful outcomes were significantly associated with treatment duration, education level, TB case category, and HIV status, as identified through multiple logistic regression analyses. The findings highlight the need for tailored management strategies, enhanced patient education, and integrated TB-HIV care to achieve the WHO's treatment success target of over 90%.

Keywords

Associated factors, Tuberculosis (TB), TB patients, Treatment outcomes

Introduction

Tuberculosis (TB) remains one of the most pressing global health challenges despite significant strides in its prevention and treatment. The World Health Organization (WHO) mandates routine monitoring of TB treatment outcomes using standardized classifications to ensure consistent evaluation and global comparability. According to the Clinical Practice Guidelines for Management of Tuberculosis¹, cured is defined as a former smear-positive in the last month of treatment and at least one previous occasion; completed treatment as not meet the criteria for being classified as a cure or failure; failure as sputum smear-positive at five months or later; died as having died for any reason during treatment; and default as interrupted treatment for two consecutive months or more. In this study, the treatment outcomes were classified as successful (cured and completed) and unsuccessful (failures, defaults, and deaths). Thus, this study aims to evaluate TB treatment outcomes and determine the associated factors with TB treatment success among TB patients in Kelantan over three years (2021-2023).

Materials and Methods

This cross-sectional study utilized secondary data between January 2021 and December 2023 from the MyTB database maintained by the TB/Leprosy Sector,

State Health Department of Kelantan. A non-probability sampling method was applied, adhering to strict inclusion and exclusion criteria. Patients who transferred out, changed diagnosis, or were still undergoing treatment during data collection were excluded from the analysis. Data were analyzed using multiple logistic regression analysis in IBM SPSS Statistics version 25.0, with treatment outcomes as the dependent variable. Independent variables included sociodemographic factors, clinical characteristics, and treatment-related characteristics. Ethics approval was obtained from the Medical Research Ethics Committee (MREC), Ministry of Health (MOH), Malaysia.

Results and Discussion

There were 3,063 TB cases reported in Kelantan. After excluding 622 cases due to transfers, diagnosis changes, or ongoing treatment, a total of 2,441 cases were included. The ages of the patients ranged from 18 to 92 years, with a mean $\pm$ SD of 50.2 $\pm$ 17.1 years. Treatment duration varied from 0 to 991 days, with a mean $\pm$ SD of 200.1 $\pm$ 111.6 days. The overall treatment success rate was 78.2% (1,908), comprising 41.3% (1,009) cured and 36.8% (899) treatment-completed. The unsuccessful outcomes were 21.8% (533), including failures at 1.4% (33), defaults at 2.5% (60), and deaths at 18.0% (440) (Figure 1). Multiple logistic regression analysis identified several significant factors associated with TB treatment success. After adjusting for confounding variables, duration of treatment, education levels, TB case category, and HIV status remained significantly associated with TB treatment success (Table 1). The study revealed that each additional day of treatment increased the odds of treatment success by 4% (AOR: 1.04, 95% CI: 1.03, 1.04, $P < 0.001$). This result proves that longer treatment durations are directly linked to higher success rates, reinforcing the need for patients to adhere strictly to prescribed regimens.

Meanwhile, patients who received education at Institut Pengajian Tinggi (IPT) levels had 3.41 times higher odds of achieving treatment success than those without formal education (AOR: 3.41, 95% CI: 1.42, 8.20, $P = 0.006$), which means that education is critical to TB treatment success, reinforcing the importance of integrating health education into TB control programs. Furthermore, individuals categorized as new TB cases had 4.51 times higher odds of successful treatment than those classified after failure (AOR: 4.51, 95% CI: 1.75, 11.61, $P = 0.002$). These findings emphasize the urgent need for specialized interventions for patients with prior failed TB treatments, ensuring they receive enhanced medical support for better outcomes. Additionally, patients with a positive HIV status had an 83.0% lower chance of treatment success compared to those with a negative HIV status (AOR: 0.17, 95% CI: 0.09, 0.34, $P < 0.001$). Therefore, the urgent need for comprehensive TB-HIV co-management programs, aiming to reduce unsuccessful rates among HIV-positive patients is required. Nevertheless, our research has certain limitations. The study data were retrieved from the MyTB database, and the issue is that missing data cannot be minimised, as well as a small sample size

in other categories of education level (11 cases), recurrent case category (132 cases), and unknown HIV status (9 cases).

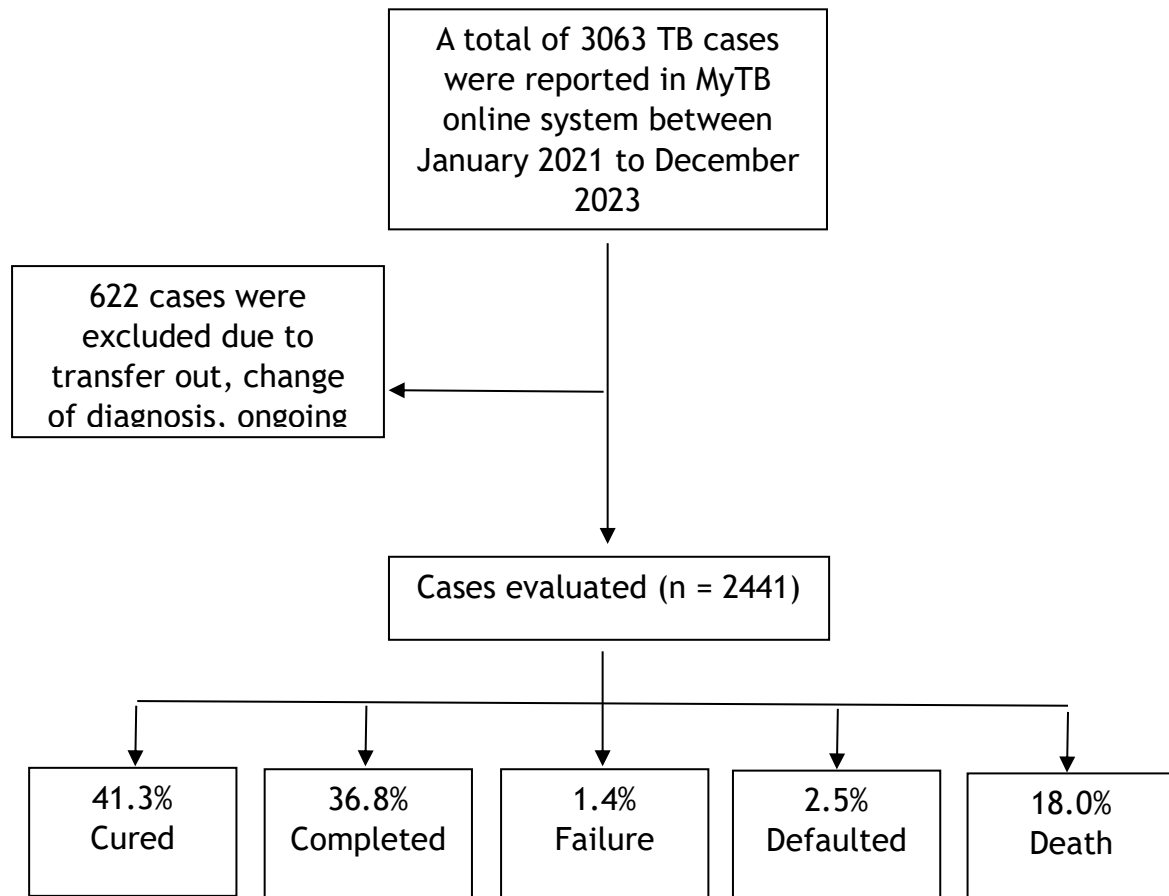


Figure 1: Schematic diagram for the selection of patients (n=2,441)

Table 1: Factors associated with TB treatment success among TB patients in Kelantan using multiple logistic regression (n=2,441)

Factors		Multiple logistic regression ^a			
		b	Adjusted OR (95% CI)	Wald statistic	P-value
Duration of treatment*		0.04	1.04 (1.03, 1.04)	442.2	<0.001
Education level	No formal	0	1		
	Primary	0.50	1.65 (0.74, 0.71)	1.47	0.225
	Secondary	0.36	1.43 (0.70, 2.91)	0.95	0.330
	IPT	1.23	3.41 (1.42, 8.20)	7.51	0.006
	Others	0.37	1.45 (0.14, 14.90)	0.10	0.753
Category case	After fail	0	1		
	New	1.51	4.51 (1.75, 11.61)	9.73	0.002
	Recurrent	0.66	1.94 (0.62, 6.06)	1.31	0.252
HIV status	Negative	0	1		
	Positive	-1.76	0.17 (0.09, 0.34)	25.83	<0.001
	Unknown	0.08	1.09 (0.02, 57.53)	0.00	0.97

*Mean

^a Forward stepwise likelihood ratio multiple logistic regression method was applied. Multicollinearity and interaction terms were checked and not detected.

Hosmer-Lemeshow GOF test ($P < 0.001$), classification table (overall correctly classified percentage = 96.9%), and the area under the ROC curve (95.6%) were applied to check the model fitness.

Conclusion

The treatment success rate of 78.2% in Kelantan falls below WHO's global target of >90%². This shortfall underscores the need for targeted strategies to address barriers to TB treatment success. Enhancing patient education, tailoring management strategies based on clinical profiles, and providing robust support systems, particularly for individuals with HIV, are critical steps in improving treatment outcomes. This study highlights the importance of monitoring treatment outcomes and addressing modifiable factors. By focusing on determinants such as treatment duration, education level, TB case category, and HIV status, healthcare providers can implement patient-centered approaches that increase success rates. Future efforts should include community-based interventions and strengthened integration of TB and HIV care services to optimize public health outcomes.

References

1. Ministry of Health Malaysia. Clinical Practice Guidelines - Management of Tuberculosis (Fourth Edition) [Internet]. 2021. Available from: <http://www.moh.gov.my>
2. World Health Organization. Global Tuberculosis Report 2022. 2022.

EPIDPP46 / 381

Population-Based Thalassaemia Carrier Mapping in Malaysia: Insights from a Half a Decade of School-Based Screening

Don Ismail Mohamad¹, Radziah Mohamad¹, Saidatul Norbaya B.¹, Alisahkhairun Rahmat¹, Mohd Shahriel Mat Daud¹, Nurul Kausar Izzati Mohd Ghazali¹, Mardiana Omar¹.

¹ Family Health Development Division, Ministry of Health Malaysia

Corresponding author's email: drdonismail@moh.gov.my

Summary

The National Thalassaemia Screening Programme in Malaysia, initiated in 2016 and targeting 16-year-old students, has provided a comprehensive mapping of the geographic and genetic distribution of thalassaemia. Screening approximately 40-60% of the annual birth cohort, the program has consistently identified a thalassaemia carrier prevalence of 5-7%. This study analysed data on screening coverage (N = 988,449), state-level carrier rates, ethnic distribution of screened individuals and carriers, and the prevalence of different thalassaemia types (alpha, beta, HbE, and others). Key findings reveal significant geographic and ethnic variations in carrier rates, highlighting the need for targeted public health interventions.

Keywords:

Thalassaemia, Genetic Screening, Adolescent Health, Malaysia, Epidemiology, Genotype Mapping, Public Health Programme, Ethnic Disparities, Geographic Variation

Introduction

Thalassaemia, a prevalent hereditary blood disorder in Malaysia, necessitates effective screening programs for carrier identification and prevention¹. The National Thalassaemia Screening Programme, a school-based initiative targeting 16-year-olds since 2016, aims to map the genetic landscape of this condition across the nation². Early detection facilitates genetic counselling and informed reproductive decisions³. This study assessed the geographical distribution of thalassaemia carriers among Form 4 students in Malaysia to determine high-prevalence areas to guide targeted awareness, education, and prevention strategies to support policy planning and resource allocation for thalassaemia control programmes in Malaysia.

Materials and Methods

This is a retrospective quantitative study, utilizing secondary data of Thalassaemia National Screening database among form 4 students. Data was collected from 2017 to 2021. School health teams conducted screenings of 16-year-old students, with results recorded in a standardized format. Initial screening using a full blood count to detect level of haemoglobin and mean corpuscular haemoglobin, further analysis for HB analysis using either High Performance Liquid chromatography (HPLC) or Cation-exchange Chromatography (CR) and DNA testing was performed by designated laboratories. The analysis includes descriptive statistics of screening

coverage by state and ethnicity, carrier prevalence rates per 1,000 screened individuals overall, by state, and by ethnicity, as well as the distribution of different thalassaemia carrier types.

Results and Discussion:

Data collected over a five-year period showed a national thalassaemia carrier rate of 59.1 per 1,000 students, with 58,428 confirmed carriers among 988,449 students screened. HbE thalassaemia was identified as the most common type with a carrier rate of 28.0 per 1,000 students, followed by alpha (17.2) and beta thalassaemia (13.5). The study found no significant gender-specific differences in carrier rates. Regional differences in carrier rates were observed, with Terengganu having the highest HbE carrier rate at 55.2 per 1,000 students. Kedah had the highest alpha thalassaemia carrier rate at 43.9 and Sabah had the highest beta thalassaemia carrier rate at 37.2. Ethnic differences were also notable: the Orang Asli group had the highest HbE carrier rate at 125.7 per 1,000 students, the Siamese ethnic group had a high alpha thalassaemia carrier rate at 50.4 per 1,000 students and the Bumiputera group in Sabah had the highest beta thalassaemia carrier rate at 38.7 per 1,000 students.

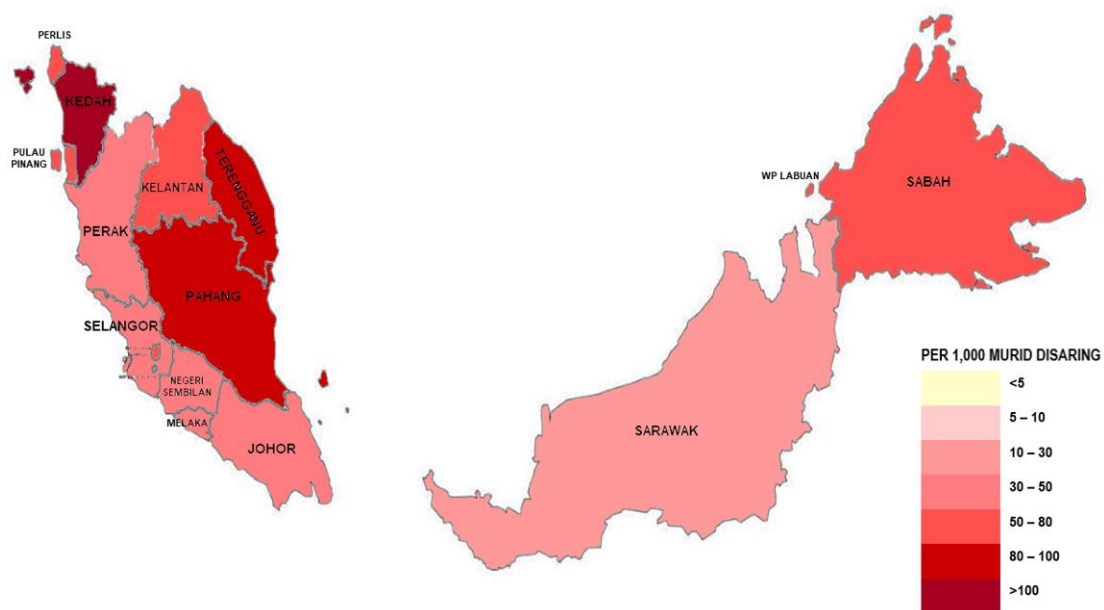


Fig.1: Distribution of Thalassaemia Carriers (per 1,000 students screened in Malaysia) for the Years 2017 to 2021 in Malaysia

Conclusion

The National Thalassaemia Screening Programme has successfully mapped the burden of thalassaemia in Malaysian adolescents, revealing significant geographic and ethnic disparities in carrier prevalence and the distribution of different thalassaemia types. These data are crucial for guiding targeted interventions, including enhanced screening in high-burden areas and communities, culturally sensitive awareness campaigns, and accessible genetic counselling services, to effectively manage and mitigate the impact of thalassaemia in Malaysia.

References

1. Goh LPW, Chong ETJ, Lee P-C. Prevalence of alpha(α)-thalassemia in Southeast Asia (2010-2020): a meta-analysis involving 83,674 subjects. *Int J Environ Res Public Health*. 2020;17(20):7354. <https://doi.org/10.3390/ijerph17207354>
2. Ministry of Health Malaysia. *National Thalassaemia Screening Programme Guidelines*. Putrajaya: Ministry of Health Malaysia; 2016.
3. Zhong A, et al. Ethical, social, and cultural issues related to clinical genetic testing and counseling in low- and middle-income countries: a systematic review. *Genet Med*. 2021;23:2270-80.

EPIDPP47 / 383

The Forgotten Pill? Lipid-Lowering Therapy Adherence at One Year After Acute Myocardial Infarction

Hui Li Lim¹, Wen Jun Wong², Swee Hung Ang³, Alan Yean Yip Fong^{4,5}, Gurudevan Mahadevan⁶, Yvonne Mei Fong Lim¹

¹ Centre for Clinical Care and Outcomes Research, Institute for Clinical Research, National Institutes of Health, Ministry of Health, Malaysia

² Centre for Clinical Epidemiology, Institute for Clinical Research, National Institutes of Health, Ministry of Health, Malaysia

³ Centre for Coordination of Clinical Research Network, Institute for Clinical Research, National Institutes of Health, Ministry of Health, Malaysia

⁴ Clinical Research Centre, Hospital Umum Sarawak, Ministry of Health, Malaysia

⁵ Sarawak Heart Centre, Kota Samarahan, Ministry of Health, Malaysia

⁶ Department of Cardiology, Hospital Sultanah Aminah, Ministry of Health, Malaysia

Corresponding author's email: lim.hl@moh.gov.my

Summary

Adherence to lipid-lowering therapy (LLT) is essential for effective secondary prevention in post-acute myocardial infarction (AMI) patients. In this study of 1595 Malaysian patients, 64% were non-adherent to LLT over 12 months, as measured by the proportion of days covered (PDC<0.8). Non-adherence was independently associated with hypertension, history of prior AMI events, and ST-elevation myocardial infarction (STEMI) subtype at the index admission. These findings highlight the need to optimize medication regimens, implement structured follow-up, and provide culturally tailored education to improve adherence, which is essential to prevent the recurrence of major adverse cardiovascular events and improve long-term survival.

Keywords

Lipid-lowering therapy (LLT), adherence, acute myocardial infarction (AMI)

Introduction

Acute myocardial infarction (AMI) remains a leading cause of morbidity and mortality worldwide. Effective secondary prevention, particularly with lipid-lowering therapy (LLT), is crucial for reducing recurrent cardiovascular events and improving patient outcomes. This study aims to measure adherence to LLT in post-AMI patients and to identify determinants associated with non-adherence.

Materials and Methods

This study included patients aged ≥ 18 years who were hospitalised for AMI between 2016 - 2019, as part of the cohort study titled 'Impact of Low-Density Lipoprotein Cholesterol Population Targets in Acute Myocardial Infarction (LDL-C TITAN): Bridging between guidelines and practice' (NMRR ID-22-02886-BW4 (IIR)), involving six hospitals in Malaysia. For this analysis, medication dispensing data were obtained from the Pharmacy Information System (PhIS), available at Sarawak Heart Centre and Sultanah Aminah Hospital. LLT adherence was assessed over 1-, 3-, and 12 months post-discharge using the proportion of days covered (PDC). PDC was the ratio of days with medication available to total days in each observation

period, starting from the first prescription fill date ¹. For multiple refills, overlapping periods were adjusted by shifting fill dates and quantities forward. Patients were categorised as "adherent" if the average PDC over a 12-month period was ≥ 0.8 , and "non-adherent" if < 0.8 ¹.

Results and Discussion

Among 1595 post-AMI patients, LLT adherence was sub-optimal at 1 month (mean PDC=0.71) after discharge and declined over time (mean PDC=0.72 over 3 months; mean PDC=0.53 over 12 months). 64% of them exhibited non-adherence to LLT over 12 months. Non-adherent patients were slightly younger (mean age 57.0 vs. 58.5 years, $p = 0.017$) with marginally higher LDL cholesterol (3.2 vs. 3.1 mmol/L, $p = 0.591$) and lower PDC value (0.28 vs. 0.99, $p < 0.001$) when compared with adherent patients. Multivariable logistic regression identified hypertension (adjusted odds ratio (aOR)=1.70; 95% confidence interval (CI): 1.20 - 2.42), history of prior AMI events (aOR=1.72; 95% CI: 1.11 - 2.68), and STEMI subtype at the index admission (aOR=2.81; 95% CI: 2.03 - 3.91) as independent risk factors for non-adherence. The 64% non-adherence rate aligns with prior Malaysian studies reporting rates of 39.7-74.0% ^{2,3}. Surprisingly, patients with the STEMI subtype and history of previous AMI events, despite their elevated risk, also exhibited poorer adherence, likely due to complex medication regimens and insufficient patient education, both of which are recognised barriers to adherence in high-risk populations ³.

Table 1: Factors Associated with Non-adherence to LLT in Post-AMI Patients

Variables	cOR	95% CI	p-value	aOR	95% CI	p-value
Age <60 years (Ref: ≥ 60 years)	1.19	0.97 - 1.46	0.095	1.11	0.79 - 1.55	0.542
Female (Ref: Male)	1.22	0.92 - 1.62	0.180	0.91	0.55 - 1.50	0.717
Non-Malay (Ref: Malay)	0.71	0.58 - 0.87	0.001*	0.89	0.66 - 1.20	0.444
Current smoker (Ref: Non-smoker)	1.24	0.99 - 1.56	0.066	1.00	0.68 - 1.48	0.994
Former smoker (Ref: Non-smoker)	1.10	0.82 - 1.48	0.526	0.95	0.61 - 1.46	0.803
BMI $\geq 25\text{kg/m}^2$ (Ref: $< 25\text{kg/m}^2$)	1.00	0.77 - 1.30	0.975	0.85	0.62 - 1.16	0.307
Diabetes mellitus (Ref: No)	1.33	1.07 - 1.65	0.011*	1.39	0.98 - 1.99	0.070

Hypertension (Ref: No)	1.17	0.95 - 1.45	0.140	1.70	1.20 - 2.42	0.003*
Dyslipidaemia (Ref: No)	0.66	0.53 - 0.82	<0.001*	0.91	0.65 - 1.30	0.616
Heart failure (Ref: No)	0.79	0.48 - 1.34	0.374	0.68	0.32 - 1.43	0.311
Atrial fibrillation (Ref: No)	0.71	0.40 - 1.26	0.237	0.76	0.30 - 1.86	0.540
Stroke (Ref: No)	2.00	0.95 - 4.73	0.086	2.56	0.86 - 8.87	0.107
Chronic Kidney Disease (Ref: No)	0.55	0.32 - 0.96	0.033*	0.53	0.23 - 1.18	0.132
History of prior AMI events (Ref: None)	1.90	1.38 - 2.64	<0.001*	1.72	1.11 - 2.68	0.016*
STEMI subtype (Ref: NSTEMI)	2.47	1.99 - 3.06	<0.001*	2.81	2.03 - 3.91	<0.001*
Revascularization (Ref: No)	0.99	0.80 - 1.22	0.929	1.35	1.00 - 1.82	0.053
High LLT intensity** (Ref: Low)	0.70	0.33 - 1.38	0.321	0.64	0.20 - 1.83	0.411
≥5 medications (Ref: <5)	0.79	0.62 - 1.00	0.045*	0.95	0.66 - 1.37	0.797
LDL cholesterol value on admission	1.02	0.94 - 1.12	0.591	1.03	0.91 - 1.16	0.695

cOR, crude odds ratio; aOR, adjusted odds ratio; CI, confidence interval; STEMI, ST-elevation myocardial infarction; NSTEMI, non-ST-elevation myocardial infarction

* Statistically significant ($p < 0.05$)

** High LLT intensity category included high and very high intensity LLT

Conclusion

Two-thirds of AMI patients remain non-adherent to LLT 12 months after AMI hospitalisation. Recognizing these key risk factors highlights the need for targeted

interventions, such as patient education, optimisation of medication regimens, and tailored follow-up, to improve adherence rates.

References

1. Raebel MA, Schmittiel J, Karter AJ, Konieczny JL, Steiner JF. Standardizing terminology and definitions of medication adherence and persistence in research employing electronic databases. *Med Care* [Internet]. 2013;51(8 Suppl 3):S11. Available from: <https://pmc.ncbi.nlm.nih.gov/articles/PMC3727405/>
2. Kassab Y, Hassan Y, Abd Aziz N, Ismail O, AbdulRazzaq H. Patients' adherence to secondary prevention pharmacotherapy after acute coronary syndromes. *Int J Clin Pharm*. 2013;35(2):275-80.
3. Ganasegeran K, Rashid A. The prevalence of medication nonadherence in post-myocardial infarction survivors and its perceived barriers and psychological correlates: a cross-sectional study in a cardiac health facility in Malaysia. *Patient Prefer Adherence* [Internet]. 2017;11:1975. Available from: <https://pmc.ncbi.nlm.nih.gov/articles/PMC5726356/>

EPIDPP48 / 384

Concomitant Lymphatic Filariasis in Humans and Animals in Sabah: Findings from the SABAH-VI Baseline Study

Mohd Hatta bin Abdul Motalip¹, Khairiah binti Ibrahim², Rahmah Noordin³, Nor Azlina binti Abdul Aziz⁴, Sajidah Khadijah Meor Azlan⁴, Eida Nurhadzira binti Muhammad¹, Faizul Akmal bin Abdul Rahim¹, Amierul Fikri bin Mahmud¹, Mohammad Ridhuan bin Mohd Ali⁵, Emelia Osman³

¹ Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

² Disease Control Division, Ministry of Health Malaysia

³ Department of Parasitology and Medical Entomology, Faculty of Medicine, Universiti Kebangsaan Malaysia

⁴ Parasitology Unit, Faculty of Veterinary Medicine, Universiti Putra Malaysia

⁵ Institute for Medical Research, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: m.hatta@moh.gov.my

Summary

The baseline data of the SABAH-VI study was used to examine the potential for zoonotic lymphatic filariasis (LF). Despite an extensive mass drug administration (MDA) program, there was a significant LF prevalence and an association between LF positivity in humans (49.9%) and animals (23.9%). Among the positive samples, *B. malayi* single infections predominated. Mixed LF with *B. malayi* and *B. pahangi* was also observed in humans (0.7%) and animals (3%). Genome studies of *Brugia* spp in animals and humans are essential to confirm the zoonotic LF transmission. Therefore, concurrent MDA for humans and animals is essential, especially in areas where MDA has been suboptimal.

Keywords

Lymphatic filariasis, *Brugia* spp., Sabah, Humans, Animals, Zoonoses

Introduction

Lymphatic filariasis (LF) is a global health concern impacting approximately 120 million individuals in 72 nations. About 66% of the LF cases were reported in India and Africa, while the rest came from Southeast Asia, Asia Pacific, and America ¹. In 2003, LF threatened about 1 million people in Malaysia, spanning eight endemic states with 127 Implementation Units (IUs). A yearly mass drug administration (MDA) with a single dose of Diethylcarbamazine and Albendazole has reduced LF prevalence in most IUs. Nonetheless, certain IUs in Sabah exhibited elevated antibody levels despite numerous initiatives, including the introduction of the Ivermectin, Diethylcarbamazine, and Albendazole (IDA) regimen for MDA with extensive coverage. Active local transmission persisted, causing re-infection in the community ². Previous animal samples also showed LF positivity, suggesting possible zoonotic LF ². Thus, this study aims to gather evidence of potential zoonotic LF transmission in areas with persistent LF.

Materials and Methods

This cross-sectional study utilized SABAH-VI baseline data collected in eight (8) areas where LF was persistent and included consented individuals aged five years and older. Human capillary night blood samples were collected to prepare thick blood smears (TBS), which were then stained with Giemsa and examined microscopically for the presence of *Brugia* spp. microfilariae (mf). Additionally, venepuncture blood was drawn for testing using BT+ rapid test to detect anti-filarial IgG4 antibodies. A portion of the blood was frozen for molecular analysis to detect filarial DNA by PCR using the Laidoudi method, along with species-specific DNA detection using the Rao, and Wongkamchaimethods.

Daytime blood sampling was performed on animals – 3 ml collected from the jugular venepuncture of cats and 5 ml from the cephalic venepuncture of dogs. These blood samples were used to prepare TBS for staining and microscopy to identify the *Brugia* spp. The remaining blood was analysed by PCR using the Wongkamchai³ method. Descriptive statistics were used to measure LF positivity in humans and animals, whereas bivariate statistics were applied to examine the relationship between LF positivity, Mf counts, and independent variables.

Results and Discussion (300)

Eight hundred twenty-two (822) individuals and 528 animals were sampled; the latter comprised 295 cats (55.9%) and 233 dogs (44.1%). The LF prevalence in humans was 49.9% (95% CI: 46.4%, 53.3%), which was significantly higher than the LF positivity in animals, 23.9% (95% CI: 20.3%, 27.7%). There was a significant association between human and animal positivity ($p < 0.001$) (Table 1). The mean mf count in humans [73.65 (SD=197.7)] was significantly higher than in animals [23.84 (SD=33.4)], $p = 0.01$.

Table 1: LF positivity in humans and animals by study site

Study site	Humans			Animals		
	Total	n	%	Total	n	%
Kaindangan	32	22	68.8	16	5	31.3
Golong	89	47	52.8	38	10	26.3
Penubukan	111	85	76.6	90	23	25.6
Maidan	207	109	52.7	135	43	31.9
Limau Manis	137	49	35.8	72	15	20.8
Taradas	119	47	39.5	83	15	18.1
Kipahung	43	13	30.2	36	6	16.7
Kapok	84	38	45.2	58	9	15.5

Overall	822	410	49.9	528	126	23.9
---------	-----	-----	------	-----	-----	------

Chi-square statistics, df=1, p-value <0.001

Note:

1. Human samples: LF positivity was based on microscopy or PCR or antibody rapid test kit BT+.
2. Animal samples: LF positivity was based on microscopy or PCR

Of the positive samples, 9.6% were *B. malayi* single infections in humans and 10.2% in animals. Concerning mixed *Brugia* spp., only a small proportion of human samples (0.7%) was positive compared to a higher proportion (3.0%) in animals. There was no *B. pahangi* single infection identified (Table 2).

Table 2: LF positivity by *Brugia* spp.

Positivity by <i>Brugia</i> species	Humans, n=822		Animals, n=528	
	n	%	n	%
<i>B. malayi</i>	79	9.6	54	10.2
<i>B. pahangi</i>	-	-	-	-
Mixed infections (<i>B. malayi</i> and <i>B. pahangi</i>)	6	0.7	16	3.0

Note: Data based on microscopy

Our data is comparable to a published report on zoonotic Brugian filariasis in Asia⁴. While zoonotic filariasis primarily involves monkeys⁴, both cats and dogs are also susceptible⁴. Ongoing LF transmission in our study population could be attributed to the zoonotic LF in cats and dogs possibly due to their proximity or cohabitation with humans. With the abundant LF vectors in the area, concurrent human and animal treatments could thus prevent human re-infection⁵.

Conclusion

This study demonstrated a higher LF prevalence in humans compared to domestic animals. However, animals exhibited a higher infection rate by mixed *Brugia* species than humans. Genome analysis of the *Brugia* spp in humans and animals is essential to confirm the zoonotic LF transmission, especially in areas where the MDA was suboptimal.

Acknowledgments

We would like to thank the Director-General of Health Malaysia for permission to publish this poster

References

1. World Health Organization. *Monitoring and epidemiological assessment of mass drug administration: Global programme to eliminate lymphatic*

- filariasis: A manual for national elimination programmes*. Geneva: WHO; 2011. Available from: http://www.who.int/neglected_diseases/en
2. Abdul Mutalip MH, Ibrahim K, Abdul Aziz NA, Noordin R, Mahmud MAF, Jaafar IS. A cluster-randomized study on the effectiveness of veterinary intervention (VI) for the National Lymphatic Filariasis Elimination Program (SABAH-VI). 2024.
 3. Wongkamchai S, Monkong N, Mahannol P, Taweethavonsawat P, Loymak S, Foongladda S. Rapid detection and identification of *Brugia malayi*, *B. pahangi*, and *Dirofilaria immitis* by high-resolution melting assay. *Vector Borne Zoonotic Dis.* **2013**;13(1):31-6. doi:10.1089/vbz.2012.0971
 4. Naing C, Whittaker MA, Tung WS, Aung H, Mak JW. Prevalence of zoonotic (brugian) filariasis in Asia: A proportional meta-analysis. *Acta Trop.* **2024**;249:107049. doi:10.1016/j.actatropica.2023.107049
 5. Rojanapanus S, Toothong T, Boondej P, et al. How Thailand eliminated lymphatic filariasis as a public health problem. *Infect Dis Poverty.* **2019**;8(1):38. doi:10.1186/s40249-019-0549-1

EPIDPP49 / 385

Persistence of Symptoms at 6 months Post COVID-19: A Cohort Study

Peter Seah Keng Tok ¹, Norazida Ab Rahman ¹, Sheamini Sivasampu ^{1,2}

¹ Institute for Clinical Research, National Institutes of Health, Ministry of Health Malaysia

² National Public Health Laboratory, Ministry of Health Malaysia

Corresponding author's email: petertok@moh.gov.my

Summary

Many individuals who have had COVID-19 experience medium- and long-term effects. This study, involving 21,296 participants followed for up to 6 months, found that 164 (0.8%) reported persistent symptoms at 1, 3, and 6 months. Fatigue, cough, and forgetfulness were the most common symptoms. Factors associated with symptom persistence included female sex, comorbidities, being symptomatic during the acute phase, and requiring hospital admission during that phase. These findings may inform comprehensive clinical management and help guide future public health strategies.

Keywords

SARS-CoV-2, COVID-19, Post-COVID, symptoms, Malaysia

Introduction

While the majority of people who have had SARS-CoV-2 infections fully recover, some may experience medium- to long-term effects. The World Health Organization (WHO) estimates that approximately 6 in every 100 people who have COVID-19 develop post COVID-19 condition, also commonly referred to as long COVID¹. In our previous work, we found that 1,510 (3.4%) of the total 44,386 study participants who were followed up to a 3-month interval had post COVID-19 condition². This current work extends the analysis by using follow-up data up to 6 months to investigate those who had persistent symptoms up to a 6-month interval, the symptoms experienced, and the factors associated with symptom persistence.

Materials and Methods

Study recruitment was during the Omicron variant predominance (April to June 2022). All individuals testing positive for SARS-CoV-2 infection (RT-PCR or RTK-Ag) in Malaysia during this period were invited to participate in the study. Data collection utilised online questionnaires delivered via the Mysejahtera app; further details on data collection were previously described². Study participants who provided complete responses for up to 6 months' duration were included in the final analysis. Multiple logistic regression was conducted to assess factors associated with symptom persistence at 6-month follow-up.

Results and Discussion

A total of 21,396 participants provided complete responses up to 6 months' duration. Of this total, 2,567 (12.0%) reported having symptoms at 1 month, 418 (2.0%) had persistent symptoms at 1 month and 3 months, while 164 (0.8%) had persistent symptoms up to 6 months post-diagnosis (1 month, 3 months, and 6 months). The rates appear lower than what we observed in our previous work², as this analysis focused on the persistence of symptoms up to 6 months post-diagnosis, rather than fulfilling the post COVID-19 condition criteria, defined as continuation or development of new symptoms three months after the initial SARS-CoV-2 infection, with these symptoms lasting for at least two months with no other explanation^{1,2}. Baseline characteristics of all study participants (N=21,296) and those who had persistent symptoms up to 6 months (n=164) are provided in Table 1. The distribution of symptoms reported by the 164 participants is shown in Figure 1. The most common symptoms at 6 months included fatigue (n=83, 50.6% among those affected), cough (n=80, 48.8%), and forgetfulness (n=71, 43.3%). The full list of symptoms involved multiple organ systems and is consistent with current literature in discovering the various pathophysiological changes and risk factors underlying the post COVID-19 condition (1,3). Among those who had persistent symptoms up until 6 months (n=164), around 1 in 4 had limitations in performing their usual daily activities, and almost 1 in 2 reported that their work was affected. The recognition of symptoms and their functional impact is important to guide early and tailored rehabilitation interventions⁴. Being female (adjusted odds ratio, AOR 2.01, 95% CI 1.35, 2.99), having existing comorbidities (AOR 2.16, 95% CI 1.54, 3.04), the presence of symptoms during the acute phase (AOR 12.63, 95% CI 8.34, 19.11) and requiring hospital admission during the acute phase (AOR 2.74, 95% CI 1.54, 4.87) were associated with higher likelihoods of symptoms persistence at 6 months post COVID-19. These factors were similarly observed in our previous study (2) and align with risk factors found elsewhere^{1,3}.

Table 1: Baseline characteristics of all study participants at baseline (N=21,396) and patients who had persistent symptoms up to 6 months follow-up (n=164)

Characteristics	Study participants	Persistent symptoms at 6-month follow-up
	N = 21,396	n = 164
Age, years old		
Mean (SD)	39.6 (11.8)	37.1 (8.84)
Sex		
Male	8,847 (41.3%)	35 (21.3%)
Female	12,549 (58.7%)	129 (78.7%)
Ethnicity		
Malay	10,646 (49.8%)	92 (56.1%)
Chinese	8,281 (38.7%)	61 (37.2%)

	Indian	1,272 (5.9%)	5 (3.0%)
	Others	1,197 (5.6%)	6 (3.7%)
Comorbidities			
	Present (at least one)	6,000 (28.0%)	70 (42.7%)
	Not present (no comorbid)	15,396 (72.0%)	94 (57.3%)
Presence of symptoms during the acute phase*			
	Symptomatic	5,283 (24.7%)	136 (82.9%)
	Asymptomatic	16,113 (75.3%)	28 (17.1%)
Hospital admission during the acute phase*			
	Required admission	554 (2.6%)	14 (8.5%)
	No admission	20,842 (97.4%)	150 (91.5%)

*Acute phase refers to the period when the individuals were tested positive for COVID-19; a baseline assessment questionnaire was administered to participants seven days after the positive test date.

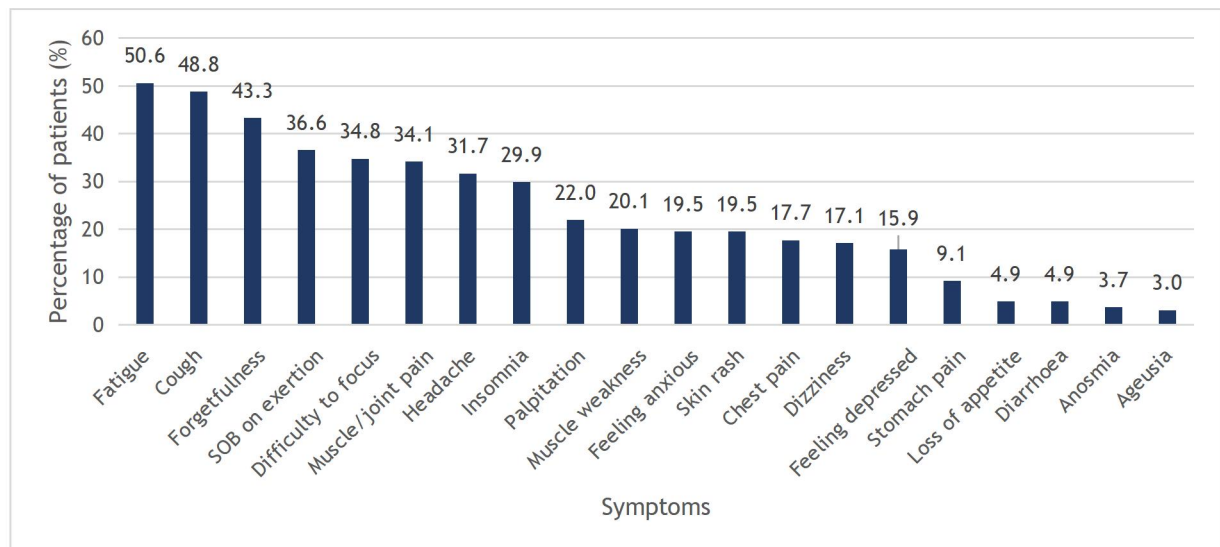


Figure 1: Distribution of symptoms among patients who had persistent symptoms at 6-month follow-up (n = 164)

Conclusion

Given the scale of the COVID-19 pandemic and the number of individuals affected, understanding its medium- and long-term effects—including the spectrum of symptoms, their impact on daily functioning, and risk factors for persistence—remains essential to guide public health responses and comprehensive clinical care.

References

1. World Health Organization. Post COVID-19 condition (long COVID) [Internet]. 2025 Feb 26 [cited 2025 Apr 28]. Available from: [https://www.who.int/news-room/fact-sheets/detail/post-covid-19-condition-\(long-covid\)](https://www.who.int/news-room/fact-sheets/detail/post-covid-19-condition-(long-covid))
2. Tok PSK, Kang KY, Ng SW, et al. Post COVID-19 condition among adults in Malaysia following the omicron wave: a prospective cohort study. *PLoS One*. **2024**;19(1):e0296488.
3. Davis HE, McCorkell L, Vogel JM, et al. Long COVID: major findings, mechanisms and recommendations. *Nat Rev Microbiol*. **2023**;21(3):133-46.
4. Zamli AH, Misnan NA, Lim SY, et al. Post-COVID-19 condition characterization: insights from a cross-sectional study in a Malaysian rehabilitation center. *Asia Pac J Public Health*. **2023**;35(8):516-23.

EPIDPP50 / 388

Five-Year Comparative Analysis of Immunochemical Faecal Occult Blood Test Uptake and Its Predictors among Malaysian Average-Risk Population (2019-2023)

Wan Nur Syamimi Wan Mohamad Darani¹, Thamil Arasu Saminathan¹, Halizah Mat Rifin¹, Muhammad Fadhli Mohd Yusoff¹

¹Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: syamimi@moh.gov.my

Summary

The immunochemical faecal occult blood test (iFOBT) has been introduced in Malaysia as a tool for early detection of colorectal cancer (CRC), aiming to improve prevention and treatment outcomes. This study analysed data from the National Health and Morbidity Survey (NHMS) 2019 and 2023 to compare the trends and predictors of iFOBT uptake among the Malaysian average-risk population. Findings indicated an increase in iFOBT uptake over the five years. Key predictors included older age (60-75 years), tertiary education, and participation in other health screenings. Prompt interventions, including focused health promotion strategies in these groups of populations are needed to accelerate the achievement towards the national target for CRC screening.

Keywords

Colorectal cancer, Immunochemical faecal occult blood test, Malaysia

Introduction

CRC alongside lung and breast cancer, is one of the most prevalent cancers in Malaysia¹. Despite being highly preventable with early detection, the 5-year survival rate for CRC patients remains consistently below 50% due to delays in diagnosis at stages III and IV of the disease¹. To promote timely prevention and treatment of CRC, the Ministry of Health (MOH) has implemented the iFOBT for an opportunistic CRC screening in public health clinics since 2014, which is recommended for average-risk, symptom-free individuals aged 50 to 75 years¹. This study aims to compare the trend in iFOBT uptake and its predictors among the Malaysian average-risk population from 2019 to 2023.

Materials and Methods

This study utilized data from two rounds of NHMS in 2019 and 2023, employing a multistage stratified sampling design based on states of Malaysia and urban and rural strata^{2,3}. Of the total 14,965 respondents in 2019 and 13,616 respondents in 2023, 3,876 respondents in 2019 and 4,327 respondents in 2023 were selected based on age-eligibility criteria (50-75 year-old) for national CRC screening. 10 independent variables; age, gender, ethnicity, marital status, educational level, employment status, household income status, locality (urban/rural), history of

health screening, and BMI status were included in the study. The study outcome was iFOBT uptake (in the lifetime) which was the respondent's self-reported response during the surveys. All data were analysed using IBM SPSS Statistics version 26.0. Sociodemographic characteristics and the study outcome were described in frequency (n) and percentage (%). Simple logistic regression (SLogR) and multiple logistic regression (MLogR) were used to determine the predictors for iFOBT uptake, with the level of significance set at 0.05.

Results and Discussion

This study observed an increasing trend of iFOBT uptake among the average-risk population in Malaysia from 2019 (459/3876, 11.8%) to 2023 (606/4327, 14.0%). Based on the descriptive analysis, both years demonstrated similar predominant characteristics among those reported underwent iFOBT including individuals aged 60-75 (2019: 254, 55.3%; 2023: 385, 63.5%), females (2019: 260, 56.6%; 2023: 331, 54.6%), those of Malay ethnicity (2019: 291, 63.4%; 2023: 352, 58.1%), married individuals (2019: 363, 79.1%; 2023: 465, 76.7%), individuals with secondary education level (2019: 184, 40.1%; 2023: 353, 58.4%), unemployed individuals (2019: 298, 71.6%; 2023: 392, 65.1%), those from lower social class (bottom 40%) (2019: 298, 71.6%; 2023: 409, 67.5%), residents of urban areas (2019: 242, 52.7%; 2023: 474, 78.2%), and individuals who had participated in other health screenings (2019: 423, 92.2%; 2023: 543, 89.6%). Apart from that, the regression analysis findings reported an increase in the number of positive predictors of iFOBT uptake from 2019 to 2023 (Table 1). Participating in other health screenings was a significant predictor in both years, however, a downward trend in the probability of uptake was observed from 2019 (aOR 4.976; 95% CI 3.446-7.186) to 2023 (aOR 2.651; 95% CI 2.013-3.490). The results also revealed that additional predictors emerged in the later survey in 2023. Specifically, individuals aged 60-75 (aOR 1.347; 95% CI 1.094-1.659), Bumiputera Sabah, who exhibited the highest odds of iFOBT uptake (aOR 13.035; 95% CI 3.127-54.347), and those with tertiary education (aOR 1.804; 95% CI 1.197-2.719) were the positive predictors.

Table 1: Predictors of iFOBT uptake based on NHMS 2019 (n=3876) and NHMS 2023 (n=4327)

Variables	NHMS 2019 (n=3876)		NHMS2023 (n=4327)	
	aOR (95% CI)	*p-value	aOR (95% CI)	*p-value
Age				
50-59 years	1		1	
60-75 years	1.008 (0.796-1.277)	0.947	1.347 (1.094-1.659)	0.005
Ethnicity				
Others	1		1	
Malay	1.367 (0.574-3.253)	0.480	7.894 (1.931-32.276)	0.004
Chinese	1.342 (0.545-3.301)	0.522	7.928 (1.925-32.648)	0.004
Indian	2.150 (0.858-5.387)	0.103	6.890 (1.627-29.173)	0.009
Bumiputera Sabah	1.167 (0.444-3.067)	0.754	13.035 (3.127-54.347)	<0.001
Bumiputera Sarawak	1.609 (0.609-4.252)	0.338	7.248 (1.635-32.133)	0.009

Educational level				
No formal education	1		1	
Primary education	0.866 (0.597-1.257)	0.450	0.964 (0.700-1.328)	0.822
Secondary education	0.749 (0.509-1.102)	0.142	1.168 (0.876-1.556)	0.289
Tertiary education	0.697 (0.420-1.157)	0.163	1.804 (1.197-2.719)	0.005
Employment status				
Unemployed	1		1	
Gov. employee	0.801 (0.490-1.310)	0.377	1.145 (0.737-1.778)	0.547
Private employee	0.802 (0.566-1.136)	0.214	1.098 (0.833-1.449)	0.507
Self employed	0.938 (0.716-1.230)	0.645	1.038 (0.806-1.339)	0.771
Household income status				
Bottom 40%	1		1	
Middle 40%	1.208 (0.924-1.580)	0.167	0.878 (0.699-1.104)	0.266
Top 20%	0.999 (0.640-1.559)	0.995	1.108 (0.821-1.494)	0.502
Locality				
Rural	1		1	
Urban	0.831(0.661-1.044)	0.111	1.220 (0.974-1.528)	0.083
**Other health screenings				
No	1		1	
Yes	4.976 (3.446-7.186)	<0.001	2.651 (2.013-3.490)	<0.001

Note: aOR, adjusted odds ratio; CI, confidence interval; Gov., government
Predictors were determined using MLogR which included six variables with a p-value <0.25 in bivariate analysis and biological plausibility in the multivariable model using the enter method. Multicollinearity and interaction effects were also examined.

*Level of significance set at 0.05

**Other health screenings include blood pressure, blood cholesterol and diabetes screenings

The uptrend of iFOBT uptake observed in the present study aligns with findings from previous studies^{1,4}, reinforcing the initiatives aimed at enhancing CRC screening in the country to achieve 40% coverage by 2030¹. Older age, a significant predictor, offers a plausible explanation; as the incidence of CRC increases with age, the perception of risk for developing CRC similarly escalates, hence increased the screening rates⁵. Higher education enhances health literacy, thereby enabling individuals to make informed health decisions. Most importantly, we found that all major ethnic groups were significant predictors for iFOBT uptake in the later survey which could be attributed to improved knowledge on CRC risk factors and targeted promotion on CRC screening during community outreach programs⁵. This study, however, presents a self-reported iFOBT screening status which may be subject to recall or social desirability bias.

Conclusion

The rising trend of iFOBT uptake signifies gradual progress towards the national goals for CRC screening, yet, it remains far beneath the desired target. The promotion of colorectal cancer (CRC) screening should be intensified, especially for younger adults and those with lower educational levels. Additionally, strategies

must be tailored to sustain long-term progress in CRC screening across Malaysia's multiethnic population, ensuring equitable and early detection of colorectal cancer nationwide.

References

1. Tamin NSI, Razalli KA, Sallahuddin SN, Chan HK, Hassan MRA. A 5-year evaluation of using stool-based test for opportunistic colorectal cancer screening in primary health institutions across Malaysia. *Cancer Epidemiol.* 2020;**69**:101829.
2. Institute for Public Health, Ministry of Health Malaysia. National Health and Morbidity Survey (NHMS) 2023: Non-Communicable Diseases and Healthcare Demand: Technical Report. 2024.
3. Institute for Public Health, Ministry of Health Malaysia. National Health and Morbidity Survey (NHMS) 2019: Vol. 1: NCDs - Non-Communicable Disease: Risk Factors and other Health Problems. 2020.
4. Zamorano-Leon JJ, López-de-Andrés A, Álvarez-González A, Maestre-Miquel C, Astasio-Arbiza P, López-Farré A, et al. Trends and Predictors for the Uptake of Colon Cancer Screening Using the Fecal Occult Blood Test in Spain from 2011 to 2017. *Int J Environ Res Public Health.* 2020;**17**(17).
5. Bujang NN, Lee YJ, Mohd-Zain SA, Aris JH, Md-Yusoff FA, Suli Z, et al. Factors Associated With Colorectal Cancer Screening Via Immunochemical Fecal Occult Blood Test in an Average-Risk Population From a Multiethnic, Middle-Income Setting. *JCO Glob Oncol.* 2021;**7**:333-41.

EPIDPP51 / 392

From Therapy to Threat: Legionellosis Outbreak at a Recreational Hot Spring in Melaka

Nur Aishah Buang¹, Khairul Anuar Abdullah², Hafiz Idran Radzali³, Mohd Ridzuan bin Janudin³, Siti Nadiah Mohamad Mohsin¹, Raziah Nordin¹, Ainur Nafisya Kamarolzaman², Adibah Ibrahim³

¹ Melaka State Health Department

² Jasin District Health Office

³ Melaka Tengah District Health Office

Corresponding author's email: aishahbg@moh.gov.my

Summary

A Legionellosis outbreak at a hot spring in Melaka affected 51 out of 100 exposed individuals, with a 51.0% attack rate. Outbreak initially suspected as leptospirosis due to similar clinical features then was confirmed Legionella after three cases tested positive serologically. Investigations linked it to contaminated heated water, ideal for Legionella due to high usage, poor chlorination, irregular drainage, and maintenance issues. Immediate actions like pool drainage and remediation contained the outbreak. This highlights the critical need for routine water testing, proper sanitation, and regulatory oversight in recreational facilities to prevent waterborne infections.

Introduction

Legionellosis is a waterborne infection caused by Legionella species, primarily L. pneumophila, and is often linked to inadequately treated aquatic systems. Warm, stagnant water around 25-45°C such as hot springs, cooling towers, air conditioning systems, humidifiers and industrial sprays provides an ideal environment for Legionella proliferation. Inhalation of aerosolized contaminated water facilitates transmission, making recreational facilities with poor maintenance particularly high-risk^{1,2}.

In Malaysia, legionellosis remains underdiagnosed and underreported, partly due to its nonspecific presentation and frequent clinical overlap with leptospirosis which is also endemic in Malaysia. Both infections share symptoms such as fever, headache, and myalgia and may occur in similar environmental conditions, especially in flood-prone or poorly sanitised areas³. On 7 June 2024, Melaka Tengah District Health Office received notification of febrile illness among visitors to Jasin Hot Spring. This outbreak later became viral on WhatsApp groups, raising public concern. This investigation aimed to identify the causative pathogen, describe epidemiological characteristics, and public health response to Legionellosis outbreak in hot spring settings.

Methods

Case definitions were applied in accordance with the World Health Organization's Legionellosis Outbreak Toolbox (2022) and supplemented by CDC 2020 case definitions. Case finding was conducted through review of notification data, health facilities records, field investigation and interview. Cases were defined as suspected, confirmed, or discarded based on clinical presentation, epidemiological

exposure, and microbiological evidence. A suspected case was defined as any person with fever and at least one symptom of body ache, headache, vomiting, or fatigue with exposure to the hot spring within the incubation period. A confirmed case was defined as one with clinical compatibility and a positive *Legionella* IgM result. Environmental assessments were performed including site inspection of sanitation conditions, waste management, and water quality. 2 rodents, five water samples and three soil samples were collected and sent to the National Public Health Laboratory for analysis. In-situ measurements for pH, turbidity, and chlorine levels were also conducted to evaluate potential environmental risk factors.

Results

Among the 100 identified individuals, 51 met the case definition with attack rate 51.0%. All cases presented with fever; other symptoms included body ache (29.4%), headache (25.5%), vomiting (21.6%), diarrhoea (17.7%), fatigue (17.7%), and loss of appetite (9.8%). Seven patients (13.7%) required hospitalisation. Three were serologically confirmed with *Legionella*. PCR and MAT were negative for *Leptospira*. Environmental inspection revealed sediment accumulation, high turbidity and low chlorine levels (0.02-0.17 mg/L). The visitor load was double during the school holiday approximately 70 individuals per day. All water samples tested negative for *Leptospira*. *Legionella* testing was not performed on water samples due to initial misclassification of the outbreak as leptospirosis. Soil and rodent samples tested positive for *Leptospira*.

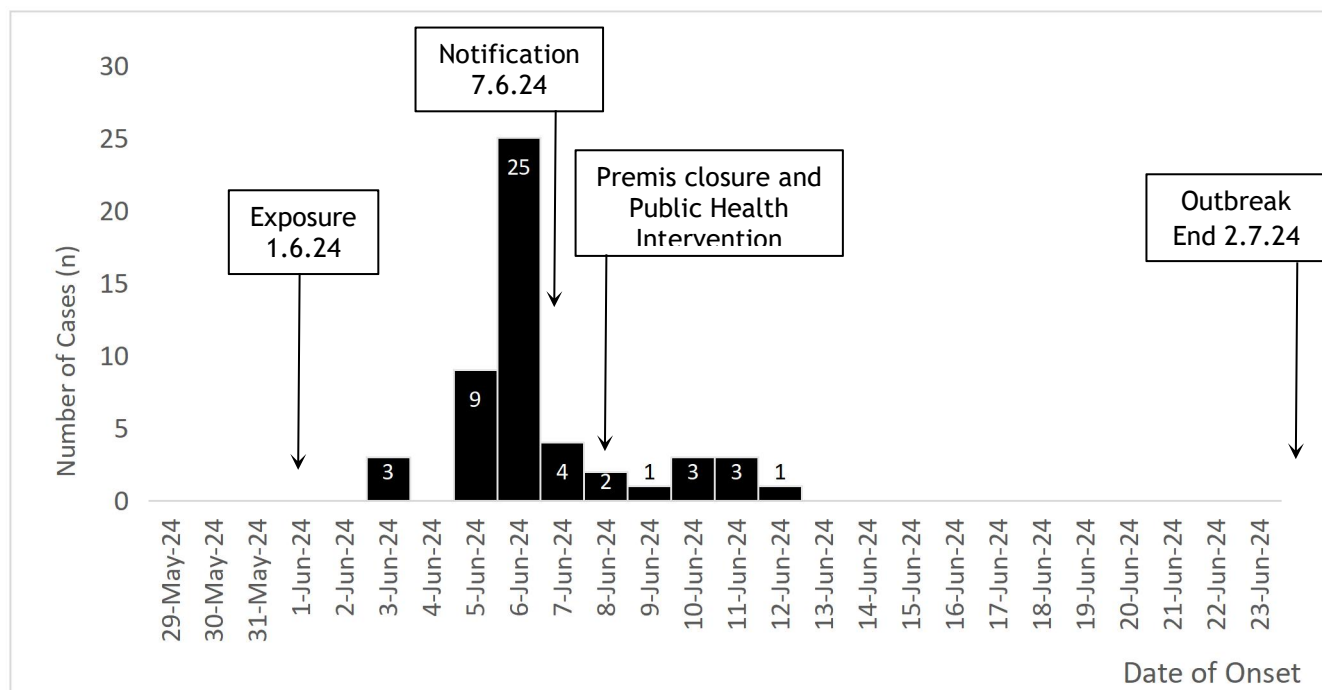
Discussion

This outbreak illustrates the significant public health risks associated with poorly maintained recreational water environments. The combination of low residual chlorine, high visitor traffic, and inadequate maintenance created conditions favourable for *Legionella* growth and transmission. Detected chlorine levels were significantly below the WHO recommended threshold of 0.5 mg/L, undermining microbial safety (4).

Sediment in the pool likely contributed to biofilm formation, which can protect *Legionella* from standard chlorination. The absence of routine maintenance records and visitor logs limited the investigation's ability to identify the full scope of exposure or compliance issues.

Although *Legionella* was not tested in water samples, the epidemiological linkage to the hot spring, favourable environmental parameters, and confirmed serological results in human cases strongly support *Legionella* as the causative agent. Thus, the absence of microbiological evidence from water should not override clinical and environmental indicators implicating *Legionella*. The initial suspicion of leptospirosis was valid due to symptom overlap, and positive soil and rodent samples suggest an alternative or co-existing source of exposure. However, all human clinical samples tested negative for *Leptospira*, reducing the likelihood of it being the primary agent in this outbreak. Public concern escalated rapidly due to viral dissemination on social media. Effective response included prompt facility closure, environmental remediation, stakeholder education, and clear risk communication. These actions highlight the importance of preparedness protocols and inter-agency coordination.

In future investigation, early consideration of multiple differential diagnosis including *Legionella* is important particularly when environmental risk factors and symptoms are compatible. Systematic *Legionella* testing in water samples is needed to strengthen the epidemiological evidence. This study was limited by the absence of visitor logs and maintenance records, which restricted comprehensive exposure assessment and verification of facility compliance.



Graph 1. Epidemic curve of Legionellosis Outbreak in a Hotspring in Melaka 1 June 2024 - 2 July 2024(n=51)

Table 1. Environmental Investigation at a Hot Springs in Melaka

Sample site	Sample Type	Temperature (°C)	pH	Turbidity (NTU)	Chlorine (mg/L)	Leptospira Test
Pool 1 (big pool)	Water	29.0	8.37	1.87	0.02	Negative
	Soil	-	-	-	-	Positive
Pool 2 (Child pool)	Water	31.1	6.58	4.72	0.17	Negative
	Soil	-	-	-	-	Negative
Pool 3 (Child pool)	Water	31.3	7.01	5.54	0.11	Negative
Pool 4 (Big pool)	Water	34.5	7.47	8.51	0.09	Negative
	Soil	-	-	-	-	Positive
	Rodent (2)					Positive

Hot water well outlet	Water	44.8	8.02	0.65	0.05	Negative
-----------------------	-------	------	------	------	------	----------

* Sample sent for laboratory testing on 8.6.2024

* Recommended reference level : Chlorine level ≥ 0.5 mg/L (ideally 1-3 mg/L);
Turbidity < 1.0 NTU

* Legionella thrives in water temperature 25-45°C (optimal ~35°C)

Table 2. Results of Laboratory Diagnosis based on IgM Test, Microscopic Agglutination Test (MAT) and Polymerase Chain Reaction (PCR) for Legionellosis and Leptospirosis (n=25)

Disease	Test	Results	Patient (%)	PCR
Legionella* (7)	IgM	Positive	3	Not done
		Negative	3	Not done
		Equivocal	1	Not done
Leptospirosis				
Probable Case (6)**	MAT	Negative	2	Not done
		Equivocal	3	1 Negative
Presumptive Case (19)***	IgM	Negative	12	2 Negative
		Equivocal	1	Not done*
		Inconclusive	2	1 Negative*

Table represents only the available laboratory data. 26 cases do not tested and characterized as epidemic-link cases

* 7 samples that tested Legionella were taken from cases that tested for Leptospirosis

** Probable Leptospirosis is cases with positive IgM Leptospirosis

***Presumptive Leptospirosis is cases that diagnose clinically

Conclusion

This outbreak highlights the urgent need for routine water quality monitoring, strict facility maintenance, and regulatory oversight to prevent future waterborne infections in hotsprings environments.

References

1. Lin YE, Stout JE, Yu VL. Prevention of hospital-acquired legionellosis. *Curr Opin Infect Dis.* 2007;20(4):360-6.
2. Hsu BM, Chen CH, Wan MT, et al. Detection of *Legionella pneumophila* in hot spring facilities by culture, amoebic co-culture and PCR. *Water Res.* 2006;40(19):3267-73.
3. World Health Organization. *Guidelines for safe recreational water environments. Volume 2: Swimming pools and similar environments.* Geneva: World Health Organization; 2006.

4. World Health Organization (WHO). *Legionellosis outbreak toolbox* [Internet]. Geneva: WHO; 2022 [cited 2025 May 13]. Available from: <https://www.who.int/emergencies/outbreak-toolkit/disease-outbreak-toolboxes/legionellosis-outbreak-toolbox>
5. Fields BS, Benson RF, Besser RE. *Legionella* and Legionnaires' disease: 25 years of investigation. *Clin Microbiol Rev.* **2002**;15(3):506-26.

EPIDPP52 / 405

Sociodemographic factors associated with multiple cardiovascular risk factors among adults in Malaysia: A gender-stratified analysis of the National Health and Morbidity Survey (NHMS) 2023

Halizah Mat Rifin¹, Wan Kim Sui¹, Hamizatul Akmal Abd Hamid¹, Tania Gayle Robert Lourdes¹, Mohd Firdaus Razali¹, Nurzaime Zulaily¹, Mohd Hatta Mutalip¹, Kimberly Wong Yui Y'ng¹, Khairul Hasnan Amali¹

¹Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: halizah@moh.gov.my

Summary

This study aimed to determine the sociodemographic factors associated with multiple cardiovascular disease (CVD) risk factors among adults in Malaysia, using data from the National Health and Morbidity Survey (NHMS) 2023. Around 50.1% of adults in Malaysia had three or more CVD risk factors. The prevalence of having three or more cardiovascular risk factors was higher among men (56.3%) than women (43.3%). Age, ethnicity, and education level were significantly associated with the multiple CVD risk factors. The findings suggest that there are targeted public health interventions to address sociodemographic disparities and reduce Malaysia's CVD burden.

Keywords

Non-communicable diseases, cardiovascular risk factors, NHMS 2023, Malaysia, gender disparities

Introduction

Cardiovascular diseases (CVDs), especially ischaemic heart disease and stroke, are the leading causes of death and disability globally¹. In Malaysia, CVD accounted for 15.1% of the top ten causes of death in 2023². Biological (hypertension, diabetes, and dyslipidaemia) and behavioural (smoking, physical inactivity, and inadequate fruit and vegetable intake) risks significantly contribute to CVD burden³. The presence of multiple risk factors greatly increases disease risk⁴. A previous Malaysian study found that 68.4% of adults had at least three CVD risk factors⁴. However, limited and outdated evidence exists on how sociodemographic factors such as age, sex, ethnicity, education, and income influence risk clustering. This study addresses this gap using updated, nationally representative data from NHMS 2023 to examine sociodemographic patterns of multiple CVD risk factors, stratified by gender, offering timely evidence to guide targeted public health strategies.

Materials and Methods

This study analysed data from the National Health and Morbidity Survey (NHMS) 2023, a nationally representative cross-sectional survey using two-stage stratified random sampling. A total of 10,858 adults aged ≥ 18 years participated through interviews using validated questionnaires, self-administered questionnaires (alcohol module only), and clinical and anthropometric measurements. Nine cardiovascular risk factors were assessed: physical inactivity, current smoker, current alcohol drinker, inadequate fruit and vegetable intake, diabetes,

hypertension, hypercholesterolaemia, hypertriglyceridaemia, and overweight/obesity. The outcome was defined as having three or more risk factors. 3. Sociodemographic variables included age, sex, ethnicity, education, income, occupation, and locality. Data was weighted to account for the complex survey design. Data analysis involved complex sample descriptive statistics and multivariable logistic regression using SPSS version 29.0.

Results and Discussion

A total of 9,985 adults were included in the analysis. Overall, 50.1% exhibited three or more cardiovascular disease (CVD) risk factors, with a higher prevalence among men (56.3%) compared to women (43.3%). In both sexes, the prevalence of multiple CVD risk factors increased progressively with age. Among men, the prevalence rose from 34.7% (18-29 years) to 74.2% (≥ 60 years), and among women from 27.7% to 69.6%. Multivariable analysis indicated that all age groups had significantly higher odds compared to those aged 18-29, with the highest odds observed in the ≥ 60 group (AOR men = 6.78; women = 11.74). This finding aligns with previous studies showing strong age-related CVD risk clustering (4). Ethnicity was also significantly associated: Bumiputera Sabah and Sarawak men had higher odds (AOR = 1.63), while Chinese women had lower odds (AOR = 0.66), reflecting previously observed ethnic disparities. Lower education levels were linked to increased clustering, particularly among women without formal education (AOR = 2.62), reinforcing known associations between education and chronic disease risk (4). Among men, those living in rural areas had higher odds, while unemployed and low-income (B40) men exhibited lower odds. This unexpected trend may indicate underdiagnosis, limited healthcare access, or physically demanding lifestyles among unemployed and low-income men. For women, income, occupation, and locality were not significantly associated. These findings reaffirm that CVD risk clustering is shaped by age, ethnicity, and education, consistent with past evidence^{1,4,5}. The updated national data from NHMS 2023 highlights the continued need for tailored equity-focused prevention strategies to address sociodemographic disparities in CVD burden.

Table 1: Sociodemographic factors associated with the presence of ≥ 3 cardiovascular risk factors among adults in Malaysia: A gender-stratified analysis.

Sociodemographic factor	≥ 3 cardiovascular risk factors	
	Men (n =4620)	Women (n =5365)
	Adjusted OR	Adjusted OR
	(95% CI)	(95% CI)
Age group		
18-29	1.00	1.00
30-39	2.14(1.70,2.70)**	2.60 (1.94, 3.49)**
40-49	3.57(2.70,4.72)**	5.60 (4.21, 7.44)**
50-59	5.56(4.23,7.30)**	10.76 (8.13,14.25)**
≥ 60	6.78(5.00,9.19)**	11.74 (8.60,16.04)**
Ethnicity		
Malay	1.00	1.00
Chinese	0.93 (0.67,1.30)	0.66 (0.49, 0.89)*

Indian	1.17(0.78,1.73)	1.03 (0.74,1.43)
Bumiputera Sabah & Sarawak	1.63 (1.20, 2.20)*	1.29 (0.96, 1.73)
Others	0.94 (0.61, 1.55)	1.16 (0.79,1.71)
Income level		
Bottom 40%	0.72 (0.54,0.97)*	1.080 (0.82,1.43)
Middle 40%	0.91 (0.67,1.21)	0.999 (0.7,1.33)
Top 20%	1.00	1.00
Occupational status		
Unemployed	0.70 (0.54,0.90)*	0.866 (0.68, 1.11)
Unpaid worker/ caregiver/homemakers/retiree /students	1.30 (0.61,2.79)	1.19 (0.96,1.47)
employed	1.00	1.00
Education status		
No formal education	1.57 (0.92,2.69)	2.62 (1.72, 3.98)**
Primary	2.16 (1.43,3.27)**	2.10 (1.43,3.06)**
Secondary	1.84 (1.39,2.43)**	1.84 (1.39,2.42) **
Tertiary	1.00	1.00
Locality		
Rural	1.37 (1.05,1.78)*	1.132 (0.88,1.45)
Urban	1.00	1.00

Adjusted OR, adjusted for all other variables in the model; *p-value < 0.05; **p-value <0.001.

Conclusion

The high prevalence of multiple cardiovascular risk factors among adults in Malaysia underscores the need to develop comprehensive prevention strategies. Sociodemographic factors such as age, ethnicity, and education influence CVD risk clustering. Targeted interventions addressing vulnerable groups are essential to mitigate the rising burden of cardiovascular diseases nationwide.

References

1. Rifin HM, Omar MA, Wan KS, Rodzlan Hasani WS. 10-year risk for cardiovascular diseases according to the WHO prediction chart: findings from the National Health and Morbidity Survey (NHMS) 2019. *BMC Public Health*. 2024;24(1):2513.
2. Department of Statistics Malaysia (DOSM). *Statistics on Causes of Death Malaysia, 2024*. Putrajaya: Department of Statistics Malaysia; 2024.
3. World Health Organization. *Noncommunicable diseases* [Internet]. Geneva: WHO; [cited 2025 May 28]. Available from: <https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases>
4. Ghazali SM, Seman Z, Cheong KC, Hock LK, Manickam M, Kuay LK, et al. Sociodemographic factors associated with multiple cardiovascular risk factors among Malaysian adults. *BMC Public Health*. 2015;15(1):68.

5. Havranek EP, Mujahid MS, Barr DA, Blair IV, Cohen MS, Cruz-Flores S, et al. Social determinants of risk and outcomes for cardiovascular disease. *Circulation*. 2015;132(9):873-98.

EPIDPP53 / 406

Pinpointing Locations And Time For Dengue Preventive Activities In Perak By Exploring Connections Between Populations Movements And Previous Dengue Trend Data.

Shaffik S¹, Mohd Fadhli S¹, Thiruchelvam M¹, Husna Maizura AM¹.

¹Perak State Health Department

Corresponding author's email: dr.shaffik@moh.gov.my

Summary

Accurate dengue forecasting system is demanded in view of limited resources to implement preventive actions in increasing urban and sub-urban population. However, pinpointing the exact time to do preventive actions in a location is a challenge. With experience of reduction of dengue cases during Covid-19 pandemic MCO, we explored the connection between mass population movement, data from e-dengue and previous risk assessment to plan preventive actions.

Keywords

Dengue forecasting, dengue prevention, e-dengue, mass population movement, dengue risk assessment.

Introduction

Forecasting surge of dengue cases is one of the magic bullets for dengue prevention activities. Several systems had been created in Malaysia to forecast the surge of dengue cases. However, with limited resources, the challenges are to determine the exact locations, activities and time to conduct dengue prevention activities. We combined data from e-dengue, previous risk assessment report and human movement to pinpoint the best interval, location and select the accurate dengue prevention activities.

Methodology

Based on e-dengue data from 2020 to 2024, at least 120 localities (throughout the State of Perak) which recorded dengue outbreaks 2 to 4 weeks after Chinese New Year and Aidilfitri were selected. By reviewing previous risk assessment reports, all 12 district offices were instructed to plan their preventive vector control activities which concentrated on health promotion and larva source management such as locality inspections, larvaciding & lethal ovitrap activities. Prevention activities were conducted 2 weeks before Chinese New Year (2nd and 3rd week of January 2025) and 2 weeks before Aidilfitri (2nd and 3rd week of March 2025). Then, we compared Perak 2025 dengue weekly trend with previous 5-year moving median, weekly Malaysia dengue trend and neighboring states (Kedah, Penang and Selangor).

Result and Discussion

Even though the neighboring states' weekly dengue cases trend followed their own previous 5-year moving median, Perak showed differences. Weekly dengue cases in Perak recorded a significant decrease in trend in comparison to previous 5-year moving median, especially after both occasions. We believe that mass population

movement e.g., during Aildilfitri and Chinese New Year plays an important role in surging dengue cases based on previous experience during Covid-19 MCO. Mass population movement introduces the host (healthy and unhealthy) from endemic regions (within and inside Perak) to non-endemic regions but with high density of dengue vectors. Thus, completed the epidemiological triad. Although this result shows some promise, there is a need to observe the intervention's effects in highly endemic regions such as Petaling and the influences of circulating dengue serotypes shift.

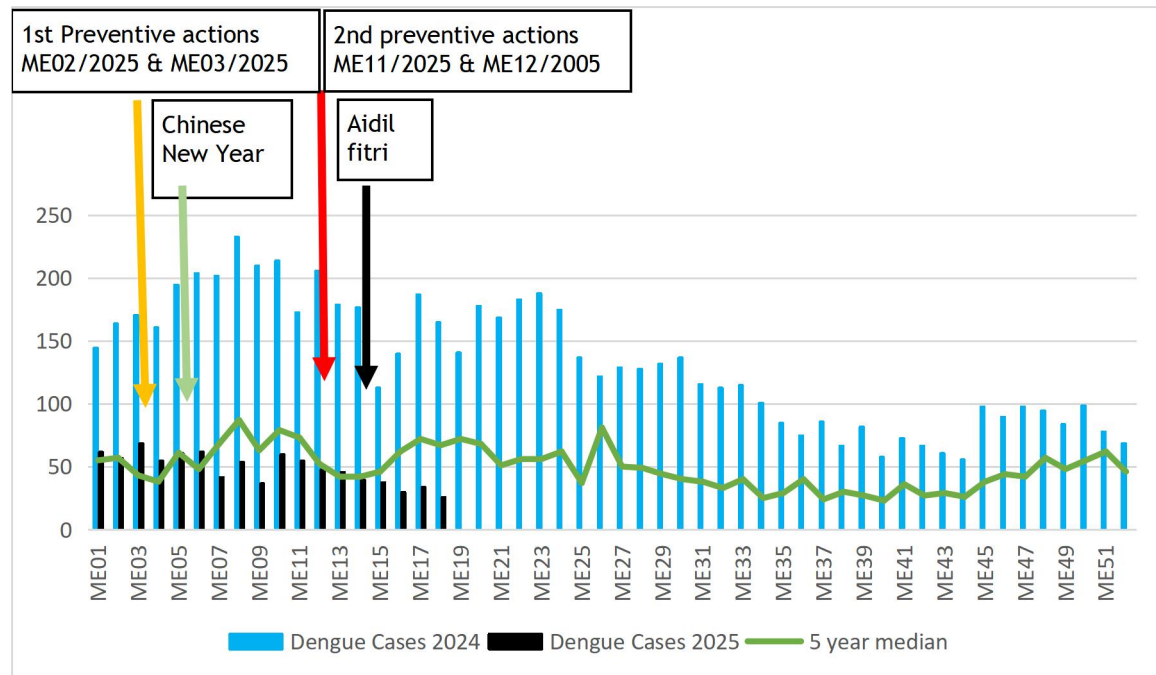


Figure 1: Perak weekly Dengue cases 2024,2025 and 5 Year Median

Conclusion

We believe by combining data of mass population movements (e.g long school holidays, Aidilfitri and Chinese New Year), data from e-dengue and previous risk assessments reports we may be able to pinpoint the precise locations, and time dengue and to select best prescriptions for preventive activities.

References

1. Hussain-Alkhateeb L, Kroeger A, Olliaro P, Rocklöv J, Sewe MO, Tejeda G, et al. Early warning and response system (EWARS) for dengue outbreaks: recent advancements towards widespread applications in critical settings. *PLoS One*. 2018;13(5):e0196811.
2. Ong SQ, Ahmad H, Mohd Ngesom AM. Implications of the COVID-19 lockdown on dengue transmission in Malaysia. *Infect Dis Rep*. 2021;13(1):148-60.
3. Md Iderus NH, Singh SSL, Ghazali SM, Zulkifli AA, Ghazali NAM, Lim MC, et al. The effects of the COVID-19 pandemic on dengue cases in Malaysia. *Front Public Health* [Internet]. 2023;11. Available from: <https://www.frontiersin.org/journals/public-health/articles/10.3389/fpubh.2023.1213514/full>

EPIDPP54 / 421

Incidence and Factors Associated with Hospital Admission for Hand, Foot, and Mouth Disease (HFMD) in Segamat, Johor

Mohamad Fazreen bin Mohamad Anuar¹, Mohd Ridzuan bin Mohd Lutpi¹, Mohammad Nafis bin Sahiran¹, Mohd Khairul Anwar bin Kamdi¹, Choo Teck Min¹, Norjanah binti Johari¹

¹Segamat District Health Office, Jalan Gudang Ubat, Segamat, Johor

Corresponding author's email: drmfazreen@moh.gov.my

Summary

Hand, Foot, and Mouth Disease (HFMD) is a common viral illness, particularly affecting children. HFMD is often associated with significant outbreaks that lead to hospital admissions, especially in vulnerable populations like infants and young children. This study investigates the incidence and hospital admission rates of HFMD in Segamat, Johor with a focus on the age distribution, the type of cases (cluster/outbreak vs. single/sporadic), and their associations with hospital admissions.

Keywords

HFMD, Age Group, Cluster and Sporadic, Hospital Admissions, Segamat

Introduction:

Malaysia is experiencing a significant surge in HFMD cases. In Epidemiological Week 17 2025, the country reported 99,601 cases, marking a 266% increase compared to the same period in 2024. Approximately 10% of these cases are linked to outbreaks, while the remaining 90% are sporadic. Johor has been particularly affected, with cases surpassing the alert threshold since early 2025, showing higher frequencies than in the previous two years. The Ministry of Health has identified nurseries, kindergartens, and daycare centres as primary sites for HFMD clusters, underscoring the rising cases of infants and younger children diagnosed with HFMD.

Materials and Methods:

A descriptive cross-sectional study was conducted, utilising data from HFMD case records in Segamat from January 2024 to December 2024. A total of 562 notified HFMD cases were categorised based on age group. This classification was based on the National Institute of Child Health and Development. Additionally, the cases were divided into two categories: cluster/outbreak and single/sporadic cases. Hospital admission rates were recorded for each group. In order to assess the relationships between variables and the likelihood of hospital admission, Chi-square test and multiple logistic regression analysis were performed using SPSS Statistics Ver. 27 software. The dependent variable was hospital admission, and the independent variables included age group and case type. Statistical significance was set at $p < 0.05$ and the association is considered significant if the 95% interval (CI) does not cross number one.

Results and Discussions:

The incidence and characteristics of the HFMD cases in Segamat are illustrated in Table 1 below. A total of 562 notified HFMD cases were recorded in Segamat from January 2024 to December 2024. Majority of the cases were in preschool age accounting up to 36.3% of total cases, followed by school age (28.8%), toddler (23.3%), adolescent (6.4%) and infant (5.2%). Type of cases were almost equally distributed among the notified cases. The highest admission rates were among infants (27.9%) and toddler (26.0%).

Table 1: Summary of descriptive analysis of age group and case type against hospital admissions. (N=562)

Variables	Cases (n)	Percentage (%)	Admissions (n)	Admission Rate (%)
Age Group				
Infant (<1 year)	29	5.2%	8	27.9%
Toddler (1-3 years)	131	23.3%	34	26.0%
Preschool (4-6 years)	204	36.3%	32	15.7%
School Age (7-12 years)	162	28.8%	18	11.1%
Adolescent (>12 year)	36	6.4%	3	8.3%
Case Type				
Cluster/Outbreak	272	48.4%	48	17.6%
Single/Sporadic	290	51.6	47	16.2%

The chi-square test showed a significant association between age and hospital admission rates ($\chi^2=15.96$, $df=4$, $p<0.05$), with younger children, particularly those aged less than 1 year old, being more likely to require hospitalization. The chi-square test showed no significant association between case type (cluster/outbreak vs. single/sporadic) and hospital admissions ($\chi^2=0.20$, $df=1$, $p>0.05$), indicating that the likelihood of hospitalization did not differ significantly based on case type.

Table 2: Association of age group and case type with hospital admissions.

Variables	Admissions		Chi-Square (x ²)	df	p-value
	Yes	No			
	n (%)	n (%)			
Age Group					
Infant (<1 year)	8 (27.9)	21 (72.1)	15.96	4	< 0.05
Toddler (1-3 years)	34 (26.0)	97 (74.0)			
Preschool (4-6 years)	32 (15.7)	172 (84.3)			
School Age (7-12 years)	18 (11.1)	144 (88.9)			
Adolescent (>12 year)	3 (8.3)	33 (91.7)			
Case Type					
Cluster/Outbreak	48 (17.6)	224 (82.4)	0.20	1	0.74
Single/Sporadic	47 (16.2)	243 (83.8)			

The simple logistic regression model is used to examine the relationship between age group and hospital admission, which resulted in younger age groups having a significantly higher likelihood of hospitalization. Specifically, the odds of hospitalization were 4.18 times higher for children aged less than 1 year old compared to those over 12 years old (OR = 4.18, 95% CI = 1.00-17.60, p < 0.05).

Table 3: Predictors of age groups with hospital admissions.

Variables	B	Odds Ratio (OR)	95% Confidence Interval (CI)		p-value
			Upper	Lower	
Age Group					
Infant (<1 year)	1.43	4.18	1.00	17.60	0.05
Toddler (1-3 years)	1.35	2.97	1.11	13.39	0.03
Preschool (4-6 years)	0.72	1.96	0.59	7.08	0.26
School Age (7-12 years)	0.34	1.28	0.38	4.94	0.63
Adolescent (>12 year)	-	1.00	-	-	-

The rising incidence of HFMD among children, particularly in the younger age groups, may be closely associated with increased social interactions in early childhood settings such as nurseries and kindergartens. These environments, which are characterized by high-density interactions and shared resources, facilitate the transmission of enteroviruses due to frequent close contact among children, suboptimal hygiene practices, and the underdeveloped immune systems of attendees¹.

The highest admission rate found in the age groups under 3 years which aligns with existing literature indicating that younger children are more prone to severe forms of HFMD². These findings are consistent with previous Malaysian studies attributed to their immature immune responses and increased vulnerability to complications like dehydration, encephalitis, and other neurological sequelae³. Conversely, significantly lower hospitalization rates were observed among children above 12 years of age, which may reflect milder disease manifestations, more robust immune responses, or the presence of acquired immunity from prior exposures during earlier childhood⁴.

Conclusion:

Healthcare providers and policymakers may prevent severe outcomes of HFMD by focusing on early detection and preventive measures in vulnerable age groups to reduce the incidence of hospitalizations. Future studies should explore additional factors such as access to healthcare, socioeconomic conditions, seasonal and regional factors contributing to HFMD outbreaks to further aid in developing effective public health strategies.

References:

1. Kua JA, Pang J. The epidemiological risk factors of hand, foot, mouth disease among children in Singapore: a retrospective case-control study. *PLoS One*. 2020;15(8):e0236711.
2. Adnan AH, Roslee HB, Wey KS, et al. The prevention, control and evaluation related to hand, foot, and mouth disease (HFMD) among child caregivers at Taman Kurnia Jaya, Pengkalan Chepa, Kelantan. *Research Towards IR 4.0*. 2021:629.
3. Pong MY, Yap JF, Jikal M. Epidemiology of hand, foot and mouth disease outbreaks in Sabah, Malaysia: one year cross-sectional study. *IJID Reg*. 2025;14:100543.
4. Koh WM, Badaruddin H, La H, et al. Severity and burden of hand, foot and mouth disease in Asia: a modelling study. *BMJ Glob Health*. 2018;3(1):e000442.
5. Ministry of Health Malaysia. *Hand, foot and mouth disease: guidelines for healthcare providers*. Putrajaya: MOH; 2018

EPIDPP55 / 427

Tuberculosis Outbreak Investigation at a Workplace in Cheras, Kuala Lumpur, 2024

Mohamad Fazreen bin Mohamad Anuar¹, Mohd Ridzuan bin Mohd Lutpi¹, Mohammad Nafis bin Sahiran¹, Mohd Khairul Anwar bin Kamdi¹, Choo Teck Min¹, Norjanah binti Johari¹

1 Tuberculosis & Leprosy Unit, Cheras Health Office

2 Tuberculosis & Leprosy Unit, Public Health Division, Kuala Lumpur and Putrajaya Health Department

Corresponding Author's Email: alia.nadhirah@moh.gov.my

Summary

A workplace tuberculosis (TB) outbreak was identified following the notification of five TB cases among employees. The outbreak investigation and risk assessment conducted by the Cheras District Health Office revealed potential workplace transmission. Active case detection, risk communication, and multi-stakeholder engagement were key to outbreak control¹.

Keywords:

Tuberculosis, outbreak, workplace, contact screening, risk assessment

Introduction

Tuberculosis remains a significant public health concern in Malaysia², particularly in densely populated urban areas³. In August 2024, the Cheras District Health Office received a notification of five TB cases from a government office located in Cheras involving one squadron (Squad A), prompting a full-scale TB outbreak investigation. The objective of this investigation was to confirm the outbreak, identify the source and mode of transmission, assess its magnitude, and implement control measures to prevent further spread⁴.

Materials and Methods

An outbreak investigation was initiated immediately to assess the extent and source of TB transmission. The investigation included risk assessments through site visits to work premises, staff interviews, and active engagement with workplace management. Contact screening was conducted using chest radiography, sputum AFB or rapid molecular tests, and IGRA tests, guided by symptom presence and risk stratification. Data were collected using standardized line listings and site observation checklists. The investigation involved a multi-disciplinary team comprising public health personnel, occupational health officers, and family medicine specialists.

Results and Discussion

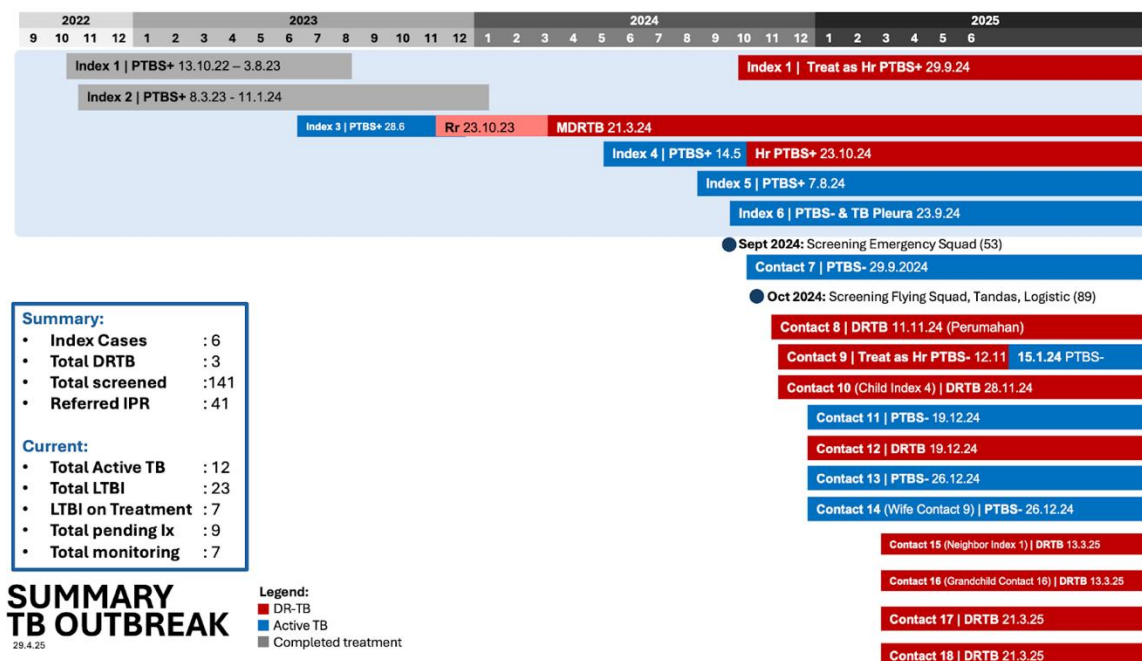


Figure 1: Timeline of cases diagnosed from workplace tuberculosis outbreak

The investigation revealed a high risk of cross-squadron TB transmission. Environmental risk assessment identified shared facilities—such as rest, prayer, and dining areas—alongside a rotating shift system as significant contributors to inter-squad exposure. By April 2025, six index TB cases were confirmed, including three cases of drug-resistant TB (DRTB). A total of 141 workplace contacts were screened across three sessions, leading to the detection of 12 additional active TB cases and 23 cases of latent TB infection (LTBI), with only seven LTBI cases initiating treatment. Secondary transmission was also observed among household contacts of several index cases, indicating wider community implications. Squad A recorded the highest number of cases (n=10), followed by Squad B and Squad C. Delayed outbreak recognition, inadequate contact management, and the clinical complexity of DRTB posed significant challenges to containment. In the absence of timely and robust mitigation measures, the risk of further transmission was assessed as moderate to high.

Conclusion

Workplace TB outbreaks demand early detection, comprehensive contact screening, and coordinated inter-agency response to effectively contain transmission. Sustained TB awareness, regular health monitoring, and the implementation of systematic infection control practices are essential to prevent recurrence and protect workforce health.

References

1. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. *Self-study modules on tuberculosis: Module 9. Tuberculosis outbreak detection and response*. Atlanta (GA): CDC; 2014.

2. CodeBlue. TB remains a public health threat in Malaysia – MAPTB Selangor. *CodeBlue*. 2024 Mar 25 [cited 2025 May 20]. Available from: <https://codeblue.galencentre.org/2024/03/tb-remains-public-health-threat-in-malaysia-maptb-selangor/>
3. Goroh MMD, Rajahram GS, Avoi R, Van Den Boogaard CHA, William T, Ralph AP, et al. Epidemiology of tuberculosis in Sabah, Malaysia, 2012-2018. *Infect Dis Poverty*. 2020;**9**(1):119. doi:10.1186/s40249-020-00739-7
4. Rea E, Huard J, Lee R. Chapter 11: Tuberculosis contact investigation and outbreak management. *Can J Respir Crit Care Sleep Med*. 2022;**6**(suppl 1):167-83. doi:10.1080/24745332.2022.2037909

EPIDPP56 / 428

Smokers' Knowledge and Perception of Smoking

Norzawati Yoep¹, Muhammad Faiz Mohd Hisham¹, Wan Kim Sui¹

¹*Institute for Public Health, National Institutes of Health, Ministry of Health, Malaysia*

Corresponding author's email: norzawati@moh.gov.my

Summary

GATS 2023 was done to monitor adult tobacco use and track key tobacco control indicators in Malaysia. Most of the current smokers in Malaysia know the health-related causes of smoking. However, diabetes caused by smoking is not widely known.

Keywords

smoking, knowledge, GATS, diabetes

Introduction

Smoking remains one of the leading causes of preventable diseases and death worldwide, despite decades of public health campaigns highlighting its risks. Understanding smokers' knowledge and perception of smoking is crucial for developing effective prevention and cessation strategies. Recent studies indicate that while most smokers acknowledge the general harms of tobacco, their understanding of specific risks is often limited¹. Perceptions also play a crucial role in smoking behaviour. In Malaysia, factors such as age, gender, and education level influenced beliefs about the relative dangers of e-cigarettes compared to traditional cigarettes². This gap can influence their motivation to quit, responsiveness to anti-smoking messages, and willingness to seek help. This study aims to describe current smokers in Malaysia and their knowledge of health risks caused by smoking.

Materials and Methods

Data from the 2023 Global Adult Tobacco Survey (GATS) was utilised. GATS was a nationwide cross-sectional study using a multi-stage stratified cluster sampling method. The stratification was by geographic locality (urban and rural). One respondent per selected living quarters, aged 15 years and above, was selected as a respondent. Data was collected through face-to-face interviews. Respondents were asked whether they were currently smoking and their knowledge of smoking health risks. Descriptive analysis was employed. All data were analysed using SPSS version 22.0.

Results and Discussion

The overall prevalence of smokers was 19.0% (95% CI:17.1-21.1). The majority of the smokers were males (96.1%; 95% CI: 92.2 - 98.1) and residing in urban areas (74.6%; 95% CI: 70.5 - 78.2). The highest prevalence of smokers was those aged 25-44 years old (96.1%; 95% CI: 92.2 - 98.1), with secondary education (51.1%; 95% CI: 46.3 - 55.9). The majority of them knew that smoking can cause stroke, heart

attack, lung cancer, emphysema or chronic lung disease, oral cancer, premature birth and miscarriage. However, not many knew that smoking can cause diabetes (38.7%; 95% CI: 31.6 - 42.8). Nicotine and other tobacco constituents impair insulin signalling and glucose uptake³. Moreover, smoking may worsen glycaemic control and increase complications among those already diagnosed with diabetes. This includes a greater risk of microvascular and macrovascular complications⁴. Inadequate knowledge about the relationship between type 2 diabetes mellitus and smoking, and misconceptions about quitting smoking, resulted in negative attitudes toward quitting by type 2 diabetes mellitus smokers⁵. Campaigns globally and in Malaysia have historically focused on lung cancer, heart disease, stroke, and respiratory illnesses, which are perceived as more immediate or dramatic outcomes of smoking.

Table 1: Smokers' socio-demographic characteristics

Variable	Estimated population	Prevalence (%)	95% CI	
			Lower	Upper
Gender				
Male	4,598,360	96.1	92.2	98.1
Female	188,071	3.9	1.9	7.8
Residential				
Urban	3,569,822	74.6	70.5	78.2
Rural	1,216,609	25.4	21.8	29.5
Ethnicity				
Malay	2,807,888	58.8	52.5	64.7
Chinese	606,855	12.7	8.8	18.0
Indian	372,272	7.8	5.1	11.8
Others	991,735	20.8	16.6	25.6
Age Category				
65 and older	223,004	4.7	3.3	6.4
45-64	1,147,543	24.0	20.1	28.3
25-44	2,671,431	55.8	50.7	60.8
15-24	744,453	15.6	11.6	20.5
Education Level				
Less than primary	161,154	3.4	2.2	5.2
Primary	1,194,689	25.3	21.1	30.1
Secondary	2,410,648	51.1	46.3	55.9
University or above	947,937	20.1	15.4	25.8
Marital Status				
Married	2,979,863	62.3	56.6	67.6
Single	1,659,978	34.7	29.5	40.3
Widowed	88,399	1.8	1.1	3.0
Divorced	31,894	0.7	0.3	1.4
Refused to answer	19,180	0.4	0.1	1.4
Separated	7,117	0.1	0.1	0.4

Table 2: Knowledge of health risks of smoking among smokers

Variable	Estimated population	Prevalence (%)	95% CI	
			Lower	Upper
Stroke				
Yes	3,448,697	72.1	65.8	77.6
No	723,363	15.1	10.4	21.4
Don't know	536,837	11.2	8.4	14.8
Refused to answer	77,533	1.6	0.4	6.9
Heart Attack				
Yes	4,046,350	84.5	78.3	89.2
No	416,814	8.7	4.9	14.9
Don't know	248,560	5.2	3.3	8.1
Refused to answer	74,707	1.6	0.3	7.0
Lung Cancer				
Yes	4,262,626	89.1	83.5	92.9
No	281,571	5.9	3.0	11.3
Do not know	167,526	3.5	2.1	5.9
Refused to answer	74,707	1.6	0.3	7.0
Diabetes				
Yes	1,850,459	38.7	33.5	44.1
No	1,771,377	37.0	31.6	42.8
Do not know	1,092,037	22.8	18.5	27.8
Refused to answer	72,558	1.5	0.3	7.1
Emphysema / chronic lung disease				
Yes	4,233,019	88.4	83.9	91.8
No	285,124	6.0	3.6	9.8
Do not know	195,729	4.1	2.6	6.5
Refused to answer	72,558	1.5	0.3	7.1
Oral Cancer				
Yes	4,073,446	85.1	79.5	89.4
No	335,261	7.0	4.4	11
Do not know	305,166	6.4	4.3	9.4
Refused to answer	72,558	1.5	0.3	7.1
Premature Birth				
Yes	3,905,453	81.6	76.7	85.7
No	367,160	7.7	5.0	11.5
Do not know	441,259	9.2	6.4	13.0

Refused answer	to	72,558	1.5	0.3	7.1
Miscarriage					
Yes		3,838,004	80.2	75.4	84.3
No		385,080	8.0	5.4	11.8
Do not know		490,788	10.3	7.4	14.0
Refused answer	to	72,558	1.5	0.3	7.1

Conclusion

Public health efforts need to shift beyond general messages about smoking harms and address specific misconceptions. Most smokers already know the health impacts of smoking. Improving smokers' understanding of the causal relationship between smoking and diabetes is essential. It supports informed health decisions and reinforces the importance of quitting smoking, not just for preventing cancer or cardiovascular diseases, but also for reducing the burden of metabolic disorders like type 2 diabetes mellitus.

References

1. King B, Borland R, Le Grande M, et al. Associations between smokers' knowledge of causes of smoking harm and related beliefs and behaviors: Findings from the International Tobacco Control (ITC) Four Country Smoking and Vaping Survey. *PLoS One*. 2023;18(10):e0292856. doi:10.1371/journal.pone.0292856. PMID: 37874820; PMCID: PMC10597481.
2. Cheah YK, The CH, Lim KH, Kee CC. Perception about e-cigarettes in Malaysia: Sociodemographic correlates. *Int J Public Health Res*. 2022;12(1):1556-1563.
3. Attvall S, Fagerberg B, Widgren B, et al. Smoking induces insulin resistance—a potential link with the insulin resistance syndrome. *J Intern Med*. 1993;233(4):327-332.
4. Centers for Disease Control and Prevention (CDC). Smoking and diabetes. *CDC*; 2022 [cited 2025 May 27]. Available from: <https://www.cdc.gov/tobacco/campaign/tips/diseases/diabetes.html>
5. Chau TK, Fong DYT, Chan SSC, et al. Misconceptions about smoking in patients with type 2 diabetes mellitus: a qualitative analysis. *J Clin Nurs*. 2015;24(17-18):2545-2553. doi:10.1111/jocn.12854

EPIDPP57 / 430

The Hidden Epidemic: Leptospirosis Risk and Spread in Kinta District (2022-2024)

Zulaikha Abdul Razak¹, Gregory a/l Joseph Xavier¹, Mohd Zamri Md Ali¹, Pathma Sree R¹, Vinothkumarthevar R¹

¹Kinta District Health Office, Perak, Malaysia

Corresponding author's email: kuuzue@gmail.com

Summary

This study provides an epidemiological analysis of leptospirosis in Kinta District from 2022 to 2024 (up to Epidemiological Week 32), focusing on demographic patterns, occupational risks, and environmental exposures. A total of 393 cases were reported, with a significant male predominance (68%) and the highest incidence observed among individuals aged 21-30 years. Occupational risk analysis revealed that 81.1% of confirmed cases were in low-risk categories, while rat exposure was identified as a major contributor (57.7%) to transmission. These findings highlight the need for targeted interventions in occupational and environmental settings to curb leptospirosis transmission.

Keywords

Leptospirosis, Kinta District, Epidemiology, Occupational Risk, Rodent Exposure

Introduction

Leptospirosis remains a major public health concern in Malaysia, particularly in regions like Kinta District. The disease is predominantly driven by environmental and occupational exposures, with transmission often linked to contaminated water and rodent contact. In endemic areas, agricultural and water-related occupations pose significant risks. This study aims to describe the epidemiology of leptospirosis in Kinta District from 2022 to 2024, focusing on demographic characteristics, occupational exposure, and environmental risk factors to inform targeted prevention strategies.

Materials and Methods

A retrospective analysis of leptospirosis cases in Kinta District was conducted from 2022 to 2024 (up to EW32). Data were collected from surveillance reports, including demographic details, occupational exposure, and environmental risk factors. Confirmed cases were identified based on laboratory confirmation of *Leptospira* infection through microscopic agglutination tests (MAT) or PCR testing, following the WHO case definition. Probable cases were classified based on clinical symptoms consistent with leptospirosis, along with epidemiological linkage to known outbreaks or exposure to contaminated water or rodents, without laboratory confirmation. Occupational risks were classified into three categories: low, moderate, and high. It is classified based on the nature and frequency of potential exposure to leptospiral infection. Statistical analysis was performed to identify associations between exposure and leptospirosis incidence.

Results and Discussion

A total of 393 leptospirosis cases were reported during the study period, with 28.2% (n=111) classified as confirmed cases and 71.8% (n=282) as probable cases. Males constituted the majority of cases (68%), and the highest incidence was observed in the 21-30 age group (19.3%). Occupational analysis indicated that 81.1% of confirmed cases were categorized as low-risk, while 18.0% fell into high-risk occupations. Rodent exposure was significantly associated with leptospirosis, with 57.7% of confirmed cases reporting contact with rats. Environmental factors such as proximity to water bodies and parks showed minimal impact on transmission rates.

Table 1 Descriptive Analysis of Sociodemographic of Leptospirosis cases in Kinta District 2022 - 2024 (EW 32) (n=393)

Variable	Categories	Leptospirosis diagnosis		Mean (SD) (p-value)
		Confirmed (%)	n Probable n (%)	
Age group	<10 years old	11 (2.8)	51 (13.0)	33.63 (21.29)
	11-20 years old	20 (5.1)	40 (10.2)	
	21-30 years old	23 (5.9)	53 (13.5)	
	31-40 years old	19 (4.8)	43 (10.9)	
	41-50 years old	12 (3.1)	27 (6.9)	
	51-60 years old	12 (3.1)	23 (5.9)	
	>61 years old	14 (3.6)	45 (11.5)	
Gender	Male	77 (69.4)	190 (67.4)	
	Female	34 (30.6)	92 (32.6)	
Ethnic	Malay	88 (79.3)	206 (73.0)	
	Chinese	9 (8.1)	25 (8.9)	
	Indian	7 (6.3)	35 (12.4)	
	Orang asli	1 (0.9)	5 (1.8)	
	Others	6 (5.4)	11 (3.9)	
Nationality	Malaysian	105 (94.6)	270 (95.7)	
	Foreigner	6 (5.4)	12 (4.3)	
Occupational Risk	Low	90 (81.1)	231 (81.9)	
	Moderate	1 (0.9)	3 (1.1)	
	High	20 (18.0)	48 (17.0)	
Mukim	Ulu Kinta	58 (52.3)	154 (54.3)	
	Sg Terap	38 (34.2)	85 (30.1)	
	Sg Raia	6 (5.4)	22 (7.4)	
	Tronoh	2 (1.8)	15 (5.3)	
	Tg Tualang	7 (6.3)	6 (2.1)	

Table 2 Risk factors of Leptospirosis cases in Kinta District 2022 - 2024 (EW 32) (n=393)

Risk factors	Categories	Leptospirosis diagnosis		P-value
		Confirmed n (%)	Probable n (%)	
Occupational risk	Low	90 (81.1)	231 (81.9)	0.964
	Medium	1 (0.9)	3 (1.1)	
	High	20 (18.0)	48 (17.0)	
Rodent exposure	Yes	64 (57.7)	124 (44.0)	0.014*
	No	47 (42.3)	158 (56.0)	
Recreational Park	Yes	36 (32.4)	82 (29.1)	0.097
	Waterfall	17 (15.3)	18 (6.4)	
	River	11 (9.9)	23 (8.2)	
	Forest	5 (4.5)	23 (8.2)	
	Mine	1 (0.4)	4 (1.4)	
	Resort/Park	2 (1.8)	3 (1.1)	
	Paddy Field/Farm	0 (0.0)	3 (1.1)	
	Overseas	0 (0.0)	2 (0.7)	
	Beach	0 (0.0)	6 (2.1)	
	No	75 (67.6)	200 (70.9)	

*p-value <0.05 = significant

Discussion

The findings indicate that the majority of confirmed cases (81.1%) and probable cases (81.9%) occurred among individuals in low-risk occupational categories. Leptospirosis predominantly affected males, with 69.4% of confirmed cases and 67.4% of probable cases being male, and the highest incidence observed in the 21-30 age group. Rodent exposure emerged as a significant risk factor, with 57.7% of confirmed cases linked to contact with rats. In contrast, environmental factors such as water bodies and recreational parks demonstrated minimal impact on transmission rates. These findings also underscore the importance of targeted preventive measures, particularly in occupational settings with rodent exposure. Enhanced rodent control and public health education are recommended to mitigate transmission risks.

Conclusion

Leptospirosis in Kinta District is primarily associated with rodent exposure and low-risk occupational settings. Preventive strategies focusing on rodent control and environmental sanitation are essential to reduce disease transmission.

Acknowledgments

We extend our gratitude to the Kinta District Health Office for their support in data collection and surveillance.

References

1. World Health Organization. *Leptospirosis: epidemiology, risk factors, and prevention*. Geneva: WHO; 2022.
2. Ministry of Health Malaysia. *Leptospirosis Surveillance Report 2022-2024*. Putrajaya: Ministry of Health Malaysia; 2024.
3. Smith R, Jones L. Occupational hazards and leptospirosis: a systematic review. *J Public Health Res*. 2023;**15**(2):123-132.
4. Lee M, Tan C. Environmental risk factors in leptospirosis outbreaks. *Trop Med Int Health*. 2023;**10**(1):45-52.
5. Kinta District Health Office. *Annual Health Report 2024*. Perak: Kinta DHO; 2024

EPIDPP58 / 435

Are Men Who Have Sex with Men (MSM) Driving the Shift in HIV Transmission Patterns in Larut, Matang and Selama District, Perak? - A Decade of Insights (2015-2024)

Muhammad Naim Ibrahim¹, Mohd Najimi Ahmad¹, 'Ammar Amsyar Abdul Haddi¹, Syahrizal Abdul Halim¹, Husna Maizura Ahmad Mahir²

¹ Larut, Matang and Selama District Health Office, Ministry of Health Malaysia

² Perak State Health Department, Ministry of Health Malaysia

Corresponding author's email: dr.naimibrahim@moh.gov.my

Summary

Emerging patterns in HIV transmission highlight a significant epidemiological shift, fuelled by social behaviour changes and intervention efforts. This study aims to describe annual HIV transmission trends in Larut, Matang and Selama (LMS) district, Perak from 2015 to 2024 and identify significant patterns, particularly among men who have sex with men (MSM). From 2015 to 2024, 380 cases were recorded, with MSM showing a significant upward trend ($p < 0.001$) and IVDU declining. MSM cases were younger and commonly students or supporting staff. Findings underscore the need for targeted interventions under Malaysia's AIDS strategy, including education, HIV testing, PrEP access, and MSM-focused outreach.

Keywords

HIV, MSM, Men who have sex with men, Larut Matang and Selama, Trends

Introduction

Over the past decade, human immunodeficiency virus (HIV) transmission in Malaysia has shifted from injecting drug use (IVDU) to sexual transmission, which accounted for over 90% of new cases in 2022, while IVDU contributed only 6%¹. This change is likely due to reduced needle-sharing and increased high-risk sexual behaviours, particularly among MSM². The rise in MSM-related cases may be attributed to greater social openness but limited access to targeted prevention services and underdiagnosed transmission in earlier years³. The objective of this study is to describe the annual trend of newly diagnosed HIV cases in the Larut, Matang and Selama (LMS) district, Perak from 2015 to 2024 based on modes of transmission. It also aims to identify significant trends in HIV transmission, particularly among MSM.

Materials and Methods

This study employed a cross-sectional design with elements of retrospective trend analysis. Secondary data were obtained from the National AIDS Registry (NAR), comprising all HIV cases reported in the Larut, Matang and Selama (LMS) district, Perak through the District Health Office (PKDLMS) from 2015 to 2024. The term MSM was used to refer to homosexual and bisexual men. Descriptive analysis was performed to examine trends and sociodemographic characteristics, with a

particular focus on MSM-related transmission. Multinomial logistic regression was applied to assess changes in transmission patterns over the 10-year period, with statistical significance set at $p < 0.05$. All analyses were conducted using SPSS version 22.0.

Results and Discussion

A total of 380 HIV cases were diagnosed and registered in the LMS district over 10 years period. Among these, 98 individuals (25.8%) were reported to have died, with the majority of deaths attributed to AIDS-related complications. Sexual transmission was the primary mode of infection, accounting for 275 cases (72.4%), of which 146 (53.1%) were heterosexual and 129 (46.9%) were among MSM. This was followed by transmission through IVDU with 67 (17.6%) cases and 38 (10.0%) cases with unknown sources. Individuals infected through MSM were the youngest group, with a mean (s.d.) age of 31.7 (7.95) years, compared to other transmission routes. A majority of MSM-related cases were observed among males (38.7%), Malays (42.6%), individuals with at least SPM-level education (52.7%), and those working as supporting staff (45.7%) or full-time students (61.1%), compared to other transmission routes. Multinomial logistic regression revealed a significant increasing trend in MSM-related HIV transmission over the decade ($B = 0.18$, $OR = 1.20$; 95%CI:1.09,1.33; $p < 0.001$), while heterosexual transmission remained stable ($p = 0.89$). In contrast, HIV transmission through IVDU demonstrated a decreasing trend ($B = -0.18$; $p < 0.001$).

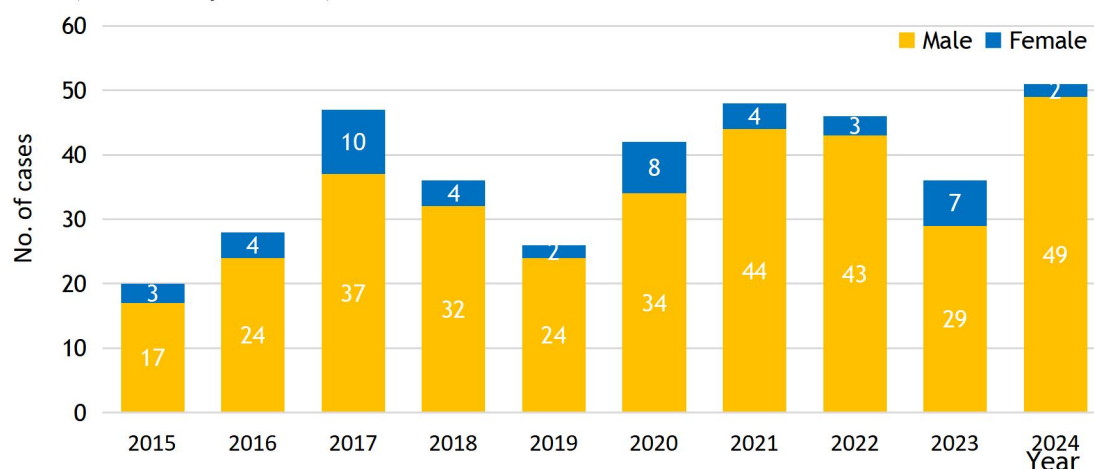
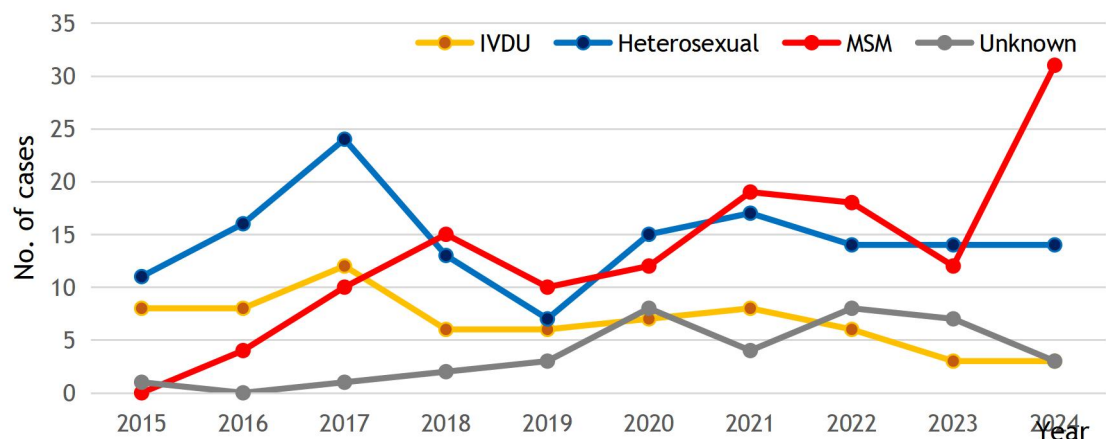


Figure 1: Trend of HIV Infection Cases by Gender in the LMS District, 2015-2024 ($n = 380$)



Fig

Figure 2: Trend of HIV Transmission Modes in the LMS District, 2015-2024 (n=380)

Table 1: Multinomial logistic regression in route of transmission changes from 2015 to 2024

Route of Transmission	B	OR (95%CI)	Wald statistic (df)	p-value
Unknown		1	1	
IVDU	- 0.18	0.83 (0.75, 0.92)	14.92 (1)	<0.001
Heterosexual	0.01	1.01 (0.92, 1.10)	0.021 (1)	0.884
MSM	0.18	1.20 (1.1, 1.33)	13.77 (1)	<0.001

These findings reflect national trends, with a growing proportion of HIV cases linked to MSM, particularly among younger individuals. This suggests rising incidence in this group, likely driven by high-risk sexual behaviours and limited access to targeted prevention. High-risk behaviours among youth are driven by sexual liberalisation, digital platforms, and poor sexuality education². Among MSM, stigma, discrimination, and fear of social repercussions continue to limit access to prevention services in Malaysia³. In contrast, the decline in IVDU-related transmission may reflect effective MOH interventions, including methadone programmes and inter-agency drug control efforts⁴. Understanding local transmission dynamics enables targeted interventions, particularly among MSM, and supports Malaysia's National Strategic Plan to End AIDS.

Conclusion

HIV transmission in the district was increasingly driven by MSM, particularly among younger individuals. This underscores the need to strengthen targeted interventions, including comprehensive sexual health education, expanded HIV testing, improved access to pre-exposure prophylaxis, and community-based outreach initiatives aimed at the MSM population to reduce stigma and enhance service uptake.

References

1. Ministry of Health Malaysia (MOH). *The Global AIDS Monitoring Report 2023 - Malaysia*. Putrajaya: MOH; 2023. 2:4-5. Available from: https://www.moh.gov.my/moh/resources/Penerbitan/Laporan/Umum/Laporan_Global_AIDS_Monitoring_2023.pdf [Accessed 2025 Apr 20].
2. Daniel I, Javier R, Santiago M, et al. Sexualized drug use, risky sexual behaviors, and prevention strategies among gay, bisexual, and other men who have sex with men. *Drugs Educ Prev Policy*. 2022;31(4):463-75. <https://doi.org/10.1080/09687637.2023.2225245>
3. Rosen AO, Wickersham JA, Altice FL, et al. Barriers and facilitators to pre-exposure prophylaxis by men who have sex with men and community stakeholders in Malaysia. *Int J Environ Res Public Health*. 2023;20(9):5669. <https://doi.org/10.3390/ijerph20095669>
4. Apenteng OO, Osei PP, Oduro B, et al. The impact of implementing HIV prevention policies, therapy and control strategy among HIV and AIDS incidence cases in Malaysia. *Infect Dis Model*. 2020;5:755-65. <https://doi.org/10.1016/j.idm.2020.09.009>

EPIDPP59 / 436

Young, Bold and at Risk:

A 10-Year Trend Analysis of Gonorrhoea and Acquired Syphilis in Larut, Matang and Selama District, Perak

Muhammad Naim Ibrahim ¹, Mohd Najimi Ahmad ¹, Ammar Amsyar Abdul Haddi ¹, Syahrizal Abdul Halim ¹, Husna Maizura Ahmad Mahir ²

¹ Larut, Matang and Selama District Health Office, Ministry of Health Malaysia

² Perak State Health Department, Ministry of Health Malaysia

Corresponding author's email: dr.naimibrahim@moh.gov.my

Summary

Acquired syphilis and gonorrhoea are re-emerging sexually transmitted infections (STIs), with many cases untreated, fuelling continued transmission. This study reviewed 343 cases in Larut, Matang and Selama (LMS) district, Perak from 2015 to 2024, focusing on age and sexual orientation. Most cases involved males under 30, with heterosexual transmission being most common. No significant trend was seen among men who have sex with men (MSM) or youth. Contributing factors include increased access to sexual activity, stigma, and low prioritisation of sexual health. Improved surveillance and public awareness may have boosted case detection. Effective control requires targeted strategies, including non-governmental organisation engagement, stigma reduction, and youth-focused interventions.

Keywords

Gonorrhoea, Syphilis, Young, Larut Matang and Selama, Trends

Introduction

Syphilis and gonorrhoea are re-emerging sexually transmitted infections (STIs) with rising cases globally and nationally¹. In Malaysia, STIs surveillance shows rising trends, with syphilis incidence rate nearly doubled from 5.7 (2012) to 14.3 per 100,000 (2022), and gonorrhoea increased from 4.78 (2013) to 5.6 per 100,000 (2022)². Early detection is critical as both conditions are curable, and timely intervention are essential to prevent ongoing transmission. A major challenge lies in identifying at-risk populations and tailoring appropriate prevention strategies for each group. This study analyses a 10-year trend (2015-2024) of gonorrhoea and acquired syphilis in the Larut, Matang and Selama (LMS) district, Perak, focusing on age and sexual orientation.

Materials and Methods

This study employed a cross-sectional design with elements of retrospective trend analysis. Secondary data were obtained from the e-Notifikasi by the Ministry of Health Malaysia, comprising all gonorrhoea and syphilis cases reported in the LMS district, Perak through the Larut, Matang and Selama District Health Office (PKDLMS) from 2015 to 2024. Acquired syphilis is an infection typically transmitted

through sexual contact and the term MSM was used to refer to homosexual and bisexual men. Descriptive analysis was performed to examine trends and sociodemographic characteristics, with a particular focus on age and sexual orientation. Multinomial logistic regression was applied to assess changes in transmission patterns over the 10-year period, with statistical significance set at $p < 0.05$. All analyses were conducted using SPSS version 22.0.

Results and Discussion

A total of 343 cases were included in the study, comprising 248 (72.3%) acquired syphilis and 95 (27.7%) were gonorrhoea registered in the LMS district over a 10-years period. Among these, 40 cases (11.7%) were co-diagnosed with HIV. Of the total, 266 (77.6%) were male and 77 (22.4%) were female. In term of races, 223 (65.0%) were Malay, followed by Indian (20.4%), Chinese (10.2%), pribumi Sabah or Sarawak (2.0%), foreigners (1.7%) and others (0.6%). The overall mean (s.d.) age for both infections was 32.2 (13.2) years old, with acquired syphilis averaging 34.8 (14.0) years and gonorrhoea was younger at 25.4 (7.6) years. The younger age group, below 30 years old, accounted for the majority of cases, with 187 (54.5%) , where 29 (8.5%) cases were below 20 years old. Most infections were transmitted via heterosexual contact (66.8%), followed by MSM (33.5%). Among male patient only, heterosexual transmission accounted for 57.1% while MSM made up 43.2%. However, multinomial logistic regression revealed no significant trend in MSM-related and younger age group for combined acquired syphilis and gonorrhoea transmission over the decade ($p > 0.05$) (Table 1).

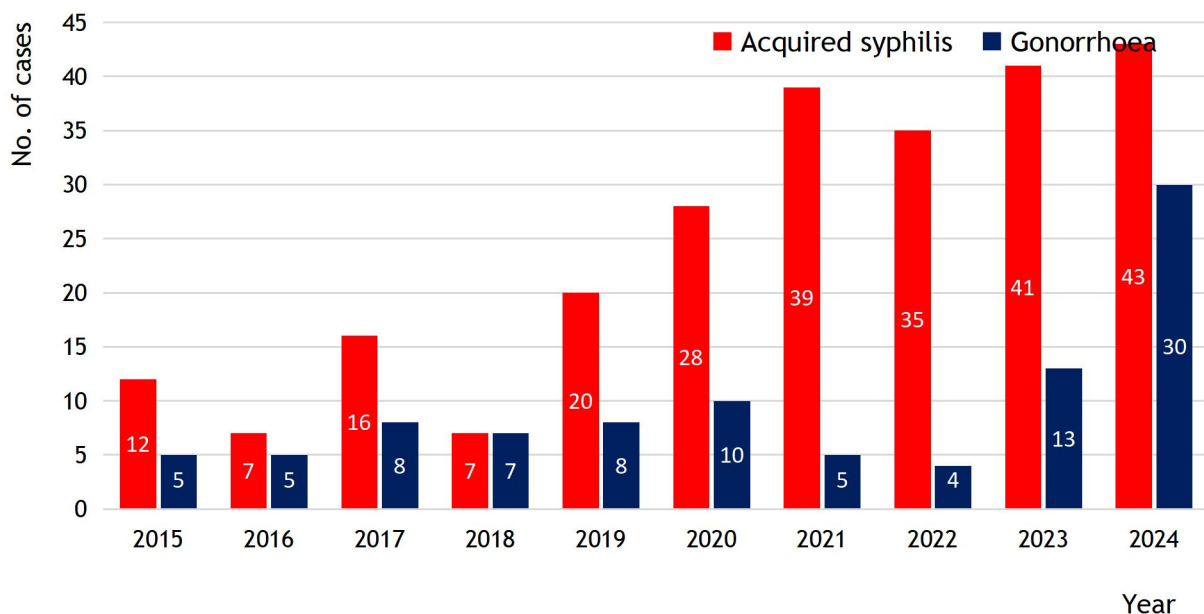


Figure 1: Trend of Syphilis and Gonorrhoea Infections in the LMS District, Perak 2015-2024 (n=343)

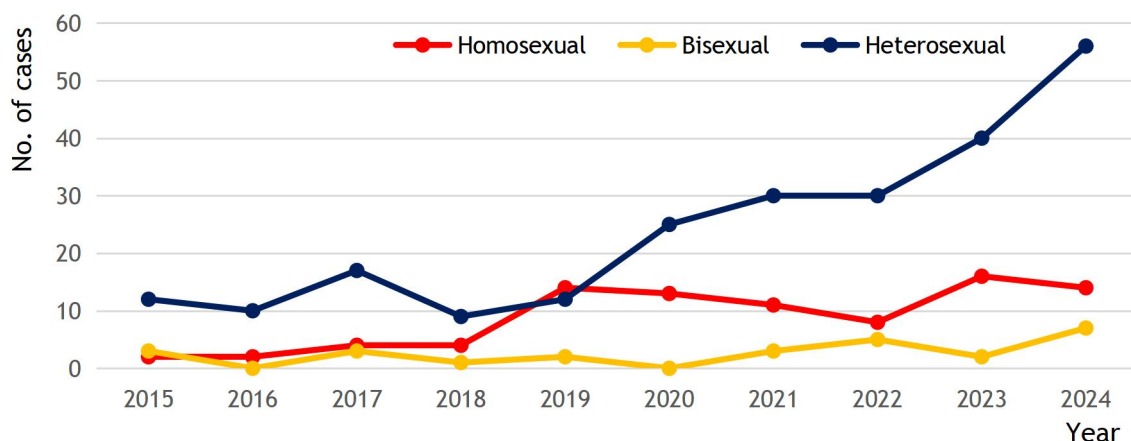


Figure 2: Trend of combined syphilis and gonorrhoea according to sexual orientation in the LMS District, Perak 2015-2024 (n=343)

Table 1: Multinomial logistic regression in STIs transmission changes in the LMS district, Perak from 2015 to 2024

Characteristics	B	OR (95%CI)	Wald statistic (df)	p-value
Age				
≥ 60 years old		1	1	
40 - 59 years old	- 0.03	0.97 (0.79, 1.18)	0.09 (1)	0.756
30 - 39 years old	0.01	1.01 (0.84, 1.22)	0.01 (1)	0.910
20 - 29 years old	0.02	1.02 (0.85, 1.22)	0.04 (1)	0.832
<20 years old	0.05	1.05 (0.85, 1.31)	0.22 (1)	0.637
Sexual orientation				
Heterosexual		1	1	
MSM	-0.01	0.78 (0.91, 1.07)	0.08 (1)	0.77

The findings reflect national trends of rising STIs in Malaysia². This increase may be fuelled by greater sexual liberalisation among youth, and easier access to sexual encounters through digital platforms³. Additionally, comprehensive public health surveillance and increased awareness may have enhanced case detection and reporting. Despite that, heterosexual transmission remains dominant, reflecting poor safe sex practices driven by stigma, low health literacy, and limited interventions due to low prioritisation of sexual health⁴. To address this, NGO collaboration is needed to promote safe sex practices among at-risk youth. Efforts should also focus on reducing stigma, improving healthcare-seeking behaviour, ensuring partner treatment, and advancing research on drivers of unsafe sex.

Conclusion

Acquired syphilis and gonorrhoea have shown an increasing trend over the past decade, particularly among the younger population. While heterosexual transmission remains dominant, MSM-related transmission also warrants focused attention. Public health interventions should prioritise sexual health by promoting safe sex practices among youth, fostering a supportive environment for health-seeking behaviour, and integrating culturally sensitive and religious elements into awareness programmes.

References

1. World Health Organization (WHO). Sexually transmitted infections [Internet]. Geneva: WHO; 2024 [cited 2025 Apr 12]. Available from: [https://www.who.int/news-room/fact-sheets/detail/sexually-transmitted-infections-\(stis\)](https://www.who.int/news-room/fact-sheets/detail/sexually-transmitted-infections-(stis))
2. Ministry of Health Malaysia (MOH). *Malaysian Guidelines Management of STIs*. 5th ed. Putrajaya: MOH; 2024 [cited 2025 May 5]. Available from: https://www.moh.gov.my/index.php/database_stores/attach_download/681/225
3. Mohamad Shakir SM, Wong LP, Lim Abdullah K, Adam P. Online STI information seeking behaviour and condom use intentions among young Facebook users in Malaysia. *Health Promot Int*. 2020;**35**(5):1116-24. doi:10.1093/heapro/daz108
4. Jaimon S, Mokti K. Challenges of sexually transmitted infections and HIV/AIDS prevention and control programme in Malaysia: A scoping review. *Malays J Public Health Med*. 2024;**24**(3):198-203 [cited 2025 May 7]. Available from: <https://mjphm.org/index.php/mjphm/article/view/2615>

EPIDPP60 / 437

Unseen Chains of Transmission: A Pertussis Outbreak Among Schoolchildren Affecting a High-Risk Infant in Melaka

Abdul Ahmad Syafiq Hussein¹, Ayuzeity Bistari Md Bukhori¹, Siti Nurbaya Abdul Aziz¹, Mohd Ridzuan Janudin¹, Nazirah A Hamid¹

¹ Melaka Tengah District Health Office

Corresponding author's email: dr.syafiqhussein@moh.gov.my

Summary

This case study investigates a *Bordetella pertussis* outbreak in Melaka Tengah, initiated by a 1.5-month-old unvaccinated infant hospitalised in April 2025. A descriptive epidemiological investigation involving 282 close contacts and 94 PCR tests identified 19 confirmed cases. Most infections involved the infant's siblings, their infant's siblings' school-aged peers, and infant's siblings' tuition centre contacts, indicating both household and community transmission. The outbreak highlights the vulnerability of unvaccinated infants and waning immunity in older children. Findings underscore the need for stronger booster strategies, early detection, and improved vaccination awareness to prevent pertussis transmission in school and community settings.

Keywords

Pertussis, whooping cough, outbreak, vaccination, waning immunity, school-aged children, Melaka

Introduction

Pertussis, or whooping cough, is a vaccine-preventable respiratory illness known for its high transmissibility, particularly in community and school settings¹. Melaka Tengah has consistently reported the highest number of pertussis cases in the state, with a notable resurgence in 2023 and 2024, raising concerns over its silent spread among partially protected or immunised individuals. In late April 2025, a 1.5-month-old unvaccinated infant from Melaka Tengah was hospitalised and confirmed to have pertussis, prompting a detailed outbreak investigation.

This study aimed to identify the source, transmission chain, and extent of pertussis outbreak triggered by a non-vaccinated infant in Melaka Tengah.

Materials and Methods

A descriptive epidemiological investigation and active case detection were conducted. A pertussis case was defined as any individual with a cough (with or without inspiratory whoop or post-tussive vomiting) since early April 2025 and epidemiologically linked to the index case's household. Laboratory confirmation was obtained via PCR testing. Data collection involved structured interviews with close contacts, contact tracing, and review of symptom onset timelines. Control

measures included health education and administration of post-exposure prophylaxis (PEP) where indicated. Descriptive analyses were employed.

Results and Discussion

A total of 282 close contacts were interviewed, and 94 individuals underwent Polymerase Chain Reaction (PCR) testing for *Bordetella pertussis*. Laboratory results confirmed 19 positive cases, with an overall positivity rate of 20.2% among those tested. Of these, seven were from the same household as the index case – all of whom were the infant’s siblings. Five cases were identified among peers in various school settings, while four were linked to a tuition centre operated by the index case’s father. Notably, all of the index case’s siblings who tested positive also attended this tuition centre, suggesting that it played a central role in the transmission chain, both within and beyond the index’s household. Furthermore, three additional cases were detected among household members of the infected peers and tuition centre contacts, indicating secondary transmission in those settings.

Table 1 shows the descriptive findings of the 19 confirmed cases. One case involved a 2-month-old infant—the index case, who was hospitalised upon diagnosis. This is consistent with previous research indicating that pertussis primarily affects infants whom not eligible for vaccination², and that hospitalisation is most common among those who are either incompletely vaccinated or ineligible for full immunisation³. In this outbreak, however, the majority of cases were among school-aged children. This pattern could be due to waning immunity, which is common as age increases. A Malaysian cross-sectional study similarly reported that most children aged five and above had low levels of protective anti-pertussis toxin (anti-PT) IgG antibodies ⁴. Of note, one of the index case’s siblings had not received any DTaP vaccine dose and tested positive. Unvaccinated individuals in high-exposure household settings face nearly three times greater risk of contracting pertussis and may serve as silent carriers, contributing to broader transmission⁵.

Table 1: Demographic Characteristics and Immunization Status of Confirmed *Bordetella pertussis* Cases

Factors	Case (n=19) (%)
Sex	
Male	10 (52.6)
Female	9 (47.4)
Age	
<1 years	1 (5.3)
1-10 years	5 (26.3)
11-20 years	10 (52.7)
21-30 years	0 (0.0)
31-40 years	2 (10.5)

41-50 years	1 (5.3)
51-60 years	0 (0.0)
>60 years	0 (0.0)
Vaccination status	
Completed*	14 (73.7)
Incomplete**	0 (0.0)
Not eligible	1 (5.3)
Not vaccinated	1 (5.3)
Unknown	3 (15.7)
Working status	
Students	14 (73.7)
Working	1 (5.3)
Housewife/Unemployed	4 (21.0)

*Complete means someone who completed 3 doses of DTaP

**Incomplete means someone who does not complete at least 3 doses of DTaP

Conclusion

This outbreak underscores the vulnerability of unvaccinated infants and the role of waning immunity in older children in facilitating pertussis transmission. Spread across households, schools, and a tuition centre highlights the importance of strong vaccination coverage and timely boosters. Strengthened surveillance, early intervention, and targeted public health measures are essential to prevent future outbreaks and protect high-risk groups.

References

1. Macina D, Evans K. Bordetella pertussis in school-age children, adolescents, and adults: a systematic review of epidemiology, burden, and mortality in Asia. *Infect Dis Ther*. 2021;**10**(3):1115-40.
2. Mohan A, Tan YY, Hashim R, et al. Incidence and severity of pertussis among hospitalized infants, Sarawak, Malaysia, 2015-2021. *J Infect Dev Ctries*. 2024;**18**:1394-403. <https://doi.org/10.3855/jidc.18837>
3. Mohamed TJ, Fong SM, Nadarajaw T, et al. Burden of pertussis among young infants in Malaysia: a hospital-based surveillance study. *Vaccine*. 2022;**40**(35):5241-7.
4. Binti Md Bahar AN, Muhamad AN, Teh CSJ, et al. Prevalence of *Bordetella pertussis* among children aged 4 years and above presenting with acute respiratory tract infection: a cross-sectional study. *Pathog Glob Health*. 2024;**118**(7-8):582-6.
5. Tariku M, Belete A, Worede D, et al. Attack rate, case fatality rate and predictors of pertussis outbreak during pertussis outbreak investigation in Ethiopia: systematic review and meta-analysis. *J Epidemiol Glob Health*. 2024;**14**(2):327-36. <https://doi.org/10.1007/s44197-024-00234-4>

EPIDPP61 / 446

Suppressing Dengue Through Wolbachia-Infected *Aedes aegypti*: Progress and Impact from a Community-Based Intervention in Melaka Tengah

Adibah Ibrahim¹, Mohd Ridzuan Janudin¹, Sharifah Nur Shahirah Syed Abdul Halim¹, Noor Hazmi Noor Hassim¹, Rabizah Hamzah²

¹ Melaka Tengah Health District Office

² Entomology Unit, Melaka State Health Department

Corresponding author's email: dr_adibah@moh.gov.my

Summary

The Dengue Innovative Control Program using *Wolbachia*-infected *Aedes aegypti* mosquitoes was launched in October 2023 at Pangsapuri Taman Tasik Utama, Melaka Tengah. Now in its sustain phase, the program aims to replace wild *Aedes aegypti* with *Wolbachia*-carrying mosquitoes to prevent dengue transmission. Preliminary results show a 80% reduction in dengue cases and a 97% *Wolbachia* frequency in the mosquito population. This biological control strategy offers a sustainable and effective approach to dengue prevention. Integrated vector management and community engagement have contributed significantly to reducing dengue incidence in this hotspot locality.

Keywords

Wolbachia, Melaka, Dengue incidence, innovative vector control, *Aedes aegypti*

Introduction

Dengue remains a significant public health challenge in Malaysia, particularly in densely populated urban and semi-urban areas. Melaka Tengah, the most populated district in Melaka, consistently reports the highest number of dengue cases. In response, Pangsapuri Taman Tasik Utama was selected as the first site in the district to implement the release of *Aedes aegypti* mosquitoes infected with *Wolbachia*, a naturally occurring bacterium that blocks dengue virus replication. Launched in October 2023, the two and a half year intervention includes a release phase and a sustain phase. The release phase involves weekly releases of *Wolbachia*-infected mosquitoes, while the sustain phase maintains high *Wolbachia* frequency to ensure lasting impact. Objectives include reducing dengue incidence and outbreaks and replacing the wild mosquito population with *Wolbachia*-infected mosquitoes. This report presents progress and findings after 18 months of implementation.

Materials and methods

This intervention study was conducted in a dengue hotspot within Melaka Tengah District using *Wolbachia*-infected *Aedes aegypti*. The 14-week release phase involved weekly releases of 14 batches of infected mosquitoes. A 32-week sustain phase followed, supported by an 8-week booster release. A second sustain phase began in 2025, with another booster planned for May 2025. Integrated vector

management strategies were concurrently implemented, including *Bacillus thuringiensis israelensis* (Bti) larviciding and source reduction targeting *Aedes albopictus*. Community engagement played a key role in ensuring public cooperation and awareness. Data were collected from dengue case records and outbreak reports (2015-2025). A Mann-Whitney U test was conducted to compare the number of dengue cases and outbreaks before and after the intervention using SPSS version 22.0. Ovitrap surveillance was used to measure Wolbachia frequency, with PCR testing confirming presence in captured mosquitoes.

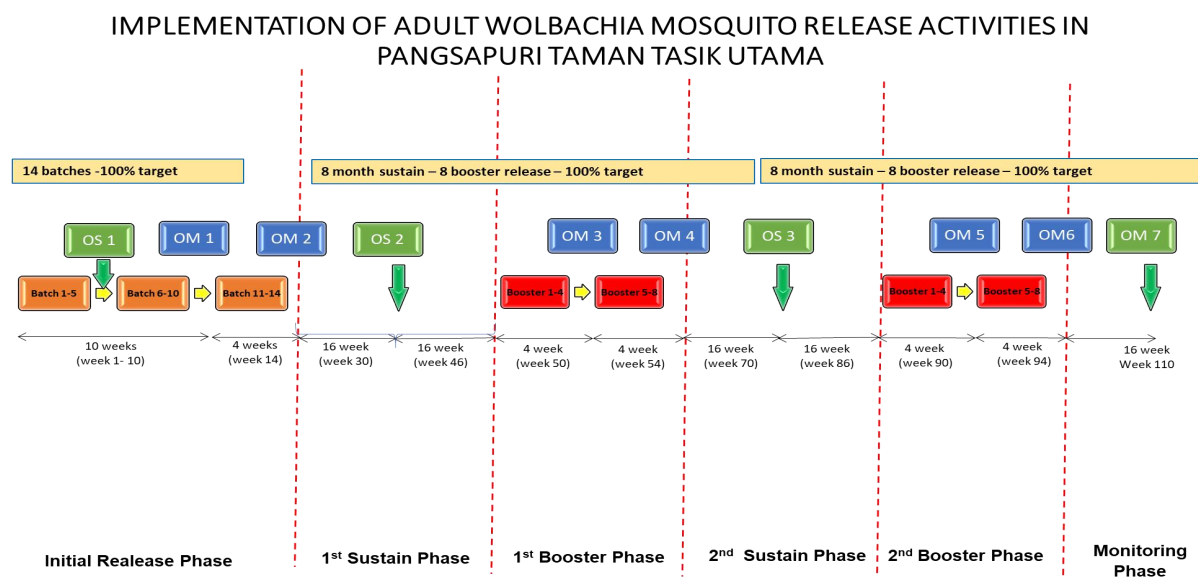


Figure 1: Timeline for the implementation of *Aedes aegypti* carrying Wolbachia release activities in Taman Tasik Utama Melaka 2023-2025

Results and Discussion

A Mann-Whitney U test was used to compare the number of dengue cases per year before and after the intervention. There was a statistically significant reduction in annual dengue cases between the pre-intervention period (Median = 8.00) and the post-intervention period (Median = 0.00), $U = 0.00$, $z = -2.12$, $p = .036$ (exact), indicating a significant decline in dengue incidence following the Wolbachia release. A separate Mann-Whitney U test assessed changes in the number of dengue outbreaks. Although the number of outbreaks decreased from a median of 1.00 pre-intervention to 0.00 post-intervention, the reduction was not statistically significant, $U = 1.00$, $z = -2.00$, $p = .073$ (exact), though it approached significance.

Table 1: Comparison between Dengue cases and number of Dengue outbreaks pre- and post-Aedes carrying Wolbachia release in TTU

Number of cases / year	N	Median	U	Z	P-value (exact
Pre-Intervention	9	8.00	0.000	-2.121	0.036
Post-intervention	2	0.00			
Number of outbreak					
Pre-Intervention	9	1.00	1.000	-2.003	0.073
Post-intervention	2	0.00			

Note. Mann-Whitney U tests were used due to non-normal distribution and small sample sizes. Exact p-values are reported. Medians are reported instead of means due to the non-parametric nature of the test.

Table 2: Descriptive results of Ovitrap monitoring (OM) post-Aedes carrying Wolbachia release in TTU

OM	OM 1	OM 2	OM 3	OM 4	OM 5
Wolbachia frequency (%)	94.90	93.18	97.18	98.74	97.22

As of April 2025, the project has entered its second sustain phase. Entomological surveillance confirms successful population replacement, with 97.22% of the local *Aedes aegypti* population carrying *Wolbachia*. Ovitrap Monitoring (OM) was conducted regularly, and mosquitoes captured were tested via PCR to determine *Wolbachia* presence. The most recent OM showed a *Wolbachia* frequency of 97.22%, indicating stable and sustained establishment of the modified mosquito population. These findings demonstrate the effectiveness of this biological intervention in reducing dengue transmission and outbreaks in a high-risk urban locality. The combination of Integrated vector management via targeted mosquito releases and community engagement has yielded public health benefits and supports scalability of this approach to other endemic regions.

Conclusion

The *Wolbachia*-based vector control strategy has proven effective in reducing dengue incidence and potentially preventing outbreaks in an urban setting. Sustained community engagement and multi-agency collaboration are essential for long-term success and scalability, offering a sustainable model for dengue prevention in other high-burden areas.

References

1. Nur Rumaizah MN, Fadly SA, Muhammad Hilmi M. Wolbachia in dengue control: a systematic review. *Open Access Maced J Med Sci*. **10**(F):501-512. doi:10.3889/oamjms.2022.9014
2. Dorigatti I, McCormack C, Nedjati-Gilani G, Ferguson NM. Using Wolbachia for dengue control: insights from modelling. *Trends Parasitol*. **34**(2):102-113. doi:10.1016/j.pt.2017.11.002
3. Nazni WA, Hoffmann AA, NoorAfizah A, et al. Establishment of Wolbachia strain wAlbB in Malaysian populations of *Aedes aegypti* for dengue control. *Curr Biol*. **29**(24):4241-4248.e5. doi:10.1016/j.cub.2019.11.007

EPIDPP62 / 365

Beyond the Virus: Did COVID-19 Spark a Rise in Autoimmune and Inflammatory Conditions?

Masliyana Husin¹, Swee Hung Ang¹, Yvonne Mei Fong Lim¹, Xin Rou Teh¹, Vivek Jason Jayaraj², Shahanizan Mohd Zin³, Santhi Subramaniam⁴, Maheshwara Rao Appanan², Sheamini Sivasampu⁴, Fahd Adeeb⁵, Peter Seah Keng Tok¹

¹*Institute for Clinical Research, National Institutes of Health, Ministry of Health Malaysia*

²*Digital Health Division, Ministry of Health Malaysia*

³*Medical Development Division, Ministry of Health Malaysia*

⁴*National Public Health Laboratory, Ministry of Health Malaysia*

⁵*RCSI and UCD Malaysia Campus (RUMC), Penang, Malaysia*

Corresponding author's email: masliyana.h@moh.gov.my

Summary

Utilising national hospital data from the Malaysian Health Data Warehouse (2016-2023), this study analyses trends in autoimmune and inflammatory disease admissions. During the COVID-19 pandemic, admissions plateaued, potentially reflecting healthcare access disruptions, reduced outpatient diagnostics delaying new diagnoses, and avoidance of hospital care by immunosuppressed patients due to infection risks. Increased reliance on telemedicine may have further deferred hospitalisations. Post-pandemic, a marked increase occurred, particularly for 'Systemic connective tissue disorders (M30-M36)' and 'Inflammatory polyarthropathies (M05-M14)'. While part of this increase may reflect pent-up demand, the timing and patterns also raise the possibility of immunological effects related to prior SARS-CoV-2 infection. These findings underscore the need for sustained surveillance and research into pandemic-related care gaps and viral triggers of autoimmunity.

Keywords

Autoimmune diseases, Inflammatory diseases, COVID-19, Time trend, Malaysia

Introduction

Emerging evidence suggests SARS-CoV-2 infection may trigger immune dysregulation, increasing susceptibility to autoimmune and inflammatory diseases. Multinational cohort studies (U.S., U.K., Germany, Hong Kong, South Korea) report 20-100% elevated risks for conditions including Rheumatoid Arthritis, Systemic Lupus Erythematosus, Psoriasis, Type 1 Diabetes and Inflammatory Bowel Disease post-COVID-19¹⁻⁴. However, population-level data from Malaysia remain unexplored. Using national hospitalisation data (2016-2023), we evaluated temporal trends in autoimmune and inflammatory disease admissions across pre-pandemic, pandemic, and post-pandemic periods to assess potential COVID-19-related effects in this population.

Materials and Methods

We included all hospital admissions for autoimmune and inflammatory diseases between 2016 and 2023 from the Malaysian Health Data Warehouse based on International Classification of Diseases (ICD-10, 2019) codes⁵. Autoimmune and

inflammatory diseases were preselected via literature review for COVID-19 associations, then refined by expert consensus. Quarterly admission rates (per 1,000,000 population) were derived using mid-year population denominators. Temporal trends were assessed via moving averages of chapter-specific admission rates.

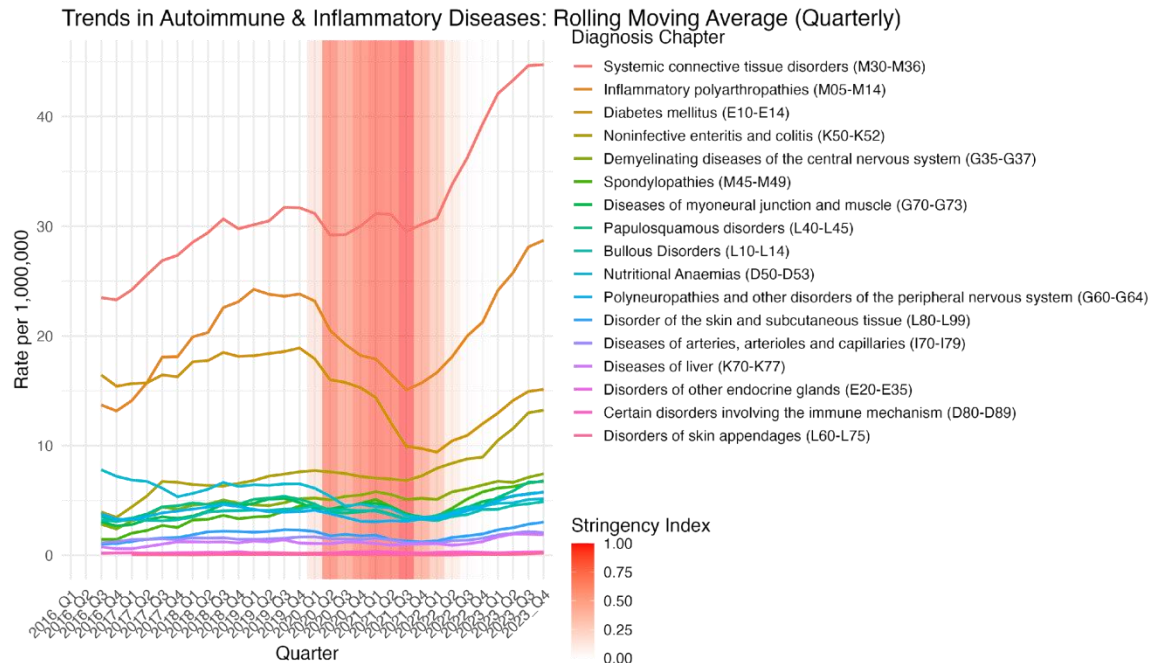


Figure 1: Trends in Autoimmune and Inflammatory Disease Admissions by ICD-10 Chapters (2019-2023), Overlaid with the COVID-19 Government Response Stringency Index (Source: Oxford COVID-19 Government Response Tracker, Hale et al., 2021).

Note: *Diabetes Mellitus (E10-E14): Type 1 Diabetes Mellitus; Diseases of Liver (K70-K77): Autoimmune Hepatitis; Nutritional Anaemias (D50-D53): Autoimmune Haemolytic Anaemia*

Table 1. Detailed Breakdown of Autoimmune and Inflammatory Diseases by ICD-10 Chapter

Autoimmune and inflammatory disease Chapters	Autoimmune and inflammatory diseases
Systemic connective tissue disorders (M30-M36)	Polyarteritis nodosa Necrotizing vasculopathy Systemic lupus erythematosus Dermatopolymyositis Systemic sclerosis Systemic connective tissue disorders Connective tissue disorders in other diseases
Inflammatory polyarthropathies (M05-M14)	Seropositive rheumatoid arthritis Psoriatic arthropathies Other rheumatoid arthritis Juvenile rheumatoid arthritis Idiopathic gout Palindromic rheumatism

Results and Discussion

Figure 1 presents quarterly moving averages of autoimmune and inflammatory disease admission rates (2016-2023), stratified by ICD-10 chapters, alongside the OxCGRT COVID-19 Stringency Index. 'Systemic connective tissue disorders (M30-M36)' demonstrated steady pre-pandemic growth (2016-2019), followed by plateauing during restrictions (2020-2021), with resurgence from Q4 2021 that surpassed pre-pandemic rates. 'Inflammatory polyarthropathies (M05-M14)' decreased during the restrictions but followed a parallel trend in the post-restriction period. Table 1 details diagnoses within these predominant chapters. The pandemic-era decline likely reflects healthcare access barriers from lockdowns and system pressures, while part of the subsequent increase in the post-pandemic period may be attributed to pent-up demand, the marked rise in Systemic connective tissue disorders (M30-M36), in particular, highlights the need to investigate SARS-CoV-2's potential role in triggering or accelerating autoimmune pathogenesis, requiring further study.

Conclusion

This study documents significant pandemic-era declines and post-COVID-19 rebounds in Malaysian autoimmune disease admissions, particularly for 'Systemic connective tissue disorders (M30-M36)'. These findings highlight critical needs: (1) sustained epidemiological surveillance of autoimmune conditions, and (2) mechanistic research into SARS-CoV-2's potential role in autoimmune pathogenesis.

References

1. Chang R, Peng K, Liu X, et al. Risk of autoimmune diseases in patients with COVID-19: a retrospective cohort study. *EClinicalMedicine* 2023; **56**:101783.
2. Peng K, Chang R, Chen Y, et al. Risk of autoimmune diseases following COVID-19 and the potential protective effect from vaccination: a population-based cohort study. *EClinicalMedicine* 2023; **63**.
3. Tesch F, Chua F, Salih R, et al. Incident autoimmune diseases in association with SARS-CoV-2 infection: a matched cohort study. *Clin Rheumatol* 2023; **42**(10):2905-14.
4. Syed U, Wang Y, Raza M, et al. Incidence of immune-mediated inflammatory diseases following COVID-19: a matched cohort study in UK primary care. *BMC Med* 2023; **21**(1):363.
5. Ministry of Health Malaysia. *Malaysian Health Data Warehouse* [Internet]. [cited 2025 Apr 29]. Available from: <https://myhdw.moh.gov.my/public/home>

EPIDPP63 / 301

Incidence of Leptospirosis in Segamat District, Johor 2024 and Its Associated Risk Factors

Choo Teck Min¹, Mohd Ridzuan Bin Mohd Lutpi¹, Mohd Khairul Anwar Bin Kamdi¹, Mohammad Nafis Bin Sahiran¹, Nor Alia Nadhirah Binti Ramli¹, Mohd Serajuddin Bin Mohd Salleh¹, Ruhaizan Bin Ruwandi¹

¹Segamat District Health Office, Jalan Gudang Ubat, Segamat, Johor

Corresponding author's email: drchooteckmin@moh.gov.my

Summary

Leptospirosis is a neglected communicable disease and recently gained attention in some regions, including South East Asia, due to El Nino floods. Leptospirosis is endemic in Malaysia and is ranked the third most fatal infection after dengue and malaria. In 2024, leptospirosis cases in Segamat district were downloaded from the e-notification system, and investigations were done to find out the risk factors. Water activity was the highest risk factor, followed by occupation, recreational spot, residential area, and unknown. One Health approach involving multisectoral collaboration reduces risk factors and leptospirosis cases.

Keywords

Incidence, Leptospirosis, Risk Factors, Endemic, Segamat

Introduction

Leptospirosis is a common zoonotic infection in the world caused by a helical and highly motile spirochete belonging to the genus *Leptospira*, which is commonly found in wild animals and rodents as its primary hosts (1). It is recognized as a neglected communicable disease and gained attention after outbreaks due to El Nino floods in India, South East Asia, Central and South America, and the United States (2). In Malaysia, leptospirosis is endemic and ranked the third most fatal infection after dengue and malaria. Heavy rainfall and floods are well-known risk factors for leptospirosis. Recreational water activities, search and rescue, occupations such as wet market workers, urban sweepers, landscapers, garbage collectors and lorry drivers are also risk factors for leptospirosis (1). In 2024, Segamat was hit by two episodes of floods affecting some parts of the district. The agricultural sector has grown fast in Segamat increases the risk of leptospirosis.

Methodology

This study is using secondary data from the e-notification system on Communicable Disease Control by the Ministry of Health. All notifiable diseases under Act 342 must be reported via this system to prevent and control them from spreading. The data was collected from epidemiological weeks 1 to 52 (31 December 2023 - 28 December 2024), located in the Segamat district of Johor. Only the confirmed cases of leptospirosis that fulfilled the case definition will be accepted. The criteria is met when leptospira microscopical agglutination testing turns positive (3). For single cases of leptospirosis, information on the history of traveling and risk factors were obtained from interviewing the patients via phone call by the assistant environmental health officers. However, in cases of an outbreak, the

investigation, environmental sampling, and risk assessment were performed in the field. The data and information were then filled in Microsoft Excel for analysis.

Results and Discussion

In 2024, the Segamat District Health Office (DHO) received 163 confirmed cases of leptospirosis, resulting in an incidence rate of 79.5 in 100 000. Out of the confirmed cases, 15 (9%) were outbreak cases and 148 (91%) were single cases. 94 (58%) cases were admitted to wards, while 69 (42%) were treated as outpatients. There were 8 (5%) mortality cases reported. In single cases, adults aged 20-64 contributed the highest number (n=87, 59%). Males had a higher number of cases, comprising about two-thirds of the total cases (n=99, 67%). The risk factors were divided into six categories, water-related activity (n=40, 25%), occupation (n=39, 24%), recreational spot (n=35, 21%), residential area (n=30, 18%), and unknown (n=19, 12%), flood (n=0, 0%). In other countries such as Thailand, the occurrence of leptospirosis is largely associated with animal farming and agriculture (4). There were three episodes of leptospirosis outbreak in Segamat in 2024: two repeated outbreaks at the same recreational spot (forest eco park) and one in a residential area. Risk assessments were done twice for the repeated outbreak, both showed a low risk of leptospirosis infection; however, environmental sampling was persistently positive for pathogenic leptospira in multiple spots. An entomological investigation was also carried out, and seven rodents, *Rattus Losea sp.* were caught out of 14 traps. For the outbreak in the residential area, the hygiene of the house is acceptable and the entomological investigation failed to catch any rodent but the patients witnessed rats in the house before. In Malaysia, leptospirosis outbreaks were also reported and mainly occurred in residential areas. The low public awareness of leptospirosis might also be a contributing factor to the likelihood of leptospirosis infections in humans in Malaysia (1).

Conclusion

The incidence rate of leptospirosis in Segamat District in 2024 was 79.5 in 100 000. It was mainly associated with water activity (1). Integrated leptospirosis prevention and control through One Health approach involving humans, animals, wildlife, and the environment to reduce risk factors and enable early detection and prompt response (5).

References

1. Philip N, Ahmed K. Leptospirosis in Malaysia: current status, insights, and future prospects. *Journal of Physiological Anthropology*. 2023 Dec 12;42(1).
2. Yuliani Setyaningsih, Apoina Kartini, Nurdin Bahtiar, Apoina Kartini, Siti Fatimah Pradigdo, Lintang Dian Saraswati. Presence of *Leptospira* sp. and leptospirosis risk factor analysis in Boyolali district, Indonesia. 2022 Feb 8;11(1).
3. Dr. Balvinder Singh Gill, Dr. Wan Noraini Wan Mohamed Noor, Dr. Rohani Binti Jahis, editors. *Case Definitions For Infectious Diseases In Malaysia*. 3rd ed. Information and Documentation Sector, Surveillance Section, Disease Control Division, Ministry of Health Malaysia; 2017.
4. Narkkul U, Thaipadungpanit J, Srisawat N, Rudge JW, Thongdee M, Pawarana R, et al. Human, animal, water source interactions and leptospirosis in Thailand. *Scientific Reports* [Internet]. 2021 Feb 5 [cited 2022 Mar 4];11(1):3215. Available from: <https://www.nature.com/articles/s41598-021-82290-5>
5. Integrated Leptospirosis Surveillance through a One Health Approach [Internet]. www.who.int. Available from: <https://www.who.int/indonesia/news/detail/18-05-2022-integrated-leptospirosis-surveillance-through-a-one-health-approach>

EPIDPP64 / 395

Overweight, Obesity, and Hypercholesterolemia Among Adults in Malaysia: Findings from the National Health and Morbidity Survey (NHMS) 2023 (Non-Communicable Disease)

Syafinaz Mohd Sallehuddin¹, Khairul Hasnan Amali¹, Nor Azian Mohd Zaki¹, Ruhaya Salleh¹, Halizah Mat Rifin¹

¹ Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: syafinaz.s@moh.gov.my

Summary

This study examines the prevalence of overweight and obesity with hypercholesterolemia among adults in Malaysia. Higher prevalence was seen in older adults, those with lower education, married or separated/divorced individuals, retirees, and unpaid workers. Key predictors include age, education, marital status, and occupation, highlighting the need for targeted interventions in high-risk subgroups.

Keywords

Overweight, obesity, Hypercholesterolemia, NHMS 2023, Adults

Introduction

Overweight and obesity are increasingly prevalent among Malaysian adults and are key contributors to non-communicable diseases (NCDs) such as diabetes and cardiovascular disease¹. Combined with this, hypercholesterolemia remains a significant metabolic risk factor, further compounding the public health burden². The co-occurrence of these conditions underscores the need for a comprehensive understanding of their prevalence and interrelationship³. This study aims to examine the prevalence of overweight and obesity with hypercholesterolemia among adults in Malaysia.

Materials and Methods

NHMS 2023 was conducted with nationally representative data utilising a two-stage stratified random-cluster sampling design. Cholesterol levels tested via a finger prick method using CardioChek® taken during the survey and hypercholesterolemia was defined as total cholesterol (TC) $\geq$ 5.2 mmol/L (4). Adults who were overweight or obese (BMI > 25) with hypercholesterolemia were included in the analysis⁴. Statistical analysis by SPSS version 29.0 (IBM Corp, 2010) with complex sample analysis was used to analyse the data, with significance p-value less than 0.05.

Results and Discussion

Among adults with hypercholesterolemia, overweight and obesity were most common in rural residents (22.6%), females (22.6%), and in those 50-59 years

(34.6%) and ≥ 60 years (34.1%) age groups. From multivariable analysis, it showed that adults aged 50-59 had significantly higher odds of overweight/obesity (AOR: 5.60; 95% CI: 3.40-7.90). Lower education levels had higher odds of overweight/obesity (primary: AOR: 1.53, secondary: AOR: 1.44, compared to tertiary). Married (AOR: 1.48) and separated/divorced individuals (AOR: 1.50) showed higher odds, while private sector employees (AOR: 0.79) and students (AOR: 0.50) were less likely to be overweight/obese than unpaid workers. Findings suggest age, education, marital status, and occupation influenced overweight and obesity in individuals with hypercholesterolemia. Education influences health literacy, while marital status may reflect behavioural changes. Private sector employees and students may be less prone to obesity due to more structured routines and higher activity levels.

Table 1: Overweight and obese with hypercholesterolemia among adults in Malaysia by sociodemographic characteristics

Sociodemographic Characteristic		Count (n)	(Overweight + Obese with hypercholesterolemia) (%)	95% CI
Location				
Urban		1990	19.7	18.23, 21.18
Rural		660	22.6	20.17, 25.15
Sex				
Male		1058	18.1	16.44, 19.99
Female		1592	22.6	21.04, 24.31
Age Group				
18-29 years		136	6.3	5.00, 7.79
30-39 years		337	15.7	13.52, 18.14
40-49 years		495	23.5	21.20, 26.09
50-59 years		670	34.6	31.33, 37.80
60 and above		1012	34.1	31.68, 36.71

Table 2: Factors Associated with Overweight and Obesity Among Adults with Hypercholesterolemia

Sociodemographic Characteristics	Crude OR	95% CI	p-value	AOR	95% CI	p-value
Age Group						
18-29 years (ref)	1.00	-	-	1.00	-	-
30-39 years	2.79	2.11, 3.70	<0.001	2.21	1.60, 3.10	<0.001
40-49 years	4.61	3.52, 6.05	<0.001	3.40	2.43, 4.78	<0.001
50-59 years	7.93	6.10, 10.30	<0.001	5.60	3.40, 7.90	<0.001
60 and above	7.77	6.01, 10.06	<0.001	5.08	3.48, 7.42	<0.001
Marital Status						
Never married (ref)	1.00	-	-	1.00	-	-

Married/living with partner	3.72	3.06, 4.53	<0.001	1.48	1.14, 1.91	0.003
Separated/divorced	5.40	4.30, 6.79	<0.001	1.50	1.13, 1.99	0.005
Education Level						
No formal education	1.97	1.49, 2.61	<0.001	1.26	0.87, 1.81	0.27
Primary school	2.24	1.72, 2.91	<0.001	1.53	1.14, 2.06	0.005
Secondary school	1.56	1.27, 1.92	<0.001	1.44	1.16, 1.80	0.001
Tertiary education (ref)	1.00	-	-	1.00	-	-
Occupation						
Government employees	0.74	0.56, 0.98	0.04	0.94	0.65, 1.37	0.75
Private employees	0.49	0.38, 0.62	<0.001	0.79	0.56, 2.06	0.16
Self-employed	0.78	0.59, 1.01	0.06	0.89	0.63, 1.26	0.51
Unpaid worker / homemaker	1.20	0.91, 1.59	0.20	1.11	0.81, 1.55	0.51
Retiree	1.59	1.22, 2.07	<0.001	1.04	0.76, 1.43	0.81
Student	0.11	0.06, 0.20	<0.001	0.50	0.25, 0.99	0.05
Not working (ref)	1.00	-	-	1.00	-	-

Conclusion

Overweight and obesity are significantly associated with hypercholesterolemia among adults in Malaysia, especially in certain high-risk groups, including older adults, those with lower education levels, and married individuals. Integrated health strategies that address obesity and high cholesterol should focus on these vulnerable groups who face higher health risks.

References

1. Hossain MS, Islam MD, Galib A, et al. Lipid profile in relation to body mass index among medical college students in Dhaka, Bangladesh. *Med Today*. 2021;33(2):114-9.
2. Al-Ajlan AR. Lipid profile in relation to anthropometric measurements among college male students in Riyadh, Saudi Arabia: a cross-sectional study. *Int J Biomed Sci*. 2011;7(2):112.
3. Shamai L, Lurix E, Shen M, et al. Association of body mass index and lipid profiles: evaluation of a broad spectrum of body mass index patients including the morbidly obese. *Obes Surg*. 2011;21:42-7.
4. Institute for Public Health (IKU). *National Health and Morbidity Survey (NHMS) 2023: Non-Communicable Diseases and Healthcare Demand: Technical Report*. Kuala Lumpur: Ministry of Health Malaysia; 2024.

EPIDPP65 / 401

Improving Diabetes Mellitus Care in Primary Health Clinics in Kuala Lumpur Through Clinical Audit of Diabetes Mellitus

Waramlah Ramlan ¹, Jaysina Ayu Jaafar Siddek ¹, Haliza Abd Manaf ¹

¹ State Health Department of Federal Territory of Kuala Lumpur and Putrajaya

Corresponding author's email: waramlah@moh.gov.my

Summary

Clinical audit of Diabetes Mellitus is a quality improvement process that involves the systematic review of diabetes care, followed by the implementation of changes to enhance patient outcomes. This study aimed to evaluate the impact of clinical audit on diabetes care of patients attending primary health clinics in Kuala Lumpur. Process measures and intermediate outcome measures were evaluated through structured review of outpatient records. A total of 3073 and 3116 were sampled for 2022 and 2024 respectively, using random sampling. Significant improvement was observed in most performance indicators. In conclusion, clinical audit is a useful tool in improving diabetes care.

Keywords

Diabetes Mellitus, Clinical Audit, Primary Health Clinics, Kuala Lumpur, HbA1c

Introduction

Diabetes mellitus (DM) has emerged as a significant public health concern in Malaysia, with its prevalence escalating from 13.4% in 2015 to 15.6% in 2023 among adults^{1,2}. This upward trend underscores the pressing need for effective management strategies, particularly within primary care settings where the majority of stable and less complicated patients receive ongoing care. Despite the availability of clinical practice guidelines and structured care protocols, variations in service delivery and adherence to best practices persist. These inconsistencies can lead to suboptimal patient management and highlight the necessity for systematic quality improvement measures. The Ministry of Health (MOH) has recognized the value of Diabetes Clinical Audit (DCA) and the National Diabetes Registry (NDR) that has been implemented nationwide to monitor and improve diabetes care in the primary health clinics. This article explores the outcomes of DCA in enhancing DM care within primary health clinics in Kuala Lumpur.

Materials and Methods

This study presents the patient characteristics, indicators of process and clinical outcome measures among audited Type 2 DM patient records in primary health clinics in Kuala Lumpur for the year 2024 in comparison with 2022. There were a total of 3073 and 3116 patients enrolled in the audit in 2022 and 2024, respectively, from which samples were derived from the NDR by using random sampling. The standard of care was critically appraised by examining various indicators from outpatient clinic cards, prescriptions, as well as laboratory results, and

benchmarking them with the standard of care recommended by the User Manual: Diabetes Clinical Audit in Health Facility³. The Student's t-test was used to compare continuous variables and Pearson's chi-squared or Fisher's exact test was used for categorical variables as appropriate. All data were analysed using SPSS version 21.0. As this was a clinical audit of diabetes care, ethical approval was considered unnecessary.

Results and Discussion

There were no statistical differences in gender, ethnicity distribution, diabetes age, anti-diabetes therapy or smoking status between the groups of patients in each audit year. However, there were significant differences in age. The majority of patients were female (58.6%), Malay (42.9%), on oral anti-diabetes therapy (73.7%) and non-smokers (93.4%) in 2024 (Table 1). All the rates of annual examination or screening of process measures showed significant improvement in 2024, except for ECG examination (Table 2). The achievements in intermediate outcome measures showed significant improvement in 2024, except for LDL screening (Table 3). The same finding was found in a similar study in Sarawak⁴. The percentage of patients achieving the Diabetes Quality Assurance target of HbA1c $\leq 6.5\%$ has gradually increased to 36.4% in 2024, from 31.9% in 2022. This finding is higher than the National Diabetes Registry Report 2020, 30.7%⁵. The mean of HbA1c had also reduced from 7.38% to 7.25%.

State-level strategies were initiated to improve the process of care, such as conducting a short course 'Diabetes Trained' (DT) among paramedics to address the lack of Diabetes Educators (DE) in the clinics. Whereas, medical officers were given opportunities to increase and update their knowledge by conducting Continuing Medical Education (CME) sessions discussing cases with experienced endocrinologists every two months. Furthermore, they were encouraged to join the Diabetes Lifestyle Program online course to enhance their knowledge about diabetes lifestyle management. To enhance complication screening, collaborative funduscopy examinations between the hospital and health clinics were conducted to increase eye screening. Adequate monofilaments were also made easily accessible in each room to facilitate foot examinations in the busy clinics. Additionally, Diabetes Mellitus Technical Meeting involving all stakeholders in diabetes management was held annually which offers a platform for discussion on navigating improvements in diabetes care within health clinics in Kuala Lumpur.

Table 1: Patient characteristics (%)

Patient characteristics		Audit 2022	Audit 2024	P-value
Age (years) (mean)		63.64	64.50	0.002
Gender	Male	41.9	41.4	0.663
	Female	58.1	58.6	
Ethnicity	Malay	42.5	42.9	0.361
	Chinese	36.7	37.5	
	Indian	19.5	18.6	
Diabetes age (mean)		53.83	54.03	0.465
Anti-Diabetes Therapy	Oral	71.6	73.7	0.069
	Insulin	28.4	26.3	
Smoking status	Yes	6.0	6.6	0.327
	No	94.0	93.4	

Table 2: Indicators of process measures (%)

Indicators	Audit 2022	Audit 2024	<i>P-value</i>
Body mass index	93.3	94.8	<0.001
Blood pressure	97.9	98.6	<0.001
HbA1c	96.3	97.6	<0.001
Total cholesterol	87.2	90.9	<0.001
HDL cholesterol	87.2	90.8	<0.001
LDL cholesterol	87.1	90.9	<0.001
Serum creatinine	88.4	92.0	<0.001
Urine protein	71.8	78.5	<0.001
Urine microalbumin	48.6	53.3	<0.001
Fundoscopy	55.0	73.6	<0.001
Foot examination	67.4	80.8	<0.001
ECG	54.5	24.6	<0.001
Erectile dysfunction examination	22.2	30.2	<0.001

Table 3: Achievement for intermediate outcome measures

Indicators	Audit 2022	Audit 2024	<i>P-value</i>
Fasting blood sugar (mean)	7.60	7.10	<0.001
HbA1c (mean)	7.38	7.25	0.002
HbA1c ≤6.5 (%)	31.9	36.4	<0.001
Systolic blood pressure (mean)	136.62	135.51	0.005
Diastolic blood pressure (mean)	75.77	74.80	<0.001
Total cholesterol (mean)	4.50	4.44	0.037
LDL cholesterol (mean)	2.52	2.49	0.333
HDL cholesterol (mean)	1.29	1.31	0.022

Conclusion

Clinical audits have resulted in simple remedial measures, including the capacity building of the staff, mobilizing resources and ensuring adequate equipment in diabetes management. By examining current practices, identifying gaps, and implementing targeted interventions, clinical audits serve as a pivotal tool in elevating the standard of diabetes management and ensuring better health outcomes.

References

1. Institute for Public Health. *National Health and Morbidity Survey 2023: Non-Communicable Diseases and Healthcare Demand. Technical Report*. Institute for Public Health; 2024.
2. Institute for Public Health. *National Health and Morbidity Survey 2019: Non-Communicable Diseases and Healthcare Demand. Technical Report*. Institute for Public Health; 2020.
3. Bahagian Kawalan Penyakit, Kementerian Kesihatan Malaysia. *Manual Pengguna Audit Klinikal Diabetes di Fasiliti Kesihatan. Manual 3.0*. 2008.
4. Tan F, et al. Improving diabetes care in a public hospital medical clinic: report of a completed audit cycle. *J Eval Clin Pract*. 2011;17(1):40-4. doi:10.1111/j.1365-2753.2010.01367.x
5. Disease Control Division, Ministry of Health Malaysia. *National Diabetes Registry Report 2020*. Ministry of Health Malaysia; 2021.

EPIDPP67 / 424

Dengue Trends in Petaling District, Malaysia: A 2023-2024 Analysis

Nor Izyani Bahari¹, Mas Ahmad Sherzkawee Mohd Yusoff¹, Jamiatul Aida Md Sani¹,
Junisha Hani Baharudin¹

¹*Petaling Health District Office, Ministry of Health Malaysia*

Corresponding author's email: dr.masahmad@moh.gov.my

Summary

Dengue remained a major public health issue across Asia, with Malaysia recording 122,423 cases and 117 deaths by week 52 in 2024, slightly lower than in 2023. Petaling District had the highest cases (20,327), with a sharp rise early in the year that declined after week 14. Deaths dropped from 8 in 2023 to 3 in 2024. Integrated Vector Management was key, combining biological, physical, and chemical methods, shared responsibilities between health authorities and local councils, and stronger community engagement via Communication for Behavioural Impact programs. Despite limitations in resources and logistics, these coordinated efforts successfully reduced outbreaks and improved dengue control.

Introduction

Dengue fever remains a serious tropical and subtropical public health burden. Overall, dengue case trends in 2024 and early 2025 demonstrated variation across Asian countries¹. The Malaysian Ministry of Health reported a cumulative 122,423 dengue cases as of 2024 week 52, with 117 deaths. These numbers were lower than those of 2023 week 52 (123,133 cases and 100 deaths)². This analysis examined integrated vector management (IVM) and the challenges regarding dengue hotspot outbreaks in the Petaling district, Selangor, Malaysia, that contributed to the declining pattern of dengue fever cases in 2024.

Materials and Methods

We analysed 2023 and 2024 using the common comparative method referring to the number of dengue fever notifications and cases registered by epidemiological week, and compared the cumulative number of outbreaks and deaths for the same year based on edengueV2 system³. The comparisons were also analysed based on the cumulative number of dengue fever cases among the three Petaling local authority areas: Subang Jaya City Council (MBSJ), Petaling Jaya City Council (MBPJ), and Shah Alam City Council (MBSA). This study involved a descriptive analysis. The following terms were used: controlled outbreak (WT), a dengue fever occurrence that exceeds one case in a particular locality where the notification date between one case and another is <14 days; uncontrolled outbreak (WTK), a dengue case occurrence that occurs >14 days from the notification of the first case; hotspot (HT), a dengue fever outbreak that persists for >30 days after the notification of the second case³. The "alert line" is an epidemic threshold benchmark determined based on the median number of weekly cases over the past 5 years (2019-2023). In this chart, the alert line is red, set at 250 cases, and is an early warning indicator of case increases that exceed the normal range. The "action line" is a benchmark set by adding 25% to the alert line value. In this chart, the action line is green and

set at 312 cases. Case numbers exceeding this line indicate a more serious situation that requires immediate outbreak control measures.

Results and Discussion

Petaling district recorded the highest dengue fever case numbers in 2024 (20,327 cases). In early 2024, Petaling dengue fever cases increased sharply compared to 2023, with case numbers exceeding the “action line” in the first few weeks. After 2024 week 14, dengue fever cases began to decline consistently and were below the action line in epidemic week 33, then were below the “alert line” until epidemic week 52. The case numbers in 2023 were higher in the second half of the year with significant fluctuations, especially around epidemiological weeks 30-50, where case numbers remained high and exceeded the alert line. (Figure 1)

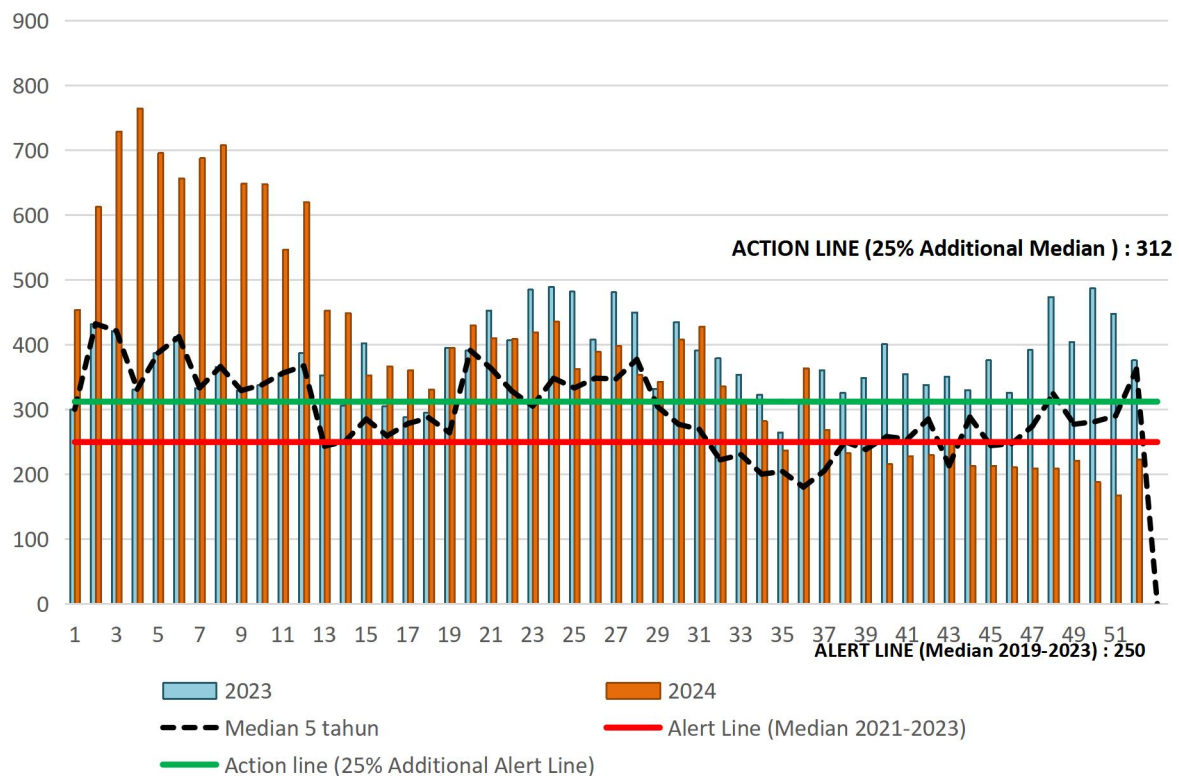


Figure 1: Comparison of Dengue Case Registers by Epidemiology Week in Petaling District for 2023 and 2024

MBSA recorded a marginal increase of 0.9%, while MBPJ experienced a significant jump of 14.7%. On the other hand, MBSJ recorded a cumulative decrease of 4.6%, which may be a result of more effective preventive measures in the area. Cumulative data on dengue fever deaths up to Epidemiological Week (EW) 52 for the years 2023 and 2024 shows a significant decrease in the overall number of deaths. In 2023, a total of 8 deaths were recorded, while in 2024, this number decreased to only 3 cases, showing a decrease of 62.5%. (Table 1)

Table 1: Cumulative Cases Registered and Dengue Fever-Related Death Cases According to Local Authorities Up to EW 52 for the Years 2023 and 2024 in Petaling District

PBT	Cumulative Cases Registered up to EW 52/2023	Cumulative Cases Registered up to EW 52/2024	% Increase/Decrease in Cases	Cumulative Death Cases up to EW 52/2023	Cumulative Death Cases up to EW 52/2024	% Increase/Decrease in Death Cases
MBSA	6005	6057	0.9%	2	0	100%
MBPJ	5676	6653	14.7%	5	2	60%
MBSJ	7988	7617	4.6%	1	1	0.0%
Jumlah	19669	20327	3.2%	8	3	62.5%

The Petaling District Health Office adopted IVM for controlling dengue outbreaks in the district, which combined control strategies to ensure more effective and cost-effective reduction in the spread of vector-borne diseases (dengue, malaria, and chikungunya). IVM involves advocacy and legislative components, agency and stakeholder collaboration, emphasising the use of combined biological, physical, and chemical methods, including *Bacillus thuringiensis israelensis* and *Wolbachia* mosquito dispersal, and space spraying ultra-low volume (ULV). The ownership approach was implemented in 2024, where uncontrolled outbreak (WTK) and hotspots (HS) were given to the local authorities. Health District Office is responsible for controlled outbreak (WT) and sporadic cases, where the team implemented more breeding site destruction (PTP) activities in WT localities (65.1%) and sporadic cases (84.9%). As the Petaling local authority controls WTK and HS localities, the local authorities implemented 52% and 93.6% of using thermal fogging (SRT) in dengue outbreak localities and sporadic localities, respectively. Furthermore, the local authorities implemented 66% of ULV in dengue outbreak localities, especially in WTK and HS localities. MBPJ recorded increased cases despite high vector control as its administered localities are closer, denser, and have a higher population density (8,844/km²) than MBSJ (5,988/km²) and MBSA (2,366/km²).

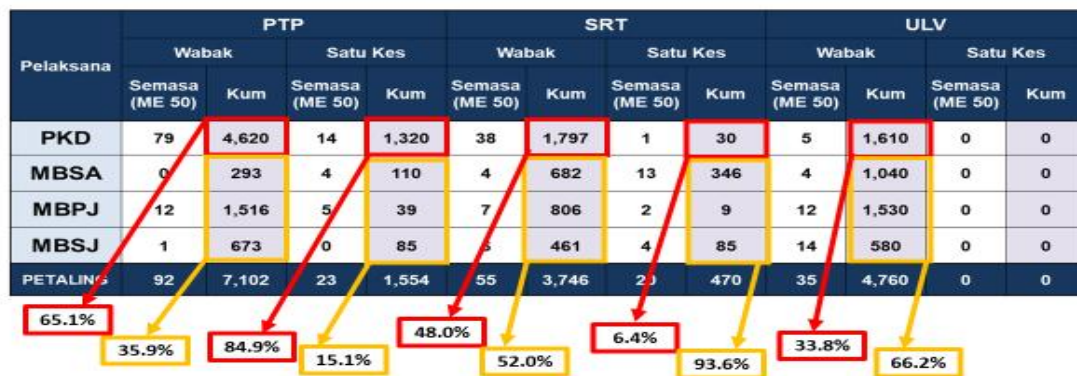


Figure 2: Control Activities for Outbreak Localities and Sporadic Cases by Local Authority for Petaling District in 2024

The implementation of dengue prevention programs through the Communication for Behavioural Impact (COMBI) approach has also contributed to the reduction in dengue patterns. COMBI zones formed from localities led by councilors of the same council zone, have further strengthened efforts to empower communities in carrying out PTP in their respective places of residence.

Conclusion

Despite limitations in human resources and logistical issues such as shortages and unavailability of poisons and shortages of transportation, the 2024 dengue fever case pattern in Petaling district demonstrated a decreasing trend, due to strategic partnership with three Petaling local authorities (MBPJ, MBSJ and MBSA) and city councilor.

References

1. European Centre for Disease Prevention and Control. Twelve-month dengue virus disease case notification rate per 100,000 population January-December 2024. 2025 [cited 2025 May 13]. Available from: <https://www.ecdc.europa.eu/en/publications-data/twelve-month-dengue-virus-disease-case-notification-rate-100-000-population>
2. Ministry of Health Malaysia. Kenyataan media KKM - situasi semasa demam denggi di Malaysia 2025 [Internet]. Putrajaya: MOH; 2025 [cited 2025 May 13]. Available from: https://www.moh.gov.my/index.php/database_stores/store_view_page/17/2599
3. Ministry of Health Malaysia. Pelan strategik pencegahan dan kawalan denggi kebangsaan 2022-2026 [Internet]. Putrajaya: MOH; 2022 [cited 2025 May 13]. Available from: https://www.moh.gov.my/moh/resources/Penerbitan/Pelan%20Strategik%20/Buku_Pelan_Strategik_Pencegahan_dan_Kawalan_Denggi_Kebangsaan_Final.pdf

EPIDPP68 / 433

Dysentery Under the Microscope: A Study from Kuala Krai

Sarah Saizan¹, Siti Salimah Yusoff¹, Hazura Mat Zubir¹

¹ Kuala Krai District Health Office, Kelantan State Health Department

Corresponding author's email: drsarah.saizan@moh.gov.my

Summary:

This case-control study investigated factors associated with confirmed dysentery cases among children in Kuala Krai District. Out of 130 children with diarrhea, 36 were confirmed to have dysentery based on laboratory results. This study showed that dysentery among children was linked to more severe illness, as indicated by hospital admissions. Environmental contamination, supported by microbial findings, was a likely source. Although formula feeding and older age showed higher odds, these were not statistically significant. The study emphasizes the importance of environmental hygiene, water quality control, and early detection in preventing dysentery.

Keywords:

Dysentery, case-control study, water supply, environmental health, Malaysia

Introduction:

Dysentery, a severe form of diarrhea characterized by the presence of blood in stools, remains a public health concern, particularly in developing countries. In Malaysia, while overall diarrheal disease trends are well-monitored, specific analyses on dysentery are limited. Kuala Krai District has reported an increasing trend in dysentery cases in recent years. This study aimed to identify factors associated with dysentery among children in Kuala Krai using a case-control design.

Methodology:

A case-control study was conducted using surveillance data from 2023 until 2025 of 130 pediatric diarrhea cases from Kuala Krai district. Thirty-six cases were confirmed dysentery (via stool culture or identifying pathogens such as Salmonella or E. coli), while 94 were non-dysentery controls. Data on demographics, feeding practices, water sources, sanitation, environmental cleanliness, and laboratory water quality were analyzed. Descriptive statistics, bivariate analysis (Chi-square/Fisher's Exact), and multivariate logistic regression were performed.

Results and discussion

Of the 130 children included, 82.3% were below 1 year old and 60% were male.

Table 1: Sociodemographic features of cases and controls

Variables		Cases (n 36)	Control (n 94)
Age	< 1 year	26	81
	> 1 year	10	13
Race	Malay	35	93
	Chinese	1	0
	Siam	0	1
Gender	Female	15	37
	Male	21	57
Seek treatment	Clinic	1	3
	Hospital	35	91
Need admission	Hospital admission	20	30
	Discharge home	16	64
Feeding	Breast milk	2	9
	Bottle feeding	34	85
Water supply	Chlorinated water	25	77
	Gravity feed system	11	17
Environment	Satisfied	5	0
	Dirty	31	94
Microbe in tap water	Not detected	24	0
	E.coli, coliform	12	94

Table 2: Bivariate and multivariate analysis

Variable	Adjusted OR	95% CI	p-value	Interpretation
Hospital admission (not admitted)	2.84	1.19 - 6.65	0.016	Significantly associated
Age >1 year	2.37	0.86 - 6.50	0.094	Not significant, but suggestive
Milk (formula feeding)	2.72	0.32 - 23.00	0.36	Not significant
Environment (unsatisfactory)	~1.0*	Wide CI	0.998	Separation detected
Sewage (uncontrolled)	~1.0*	Wide CI	0.999	Separation detected

**Extremely large coefficients and standard errors suggest perfect separation or sparse data; these values are unreliable without penalized logistic methods.*

This study highlights that there were more cases admitted to the hospital, suggesting that confirmed cases often presented with more severe clinical features requiring inpatient care. Children who were admitted were significantly more

likely to be diagnosed with confirmed dysentery, suggesting a greater severity of illness and the need for more intensive medical attention. This aligns with studies showing that dysentery often presents with more systemic symptoms compared to other diarrheal diseases, including fever, abdominal pain, and tenesmus, prompting hospital-based care^{1,2}.

Although environmental sanitation and water contamination were strongly linked to dysentery in the bivariate analysis, these variables separated data during multivariate modeling, indicating powerful associations that could not be reliably estimated with standard logistic regression. Children exposed to unsatisfactory environments and uncontrolled sewage systems had a higher likelihood of dysentery. These findings are consistent with existing literature indicating that poor sanitation is a key driver of enteric diseases, particularly in rural or underserved communities^{3,4}. The presence of pathogens such as *Salmonella* spp. and *Escherichia coli* among the dysentery cases further supports the environmental transmission pathway, often linked to fecal contamination of water and food⁵. These findings align with existing literature on the importance of clean water and hygiene in preventing enteric infections.

Although formula feeding was not statistically significant in the multivariate analysis, it showed a higher crude odds of dysentery compared to breastfed children. Formula feeding has been associated with an increased risk of gastrointestinal infections, especially in settings with unsafe water or inadequate bottle hygiene⁶. This is particularly concerning in rural areas where water quality may be compromised, as evidenced by tap water samples testing positive for *E. coli* and coliforms in some households.

Children above one year of age had slightly higher adjusted odds of dysentery, although not statistically significant. Age-related exposure to contaminated food and increased mobility may contribute to this pattern, as noted in previous pediatric studies⁷. However, this observation should be interpreted cautiously, given the small sample size.

The issue of perfect separation for variables such as water quality and microbial involvement suggests these are strong predictors of dysentery, but standard logistic regression could not estimate their effects reliably. In such cases, alternative methods like Firth logistic regression are recommended to address separation bias⁸.

Conclusion:

Dysentery cases in Kuala Krai District tend to present with greater severity. To prevent progression of severe or fatal outcomes, it is crucial to ensure early disease detection, promote food hygiene through health education, encourage the use of treated water sources, and provide timely medical treatment.

References:

1. Guerrant RL, Van Gilder T, Steiner TS, et al. Practice guidelines for the management of infectious diarrhea. *Clin Infect Dis*. 2001;**32**(3):331-351.
2. Murni IK, Duke T, Triasih R, et al. Clinical predictors of dysentery in children with acute diarrhea. *BMC Pediatr*. 2020;**20**:222.
3. World Health Organization (WHO). *Progress on household drinking water, sanitation and hygiene 2000-2020*. Geneva: WHO; 2021.
4. Gera T, Shah D, Sachdev HS. Impact of water, sanitation and hygiene interventions on growth, non-diarrheal morbidity and mortality in children in developing countries: A systematic review. *Indian Pediatr*. 2018;**55**(5):381-393.
5. Ministry of Health Malaysia. *Guidelines on Management of Food and Waterborne Diseases*. Disease Control Division, MOH; 2012.
6. Lamberti LM, Fischer Walker CL, Noiman A, et al. Breastfeeding and the risk for diarrhea morbidity and mortality. *BMC Public Health*. 2011;**11**(Suppl 3):S15.
7. Fischer Walker CL, Perin J, Aryee MJ, et al. Diarrhea incidence in low- and middle-income countries in 1990 and 2010. *BMC Public Health*. 2012;**12**:220.
8. Heinze G, Schemper M. A solution to the problem of separation in logistic regression. *Stat Med*. 2002;**21**(16):2409-2419

EPIDPP69 / 434

An episode of food poisoning outbreak: Salmonella, are you the culprit?

Mohd Adlan Md Kamal¹, Anis Nadirah Mohamad Zainudin¹, Zakiah Othman², Khairul Anwar Jabir¹, Renuga Devi Kanabalan¹, Rohaya Ramli¹

¹Cheras Health District, Kuala Lumpur & Putrajaya Health Department, Ministry of Health Malaysia

²Centers for Disease Control and Prevention (CDC), Kuala Lumpur & Putrajaya Health Department, Ministry of Health Malaysia

Corresponding author's email: adlankamal2@gmail.com

Summary

In December 2023, a food poisoning outbreak was reported following a school dinner in Cheras, affecting 72 of 322 attendees. Symptoms included diarrhoea, abdominal pain, nausea, and vomiting. A case-control study identified undercooked grilled chicken chop as the likely source, suggesting *Salmonella* spp. contamination—consistent with global trends in poultry-related salmonellosis. Although no pathogens were isolated, HACCP findings supported this conclusion. Health education was provided, emphasizing the principle of “see, smell, and taste” before eating. Strengthened food safety practices and enforcement were recommended to prevent future outbreaks.

Keywords

Food poisoning, case-control study, “see,smell and taste”

Introduction

The Cheras Health District Health Office was informed regarding a surge of patients complaining of food poisoning symptoms from the Cheras Health Clinic on 14th December 2023. A team was initiated to assess the situation and respond to the outbreak. The objective of the investigations was to determine the source of the outbreak and to implement control and preventive measures.

Materials and Methods

A case-control study (1:1 ratio) was conducted to identify the source and contributing factors of a foodborne outbreak that occurred during a Secondary School Dinner in Cheras in December 2023. A case was defined as an individual who presented with any of the following symptoms: diarrhoea, nausea, vomiting, or abdominal pain after consuming food served at the event. Active case detection and face-to-face interviews were performed among attendees. In addition, laboratory investigations including stool and environmental sample analyses were carried out. A descriptive analysis such as Hazard Analysis and Critical Control Points (HACCP) assessment was utilized to evaluate food preparation processes and identify potential safety breaches.

Results and Discussion

72 cases (44 males and 28 females) were identified among 388 attendees of the annual dinner and exposed, hence the attack rate of 18.56% (Table 1). Main symptoms were diarrhoea (100%), abdominal pain (100%), nausea (34.72%), and vomiting (4.17%) with a median incubation period of 10 hours as based on epidemiological curve (Figure 1). Analysis showed that grilled chicken chop had the highest food attack rate of 57.14% with an odds ratio of 44.67 (CI 20.1, 99.07; $p < 0.05$). The pathogen suspected was *Salmonella* spp based on the incubation period and the complaints of grilled chicken chops having a foul smell and being slimy¹⁻³. Otherwise, rectal swabs of patients and environmental samples showed no pathogen isolated. Based on HACCP, the grilled chicken chops were undercooked and the holding time was more than 4 hours⁴.

Conclusion

This food poisoning outbreak was likely caused by *Salmonella* spp as the chickens were undercooked and had a long holding time. Health education regarding food hygiene was given to students and teachers. They were advised to always practice the principle of “see, smell and taste” before consuming any food. Strict control measures and food act policy to be strengthened, be it at school and among food caterers.

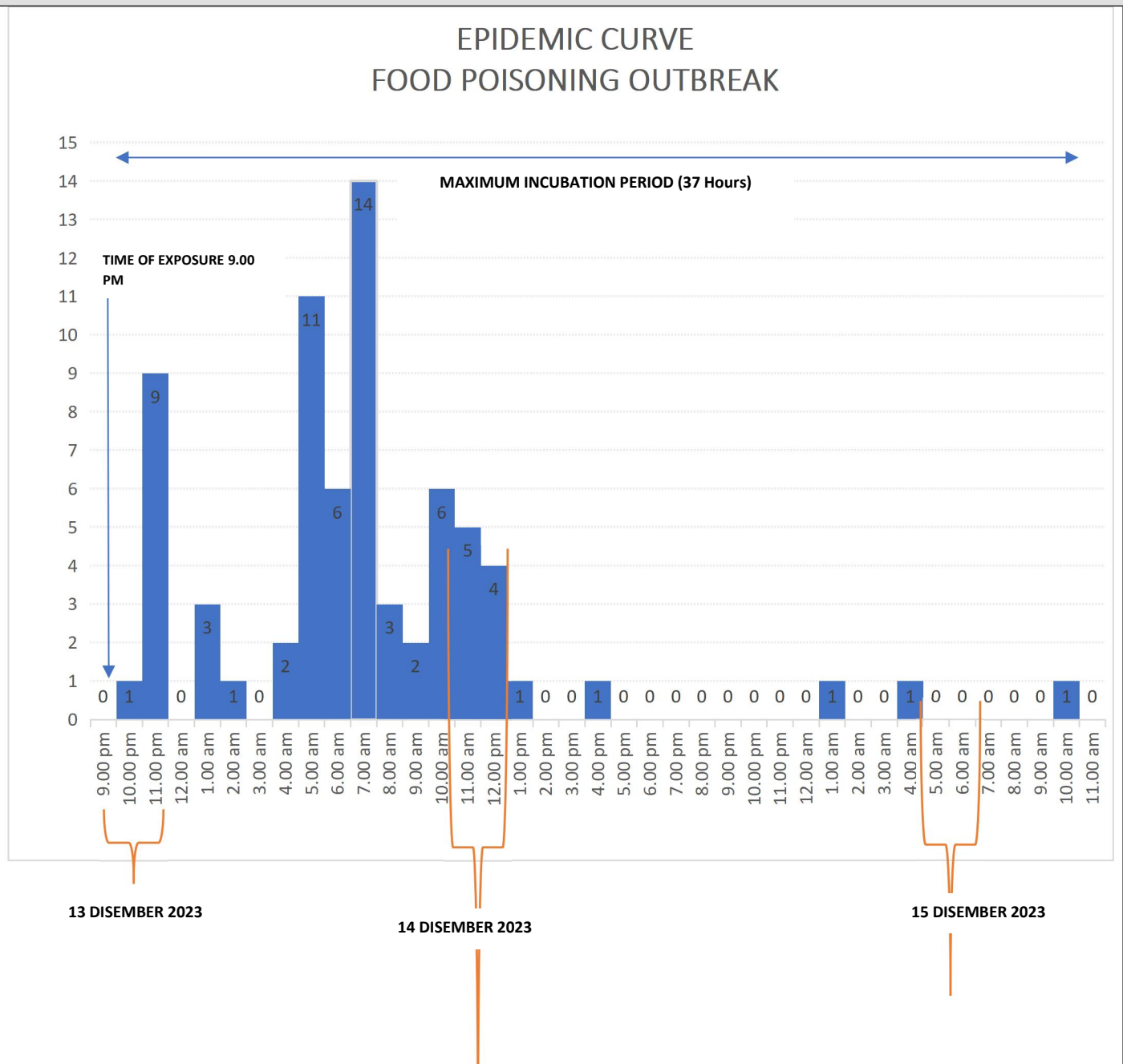
Reference

1. Majowicz SE, Musto J, Scallan E, et al. The global burden of nontyphoidal *Salmonella* gastroenteritis. *Clin Infect Dis*. 2010;50(6):882-9.
2. Shaji S, Selvaraj RK, Shanmugasundaram R. *Salmonella* infection in poultry: A review on the pathogen and control strategies. *Microorganisms*. 2023;11(11):2814.
3. Scallan E, Hoekstra RM, Angulo FJ, et al. Foodborne illness acquired in the United States—major pathogens. *Emerg Infect Dis*. 2011;17(1):7-15.
4. Ho-Palma AC, Gonzales-Gustavson E, Quispe E, et al. *Salmonella* in chicken and pork meat as a likely major contributor to foodborne illness in Peru. *Am J Trop Med Hyg*. 2024;111(1):141-8.

Table 1

NO	TYPE OF MENU	MEAL TAKEN				MEAL NOT TAKEN				DIFFER ENCE ATTACK RATE (D-H)*	OR	p value	Confidence. Interval (CI)	
		A	B	C	D*	E	F	G	H*					
		SY M PT O M A T I C	ASY M P T O M A T I C	A+ B	RATE : A/C x 100	S Y M P T O M A T I C	AS Y M P T O M A T I C	E+F	RATE: E/G x 100					
1	Mushroom soup	44	166	210	20.95	28	150	178	15.73	5.22	1.420	0.1874	0.8419	2.3950
2	Bun or Garlic Bread	32	145	177	18.07	40	171	211	18.95	-0.88	0.943	0.8246	0.5638	1.5787
3	Nasi Butter	60	193	253	23.71	12	123	135	8.88	14.83	3.187	0.0003	1.6473	6.1639
4	Buffalo Chicken (chicken wing)	52	165	217	23.96	20	151	171	11.69	12.27	2.379	0.0020	1.3578	4.1696
5	Chicken grill (chicken chop)	64	48	112	57.14	8	268	276	2.89	54.25	44.667	0.0000	20.138 1	99.071 4
6	Aglío olio seafood	29	188	217	13.36	43	128	171	25.14	-11.78	0.459	0.0030	0.2725	0.7737
7	Nugget	58	200	258	22.48	14	116	130	10.76	11.72	2.403	0.0051	1.2838	4.4975
8	Fries	58	191	249	23.29	14	125	139	10.07	13.22	2.711	0.0013	1.4503	5.0688
9	Fruit Salad	15	121	136	11.02	57	195	252	22.61	-11.59	0.424	0.0051	0.2299	0.7823
10	Assorted pudding	46	163	209	22	26	153	179	14.52	7.48	1.661	0.0587	0.9784	2.8189
11	Assorted Fruits	37	141	178	20.78	35	175	210	16.66	4.12	1.312	0.2983	0.7858	2.1907
12	Teh Tarik	24	146	170	14.11	48	170	218	22.01	-7.9	0.582	0.0470	0.3401	0.9966
13	Lemon Blue Ocean drink	39	170	209	22.94	33	146	179	18.43	4.51	1.015	0.9548	0.6073	1.6964
14	Assorted Cake	60	195	255	23.52	12	121	133	9.02	14.5	3.103	0.0005	1.6036	6.0029
15	Lamb Chop	20	120	140	14.28	52	196	248	20.96	-6.68	0.628	0.1040	0.3576	1.1037
16	Dessert cocktail	20	124	144	13.88	52	192	244	21.31	-7.43	0.596	0.0692	0.3392	1.0457

Figure 1



EPIDPP70 / 442

Harnessing Artificial Intelligence for Improved Diagnosis and Surveillance of Leptospirosis

Murnihayati Hassan^{1*}, Siti Nur Zawani Rosli¹, Meruwan Amin Shoib¹, Mohd Nadzuan Yahaya¹, Mohammad Ridhuan Mohd Ali¹

¹*Bacteriology Unit, Infectious Disease Research Centre, Institute for Medical Research, Shah Alam, Malaysia.*

Corresponding author's email: murnihassan@moh.gov.my.

Summary:

Leptospirosis remains a major public health concern in Malaysia, ranking as the third most fatal infectious disease after dengue and malaria. Between 2010 and 2022, incidence rates varied between 8.63 and 17.2 per 100,000 population, with case fatality rates ranging from 0.6% to 2.4% (Philip & Ahmed, 2023). Transmission occurs through environmental exposure to water, soil, or mud contaminated by infected animals, aligning with the One Health concept.

Artificial Intelligence (AI) is transforming diagnostic accuracy and surveillance, addressing challenges posed by the biphasic nature of the disease. AI-driven Deep Convolutional Neural Networks (DCNN) and Clinical Decision Support Systems (CDSS) improve early detection, while predictive modeling aids outbreak forecasting in high-risk Malaysian states. AI also strengthens veterinary surveillance, enabling a unified human-animal-environment approach. Sustained investment, collaboration, and data-sharing are crucial to realizing AI's full potential in combating leptospirosis in Malaysia.

Keywords

Artificial intelligence, leptospirosis, diagnostic, surveillance, Malaysia

Introductions

Leptospirosis remains a significant public health concern in Malaysia, ranking as the third most fatal infectious disease after dengue and malaria. Between 2010 and 2022, the incidence rate ranged from 8.63 to 17.2 per 100,000 population, while the case fatality rate (CFR) varied between 0.6% and 2.4% (Philip & Ahmed, 2023). Since its classification as a notifiable disease in 2010, all probable and confirmed cases must be reported to the relevant health district office. Despite a decline in incidence in 2020, the CFR increased notably compared to the previous year (2020: 1.3%, 2019: 0.6%), underscoring the continued burden of the disease (Figure 1).

The transmission of leptospirosis involves humans, animals, and the environment, aligning with the *One Health* concept, which recognizes the interconnectedness of human health, animal health, and the shared environment. Infection commonly occurs through contact with water, soil, or mud contaminated with the urine of infected animals, including rodents (especially rats), dogs, cattle, and wildlife. Additionally, direct exposure to infected animals, particularly through urine, blood, or tissues, poses a significant transmission risk, especially during handling or slaughtering of livestock.



Figure 1: The figure above was taken from Philip & Ahmed (2023).

Leptospirosis was gazetted as notifiable disease starting in 2010 represented by purple bar. Number of cases gradually increase since 2010 to 2016 and gradually decrease between 2017 to 2021. The biphasic nature of leptospirosis complicates diagnosis, contributing to its classification as a neglected tropical disease. These diagnostic challenges often delay treatment, increasing the risk of severe complications. Addressing these diagnostic and surveillance challenges, this study explores the transformative potential of Artificial Intelligence (AI) in improving leptospirosis detection and monitoring in Malaysia.

Methodology

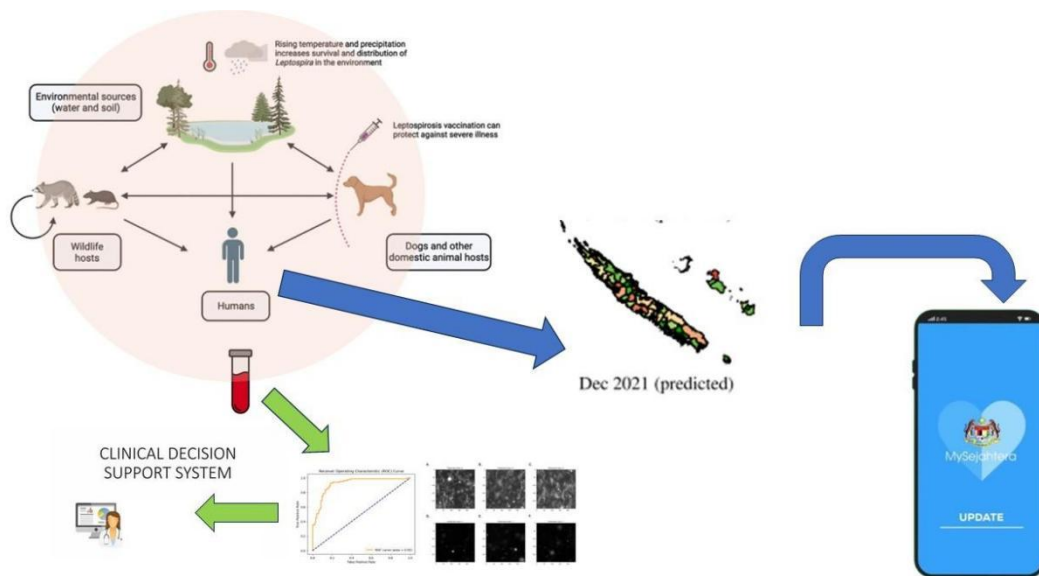
This presentation explores the transformative potential of AI in enhancing leptospirosis diagnostics and disease surveillance as determined through a literature review and public health considerations.

Result & Discussion

Based on literature reviews and public health priorities, three key AI applications—predictive modelling, early diagnosis, and veterinary surveillance—have been identified as high-impact and urgent areas for implementation.

AI-powered tools, such as Deep Convolutional Neural Networks (DCNN) integrated with the Microscopic Agglutination Test (MAT), automate and streamline leptospirosis diagnostics. Clinical Decision Support Systems (CDSS) further improve early detection by interpreting symptoms and lab results, reducing misdiagnoses and expediting treatment, especially in government healthcare facilities (Mohammad et al, 2024). Predictive modelling, driven by environmental data such as rainfall patterns, land use, and flood zones, enables early outbreak warnings and timely public health responses in high-risk states like Kelantan, Terengganu, and Sabah (Govan et al, 2025).

Additionally, AI strengthens One Health strategies through veterinary surveillance, using machine learning to detect early zoonotic spillover risks in using integrated approach that unifies human, animal, and environmental health management (Vyn et al, 2024).



(Image adapted from sources: Govan et al, 2025; Mohammad et al, 2024; Vyn et al, 2024)

Figure 2: (Green arrow) AI-powered tools like Deep Convolutional Neural Networks (DCNN) integrated with the Microscopic Agglutination Test (MAT) enhance leptospirosis diagnostics by automating detection and streamlining results interpretation through Clinical Decision Support Systems (CDSS). (Blue arrow) Predictive modeling, utilizing environmental data such as rainfall, land use, and flood zones, enables outbreak forecasting and strengthens One Health strategies through policy makers or alert to public for precaution measures via mobile application.

Conclusion

In conclusion, Malaysia has made notable strides in leveraging AI for diagnostics and outbreak prediction. The expansion into veterinary surveillance represents a crucial next step. Sustained investment, data sharing, and multi-sector collaboration are essential to fully realize AI's potential in combating leptospirosis.

References

1. Philip N, Ahmed K. Leptospirosis in Malaysia: current status, insights, and future prospects. *J Physiol Anthropol.* **42**(1):30.
2. Mohammad N, Hassan M, Rosli SNZ, Tahir NA, Mohamed NA, Mohd Sukri K, Azmi L. Enhancing leptospirosis diagnosis through an integration of machine learning with classification of microscopic agglutination images. *medRxiv*. Preprint posted 2024 Oct 7. doi:10.1101/2024.10.07.24315068.
3. Govan R, Scherrer R, Fougeron B, Laporte-Magoni C, Thibeaux R, Genthon P, et al. Spatio-temporal risk prediction of leptospirosis: a machine-learning-based approach. *PLoS Negl Trop Dis.* **19**(1):e0012755.
4. Vyn CM, Libera KC, Jardine CM, Grant LE. Canine leptospirosis: a One Health approach for improved surveillance, prevention, and interdisciplinary collaboration. *Can Vet J.* **65**(6):609-612.

EPIDPP71 / 443

Community-Based Weight Management Among KOSPEN community in Malaysia: A Public Health Approach

Maizatul Azlina Chee Din ¹, Mohd Tariq Mhd Noor ¹, Ahmad Izzuddin Anuar ¹

¹ Non-Communicable Disease Section, Disease Control Division, Ministry of Health Malaysia

Corresponding author's email: maizatulazlina@moh.gov.my

Summary

This study assessed a six-month weight loss intervention delivered via Malaysia's KOSPEN community platform, targeting adults aged ≥ 18 years with a BMI of 25.0–34.9 kg/m². Excluding individuals with chronic diseases or contraindications, 1,201 participants engaged in a program integrating nutrition, physical activity, and motivational support. Implemented across 11 states, the intervention achieved an 80% completion rate. Results showed 54.0% of participants lost weight, with 53.9% achieving $\geq 5\%$ reduction from the initial body weight. The program demonstrated effectiveness and feasibility, highlighting the value of leveraging community infrastructure to address obesity. Future enhancements may further improve long-term health outcomes.

Keywords

body weight reduction, community, intervention program, nutrition, obesity

Introduction

Obesity is a significant global public health issue, closely linked to a heightened risk of non-communicable diseases such as diabetes, cardiovascular disease, and hypertension. In Malaysia, the National Health and Morbidity Survey (NHMS) 2019 reported that over 50% of adults were either overweight or obese, reflecting an urgent need for effective intervention strategies¹. Community-based interventions have gained recognition as sustainable approaches for promoting weight loss and preventing obesity-related complications due to their accessibility and potential for long-term engagement². This study aimed to evaluate the effectiveness of a six-month weight loss intervention program implemented through the existing community platform of the Komuniti Sihat Pembina Negara (KOSPEN) initiative. The primary objective was to enable participants to reduce at least 5% of their initial body weight.

Materials and Methods

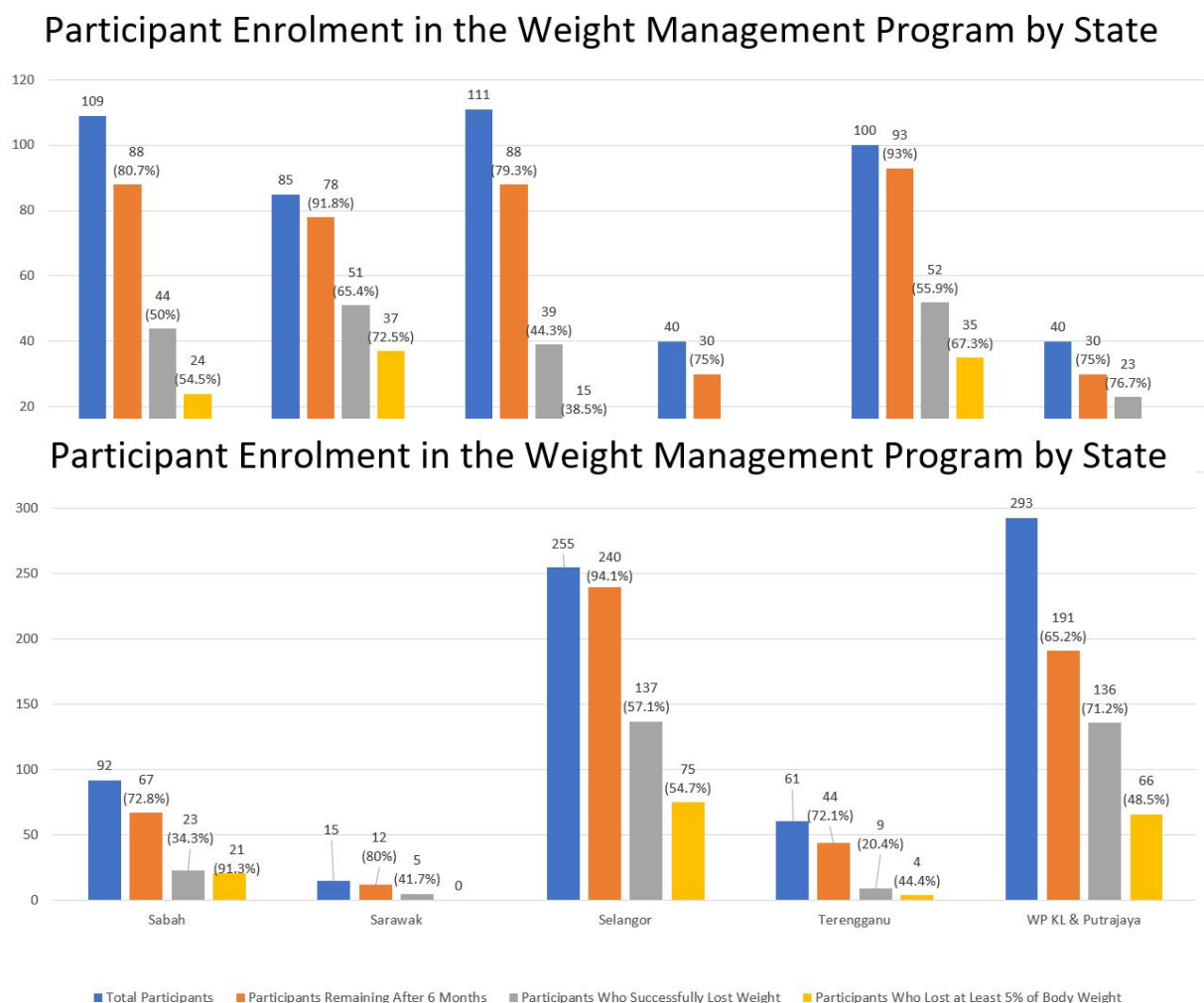
Participants were selected from the community based on inclusion criteria: aged over 18 years, with a body mass index (BMI) between 25.0 and 34.9 kg/m², and willingness to adhere to the intervention activities. Exclusion criteria included permanent physical disabilities, pregnancy, recent major surgery (unless medically cleared), a BMI ≥ 35 kg/m², and existing chronic diseases such as diabetes mellitus, hypertension, cardiovascular disease, asthma, and joint disorders. All participants were required to obtain medical clearance before enrolment. The intervention comprised three key components: nutrition, physical activity, and motivation.

Leveraging the KOSPEN platform—Malaysia’s community-based health intervention initiative—the program was rolled out across 11 states while another 4 states did not participate, consisting of 63 group sessions and involving 1201 participants.

Results and Discussion

WP Kuala Lumpur and Putrajaya recorded the highest participation (Graph 1). Program adherence was strong, with approximately 80.0% of participants completing the full six-month duration. Notably, 54.0% of participants experienced weight loss compared to their initial weight, and 53.9% successfully lost at least 5.0% of their starting weight (Figure 1). The six-month intervention proved effective in promoting moderate weight reduction among overweight and obese adults, with more than half of the participants achieving the target weight loss and a high completion rate. The integration of nutrition, exercise, and motivational elements, combined with medical screening and safety measures, contributed to the program’s success and acceptability. Utilizing the established KOSPEN infrastructure strengthened community engagement and accessibility. These findings underscore the potential of structured, community-based programs like KOSPEN in addressing obesity at the national level. Recent studies from Southeast Asia have also demonstrated that community-led interventions can produce significant improvements in weight-related outcomes and behavioral changes^{3,4}. With enhancements such as personalized support and extended follow-up, even greater health outcomes can be achieved.

Graph 1: Participant Enrolment in the Weight Management Program by State



KOSPEN Weight Management Program 2024

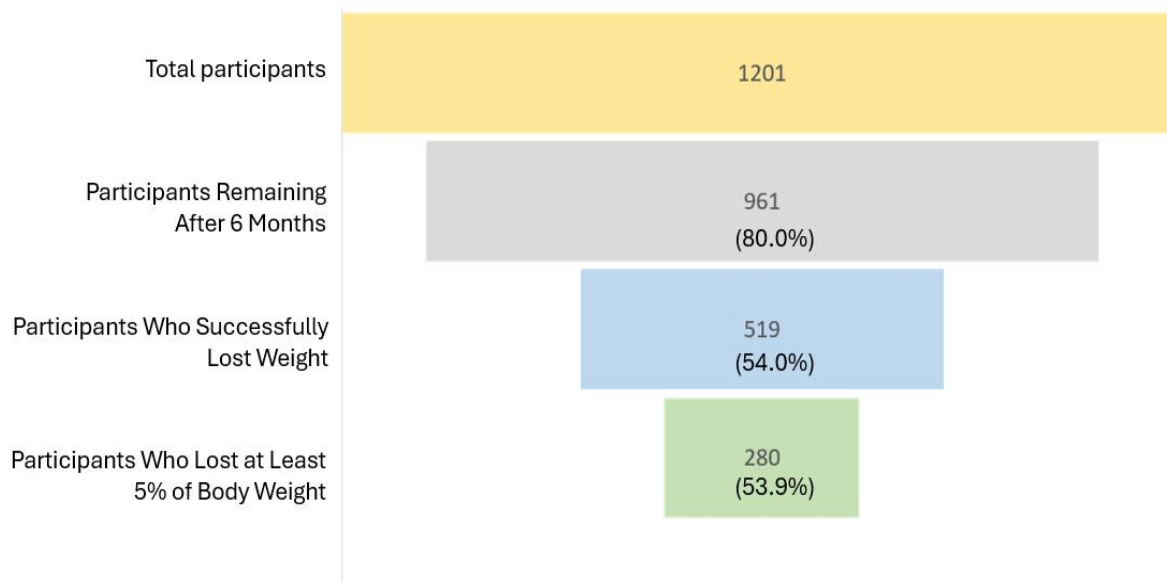


Figure 1: Descriptive results of the KOSPEN Weight Management Program 2024

Conclusion

This study demonstrated that a six-month community-based weight loss intervention using the KOSPEN platform was effective in helping overweight and obese adults achieve moderate weight loss. These results highlight the potential of structured, community-led programs in managing obesity and improving public health outcomes in Malaysia.

References

1. Institute for Public Health. *National Health and Morbidity Survey (NHMS) 2019: Non-communicable diseases, healthcare demand, and health literacy—Key Findings*. Kuala Lumpur: Ministry of Health Malaysia; 2020.
2. Goryakin Y, Suhlrie L, Cecchini M. The impact of community-based interventions on overweight and obesity: a systematic review and meta-analysis. *Obes Rev*. 16(7):635-650; 2015.
3. Nurul-Fadhilah A, Teo PS, Nik Shanita S, Mohd Nasir MT. Effectiveness of a community-based weight loss intervention among overweight and obese Malaysian adults: a quasi-experimental study. *BMC Public Health*. 21(1):1106; 2021.
4. Flodgren GM, Gonçalves-Bradley DC, Summerbell CD, Summerbell K, Carlsen S, Martin L, et al. Interventions to change the behavior of health professionals and the organization of care to promote weight reduction in overweight and obese people. *Cochrane Database Syst Rev*. 8(8):CD000984; 2022.

FAMILY HEALTH/ HEALTH MANAGEMENT

FHHMPP01 / 175

Digitalisation in Action: Solutions for Limited-Resource Settings

Nur Azmiah Zainuddin ¹, Devi Shantini A/P Rata Mohan ¹, Tengku Mohamad Iskandar
Tengku Mohamad Rosman ², Sri Devi A/P Sukumaran ², Muhammad Suhaili bin
Muhammad Shueib ³, Adlan Zafrulan Ismail ⁴

¹ *Institute for Health Systems Research, National Institutes of Health, Ministry of Health Malaysia*

² *Institute for Health Management Research, National Institutes of Health, Ministry of Health Malaysia*

³ *Langkawi District Health Office, 07000 Kuah, Kedah*

⁴ *Hospital Sultanah Maliha, 07000 Langkawi, Kedah*

Corresponding author's email: devishantini@moh.gov.my

Summary

This study examines care integration practices in Langkawi, focusing on bridging gaps between secondary and primary care for managing chronic and high-risk patients. Effective integration requires seamless information sharing to ensure continuity of care. While digitalisation enables functional integration by facilitating information exchange and collaboration, it alone is insufficient to overcome systemic barriers. High levels of team collaboration, driven by professional relationships and collective attitudes, are essential to achieving sustainable care delivery. Langkawi's experience highlights the importance of complementing technological investments with professional collaboration, offering valuable lessons for scaling digitalisation in resource-limited settings to enhance continuity of care.

Keywords

Digitalisation, functional integration, interprofessional collaboration, continuity of care, Langkawi

Introduction

The Health White Paper (HWP) envisions transforming Malaysia's healthcare system through digitalisation, focusing on achieving service delivery integration to support continuity of care under Pillar 1¹. Functional integration, as described in the Rainbow Model of Integrated Care^{2,3}, leverages technologies and resources to enable seamless information sharing across care settings. However, digitalisation alone is insufficient to achieve integration, as it requires strong professional collaboration and collective attitudes for continuity of care. Langkawi, with one hospital and five public health clinics serving 100,000 residents, provides a unique context for exploring digitalisation strategies in resource-limited settings. Fragmented systems, such as MPIS (Medical Programme Information System) in hospitals and the transition to CCMS (Clinic Management System Subscription) in clinics, underscore the need for seamless integration to optimize care delivery. Despite these challenges, healthcare providers have implemented bottom-up adaptations to bridge gaps, illustrating the interplay between digitalisation and professional collaboration in strengthening integrated care practices.

Materials and Methods

Through the lens of Langkawi's healthcare system, this study investigates how digitalisation and professional collaboration intersect to enhance continuity of care. Data were collected between April and October 2024, beginning with virtual interviews and transitioning to face-to-face sessions in Langkawi and Kedah. A total of 42 in-depth interviews (IDIs) and 7 focus group discussions (FGDs) were conducted with 64 participants, including representatives from primary and secondary care facilities in both the public and private sectors. Additional insights were obtained from relevant agencies involved in care delivery for Langkawi residents. Semi-structured interview guides, informed by the Rainbow Model of Integrated Care (RMIC), focused on functional integration domains, particularly information exchange and collaboration. Data were analysed using framework analysis⁴, guided by the RMIC taxonomy, to systematically identify barriers, enablers, and patterns. NVivo 14 software was utilised for coding and data management, ensuring robust insights into digitalisation's role in enhancing integrated care efforts.

Results and Discussion

Langkawi's healthcare system reveals significant barriers to achieving functional integration and continuity of care. Fragmented digital systems, such as MPIS in hospitals and CCMS in public health clinics, prevent seamless information sharing between primary and secondary care. These disconnected platforms hinder care coordination, particularly for high-risk patients requiring follow-up across facilities. Healthcare providers also report reliance on informal tools like WhatsApp and Google Drive to fill these gaps. While these tools facilitate real-time information exchange, their use raises concerns about data security, compliance with health information standards, and long-term scalability.

Despite these challenges, professional collaboration and bottom-up innovations have played a critical role in maintaining continuity of care. Strong interprofessional relationships and collective attitudes enable effective communication and coordination between providers. For example, healthcare providers willingly adjust their schedules or respond outside official working hours to ensure patients receive timely care. This shared commitment illustrates how collective attitudes can bridge systemic gaps, fostering trust and collaboration across care settings. Informal solutions, such as WhatsApp, have also been widely adopted for coordinating care and tracking high-risk patients. These efforts exemplify the interplay between digitalisation and professional integration, where human-driven collaboration compensates for technological deficiencies.

Langkawi's experience highlights the need for secure, interoperable digital platforms that connect hospitals and clinics, ensuring seamless information exchange. However, digitalisation alone cannot achieve integration; it must be supported by professional collaboration and training to enhance digital competency. Steele Gray's framework reinforces the dual role of digital health as the "grease" for operational efficiency and the "glue" for fostering shared values within integrated care systems⁵. Policymakers should prioritise investments in infrastructure while fostering a culture of collaboration to ensure sustainable continuity of care. Lessons from Langkawi provide a valuable blueprint for implementing scalable digitalisation strategies in resource-limited settings.

Conclusion

Langkawi's healthcare system demonstrates that digitalisation must be complemented by professional collaboration to achieve functional integration and continuity of care. Bottom-up adaptations and collective attitudes address systemic challenges, while secure and interoperable platforms are essential. These findings provide practical lessons for advancing integrated care in resource-limited settings.

Acknowledgements

We extend our sincere appreciation to all participants whose invaluable contributions have been instrumental in advancing our understanding of care integration practices. We also wish to express our gratitude to the Deputy Director-General of Health (Research and Technical Support) for her support and to the Director of the Institute for Health Systems Research for her guidance throughout this project.

References

1. Ministry Of Health. Health White Paper for Malaysia: Strengthening people's health, future proofing the nation's health systems. Putrajaya, Malaysia: Ministry of Health; 2023.
2. Valentijn PP, Ede PS, Tilburg DT. Rainbow of chaos: A study into the theory and practice of integrated primary care. 2016; **16**(2):1-4.
3. Valentijn PP, Van Der Klauw DM, Ruwaard D, et al. Towards a taxonomy for integrated care: a mixed-methods study. *Int J Integr Care*. 2015; **13**:1-18.
4. Goldsmith LJ. Using framework analysis in applied qualitative research. Qualitative Report. 2021; **26**(6).
5. Gray CS. Integrated care's new protagonist: The expanding role of digital health. *Int J Integr Care*. 2021 Oct 1; **21**(4):1-5.

FHHMPP02 / 177

From Concept To Reality: Expert Insights In Content Validation Of The Malaysian Diabetic Foot Self-Care Instrument

Divya Nair Narayanan¹, Normaizira Hamidi¹, Izzatur Rahmi Mohd Ujang¹, Nurhayati Shahrudin¹, Roslina Supadi¹, Samsiah Awang¹, Nora Hamid², Suhanahani Bastani³, Mohammad Luqman Abd Rani⁴, Tengku Mohd Asri Tengku Makhtar⁵, Nurasmilla Md Noor⁶

¹ Institute for Health Systems Research, National Institutes of Health, Ministry of Health Malaysia

² Hospital Putrajaya, Ministry of Health Malaysia

³ Hospital Sultan Idris Shah Serdang, Ministry of Health Malaysia

⁴ Klinik Kesihatan Wakaf Baru, Kelantan, Ministry of Health Malaysia

⁵ Pejabat Kesihatan Putrajaya, Ministry of Health Malaysia

⁶ Klinik Kesihatan Arau, Perlis, Ministry of Health Malaysia

Corresponding author's email: divyanair@moh.gov.my

Summary

Current assessments of diabetic foot self-care practices in Malaysia lack standardisation, limiting service quality comparisons. This study validates a diabetic foot self-care assessment instrument through expert panel reviews using the Content Validity Index (CVI). A multidisciplinary panel of six experts evaluated the instrument's relevance, clarity, organisation, scoring and purpose attainment using a 4-point scale, with iterative refinements via the Delphi technique. The final 20-item instrument achieved acceptable CVI scores (I-CVI: 0.98; S-CVI: 0.90). This process improved clarity and relevance, addressing cultural and behavioral nuances. This validated instrument will support tailored diabetic foot care education and interventions, enhancing patient empowerment nationwide.

Keywords

diabetes foot, instrument, expert panel, content validity, Malaysia

Introduction

Current assessments of diabetic foot self-care practices lack nationwide standardisation due to the absence of an objective instrument, limiting comparisons of service quality across facilities. A standardised instrument can address these gaps, enabling healthcare providers to identify deficiencies in diabetic foot care services, implement targeted interventions, and support tailored diabetic foot care education, enhancing efforts to prevent foot ulcers and enhance patient outcomes. Content validity ensures an instrument comprehensively represents the construct it aims to measure, ensuring all relevant aspects are adequately covered¹. Validating an instrument for assessing diabetic foot self-care practices tailored to the Malaysian context requires expert input to ensure its content validity, relevance, and applicability. Incorporating multidisciplinary expertise enhances comprehensive coverage of key aspects relevant to diverse patient needs and ensures its practicality in Malaysia's healthcare setting. This abstract focuses on validating the content of a diabetic foot self-care practice assessment instrument through expert panel reviews.

Materials and Methods

Content validity was determined through expert panel reviews using the Content Validity Index (CVI), with a cut-off of $\geq 0.83^2$. The six-member expert panel², selected based on their area of expertise, years of service and availability, included an endocrinologist, family medicine physician, hospital- and clinic-based occupational therapists, diabetic educator, and a public health physician with expertise in instrument validation.

Using a 4-point scale, experts evaluated the instrument across five domains: relevance, clarity, organisation, suitability of the scoring mechanism, and attainment of purpose, with all domains contributing to the CVI. Below each rated item, an open-ended space was provided for experts to offer recommendations, particularly for low-rated items. Additionally, at the end of the evaluation form, experts were given another opportunity to provide further open feedback, which was analysed qualitatively to guide amendments. The instrument underwent iterative refinement through the Delphi technique, integrating both quantitative ratings and qualitative insights.

Results and Discussion

In the first cycle, the item-level CVI (I-CVI) was 0.91, which was deemed acceptable. However, the scale-level CVI (S-CVI) was 0.56, indicating inadequate overall agreement. In the second cycle, the I-CVI improved to 0.92, maintaining acceptability, while the S-CVI increased modestly to 0.59. By the third cycle, both indices achieved acceptable levels, with the I-CVI at 0.98 and the S-CVI at 0.90, demonstrating improved consensus on content validity. The initial 29-item instrument was simplified to 24 items in Cycle 2, followed by further reductions in Cycle 3. Ultimately, 12 items were removed due to redundancy or limited applicability, four were added to capture overlooked behaviors, and 13 were amended, resulting in a final draft with 20 items and one general introductory item.

This reduction was guided by expert input, ensuring clarity, cultural relevance, and behavioral appropriateness. For instance, the item “trimmed your toenails” was replaced with the more specific “trimmed your toenails in a curved/ rounded shape” as it better aligned with best practices for diabetic foot self-care. Additionally, experts highlighted common patient habits absent from the instrument, such as “walking barefoot on stone paths” and “foot massages.” These were incorporated based on their knowledge of evolving patient behaviors, especially in rural and urban settings. Experts also provided valuable input regarding newer habits among the population, which further informed the inclusion of these items.

Refinements in wording, as suggested by experts, enhanced clarity and ease of understanding for patients. This process effectively captured the diversity within Malaysia’s multicultural population. While the discussion feedback loop relayed back to experts was initiated after the first cycle, the substantial improvements observed in the third cycle were largely attributed to the more detailed feedback provided to experts after the second cycle and direct communication with selected experts to clarify their understanding regarding ambiguous items.

Conclusion

Insights from a comprehensive expert panel were crucial for content validity, refining relevance, clarity, adequacy, scoring and simplicity, based on their diverse

experiences. Their input transformed the instrument into a practical tool tailored to Malaysia's healthcare setting and cultural diversity, enhancing diabetic foot self-care practices and empowering patients.

Acknowledgements

We extend our gratitude to the expert panel for their invaluable insights and dedication, which were instrumental in refining the instrument and ensuring its applicability within the Malaysian context.

References

1. Cook DA, Beckman TJ. Current concepts in validity and reliability for psychometric instruments: theory and application. *Am J Med.* 2006;**119**(2):166.e7-16.
2. Yusoff MSB. ABC of Content Validation and Content Validity Index Calculation. *Education in Medicine Journal.* 2019;**11**:49-54.

FHHMPP03 / 188

Chronic ambulatory care-sensitive conditions: a snapshot of potentially preventable hospitalisations in Ministry of Health facilities

Shakirah Md.Sharif¹, Hazwa Harith¹, Ang Zen Yang¹, Melody Soong Yin Yin¹, Fun Weng Hong¹.

¹ Centre for Health Outcomes Research, Institute for Health Systems Research, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: shakirah.ms@moh.gov.my

Summary

The rising prevalence of chronic diseases has become one of the most pressing public health concerns in Malaysia. Chronic diseases not only require long-term management, but poor control of chronic diseases and inadequate management of complications in the outpatient setting could lead to hospitalisations, increasing healthcare costs in the country. This study investigates potentially preventable hospitalisations (PPH) by identifying admission due to chronic ambulatory-care sensitive conditions (cACSC) in Ministry of Health facilities. In 2022, 8.63% of admissions were due to cACSC with variable trends observed throughout the year. These findings offer targets for outpatient service improvement for better patient outcomes.

Keywords

Ambulatory-care sensitive conditions, chronic, potentially preventable hospitalisations, average length of stay, readmissions

Introduction

Ambulatory care-sensitive conditions have been used internationally to identify potentially preventable hospitalisations (PPH) as a marker of primary care performance. These conditions can be divided into chronic, acute and vaccine-preventable conditions. cACSCs are conditions where hospitalisations could be prevented with optimum management in the outpatient setting and where complications are picked up and managed early. In view of the increasing burden of chronic medical conditions in Malaysia, an effort to monitor PPH has the potential to identify targets for patient care improvement to reduce the demand for hospitalisations. The aim of this study is to describe PPH due to cACSCs in Ministry of Health facilities, describe monthly trends and examine the average length of stay (ALOS) and readmission for these admissions.

Materials and Methods

Administrative data from the *Sistem Maklumat Rawatan Pelanggan (SMRP)* were analysed. Included were admissions to Ministry of Health Malaysia facilities in 2022. All COVID-19 Integrated Quarantine and Treatment Centres (PKRC) were excluded as they were temporary inpatient facilities. The reported error rate of ICD-10 coding in SMRP was 6.7%, which is below the national benchmark of 14%. PPH were defined as admissions due to cACSCs, identified through a list of ICD-10 codes developed via collaborative consensus¹. Ten medical conditions were listed as cACSCs, including angina, asthma, Chronic Obstructive Pulmonary Disease (COPD), Chronic Kidney

Disease (CKD), convulsions and epilepsy, diabetes mellitus, hypertension, heart failure, Iron-Deficiency Anaemia (IDA) and ischaemic heart disease. Average length of stay (ALOS) was defined as overnight stays, and all-cause readmission was defined as admission ≤ 30 days from the last discharge of a cACSC index case. Numbers and proportions of cACSCs were reported, along with ALOS in days and readmission rate per 100 admissions for each condition. Data cleaning and descriptive analysis was conducted using R software.

Results and Discussion

Included in the analysis were 2,370,338 admissions in the 2022 calendar year. cACSC accounted for 8.63% (n=204,562) of admissions in MOH facilities in 2022. This estimate is higher compared to reported PPH due to cACSCs in England (3.4-4.8%)² and Australia (2.8%)³; high income countries with established performance measures on PPH; but lower than the reported estimate in Vietnam, based on a study conducted by the World Bank using Social Health Insurance data aimed for healthcare performance improvement (17.0%)⁴. The mean length of stay for these PPH was 4 days, while the all-cause readmission rate was 11 per 100 (Table 1). The proportion of admissions due to asthma was the highest (1.80%, n=42,780), while the smallest proportion was due to iron-deficiency anaemia (0.18%, n=4383). Although the proportion of admissions for CKD was small, (0.21%, n=5011), it had the longest ALOS at 6 days and highest readmission rate at 28 per 100 admissions.

Table 1: Breakdown of potentially preventable hospitalisations and their outcomes

Chronic ACSC	Percentage* (%)	ALOS (days)	All-cause readmission rate (per 100 admissions)†
Overall	8.63	4	11
By medical condition			
Asthma	1.80	3	11
Heart Failure	1.44	5	4
Angina	1.40	3	16
Chronic Obstructive Pulmonary Disease	1.04	5	14
Diabetes Mellitus	0.81	5	12
Ischaemic Heart Disease	0.68	4	10
Convulsions and Epilepsy	0.56	3	8
Hypertension	0.51	3	8
Chronic Kidney Disease	0.21	6	28
Iron Deficiency Anaemia	0.18	3	11

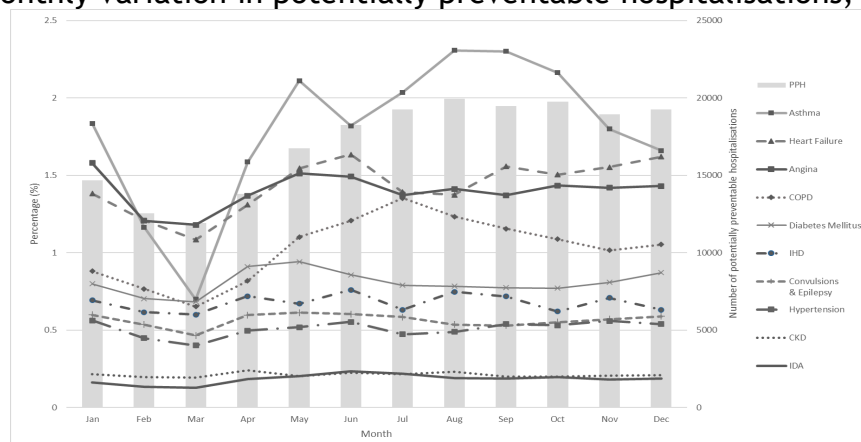
ALOS: Average length of stay; ACSC: Ambulatory care-sensitive conditions.

*Percentage out of total admissions.

†Readmissions were identified among index admissions due to cACSCs, excluding admissions after 30 November 2022.

Figure 1 illustrates the monthly variation of PPH and the proportion for each cACSC admission in 2022. The number of PPH decreased in the first quarter and was lowest in March before reaching a peak in August and almost plateauing until December. The trend observed in January to March coincided with the surge of COVID-19 cases due to the Omicron variant⁵, which may have impacted health service delivery and altered individuals' health-seeking behaviour. Evidently, the COVID-19 pandemic affected each cACSC differently. Interestingly, there was a sharp decrease for asthma in March, followed by a rapid rebound over April to May as healthcare services stabilised and patient access improved. Meanwhile, the proportion of admissions for IDA and CKD remained stable throughout 2022, likely due to health deterioration that cannot be managed via outpatient care.

Figure 1: Monthly variation in potentially preventable hospitalisations, 2022



Conclusion

In conclusion, PPH due to cACSCs accounted for 8.63% of total hospitalisations, representing a considerable burden. Policies to enhance primary care through performance monitoring using PPH can potentially improve population health and reduce healthcare costs for inpatient care. However, resource allocation for primary care enhancements such as providing integrated person-centred care is paramount to ensure chronic care optimisation. Moreover, investment into preventive care to reduce complications can decrease inpatient care demand. Further studies investigating contributing factors and prevention strategies are imperative to reduce the demand for inpatient services and improve patient outcomes.

References

1. Shakirah MS, Fun WH, Anis-Syakira J, et al. Defining Malaysia's Chronic Ambulatory-Care Sensitive Conditions Through Collaborative Consensus. Shah Alam: Institute for Health Systems Research, National Institutes of Health Malaysia; 2024.
2. Parkinson B, Meacock R, Checkland K, et al. Unseen patterns of preventable emergency care: Emergency department visits for ambulatory care sensitive conditions. *Journal of Health Services Research and Policy*. 2022;**27**(3).
3. Australian Institute of Health and Welfare. Potentially preventable hospitalisations. 2024.
4. Bales SD, Huong Lan; Nguyen,Duyen Thi Thuy; Tran Tien Hung. Potentially Preventable Hospitalizations in Vietnam : Analysis Using Health Insurance Claims Data. 2022.
5. Md Nadzri MN, Md Zamri ASS, Singh S, et al. Description of the COVID-19 epidemiology in Malaysia. *Front Public Health*. 2024;**12**:1289622.

FHHMPP04 / 190

Developing Malaysia's Men's Health Report Card: A Tool for Assessing Health Trends

Wilfred Mok Kok Hoe¹, Ang Zen Yang¹, Chew Cheng Hoon², Mohd Yasin Raja bin Abdullah¹, Diane Chong Woei Quan¹, Fun Weng Hong¹, Wan Mohd Shariffuddin Zainuddin³, Zakiah Mohd Said³, Sondi Sararaks¹

¹Institute for Health Systems Research, National Institutes of Health, Ministry of Health Malaysia ²Institute of Medical Research, National Institutes of Health, Ministry of Health Malaysia ³Adult Health Sector, Family Health Development Division, Ministry of Health Malaysia

Corresponding author's email: wilfred.mok@moh.gov.my

Summary

Despite national health surveys and disease registries, Malaysia lacks a structured approach to monitor men's health disparities, track progress in key outcomes, and consolidate gender-disaggregated data for policymaking. This study developed Malaysia's Men's Health Report Card using a three-phase approach: indicator identification through literature review, policymaker consultations, and secondary data extraction. Eighteen indicators were reported as trends or single-time estimates, prioritising gender comparisons. Despite data limitations and the absence of benchmarking, the report card provides a foundation for structured monitoring. It serves as a knowledge translation tool to improve accessibility and use of men's health data in decision-making.

Keywords

Men's health, gender-disaggregated data, health monitoring, knowledge translation, Malaysia

Introduction

Men's health is a public health priority in Malaysia, with the National Men's Health Plan of Action 2018-2023 providing strategic direction¹. While national health surveys and disease registries collect relevant data, these indicators are not always gender-disaggregated or systematically tracked. Additionally, there is no dedicated framework for monitoring men's health disparities or evaluating progress in key health outcomes. Unlike countries such as Australia, Canada, and the United Kingdom, Malaysia lacks a structured Men's Health Report Card to consolidate key indicators and comprehensively assess men's health trends. This study describes the development of Malaysia's Men's Health Report Card², establishing a systematic approach for gender-responsive health monitoring. Beyond data compilation, the report card serves as a knowledge translation tool, enhancing data accessibility for policymakers and healthcare professionals to support targeted interventions and evidence-based decision-making.

Methods

A three-phase approach was undertaken to develop Malaysia's Men's Health Report Card, ensuring a structured process for selecting indicators, engaging policymakers, extracting data, and compiling the final report. A systematic literature review was

conducted to identify men's health indicators from peer-reviewed databases, national health reports, and government publications in countries with structured men's health monitoring frameworks. Indicators were selected based on policy relevance, gender-disaggregated data availability, and routine monitoring feasibility. Policymakers validated the selection through consultations to ensure alignment with national priorities and available data sources. Secondary data from 2019 to 2023 were extracted from national health and disease surveillance reports, such as the National Health and Morbidity Survey, the Department of Statistics Malaysia, and the Malaysian National Cancer Registry. Findings were reported as trends or single-time-point estimates focusing on gender-based comparisons rather than international benchmarking and structured into visual summaries to support knowledge translation.

Results and Discussion

The database search did not yield relevant peer-reviewed articles, leading to a grey literature search using targeted keywords in Google. The search focused on countries with structured men's health monitoring systems, including Australia, Canada, Ireland, the United Kingdom, and the United States. A total of 22 indicators were identified spanning mortality, morbidity, behavioural risk factors, healthcare utilisation, and occupational health, primarily derived from existing men's health report cards and government publications. Following policymaker consultations, four indicators - family and interpersonal relationships, health literacy, dietary factors, and living arrangements - were excluded due to data limitations. The final report included 18 indicators presented as trends and gender-based comparisons. However, limitations in historical data restricted the ability to track changes over time, and some indicators required adaptation to align with Malaysia's health reporting framework. The exclusion of cross-country benchmarking limits the ability to compare Malaysia's men's health status with global counterparts. Despite these constraints, the report card provides a baseline for future monitoring, facilitating a structured approach to tracking men's health trends and informing policy decisions. The findings highlight areas where men's health outcomes diverge from those of women, reinforcing the need for targeted interventions. Additionally, the report card serves as a critical knowledge translation tool by simplifying complex data into accessible formats for policymakers. It underscores the importance of strengthening gender-specific health monitoring and improving data availability to support policy formulation and intervention planning. Future iterations of the report card should prioritise the inclusion of additional gender-specific indicators, enhance longitudinal tracking, and establish mechanisms for integrating findings into Malaysia's national health monitoring system. By addressing these gaps, the report card can play a more substantial role in shaping policies that improve men's health outcomes.

Conclusion

The development of Malaysia's Men's Health Report Card is crucial in enhancing gender-responsive health monitoring. As a knowledge translation tool, it consolidates key indicators, improves data accessibility, and supports evidence-informed decision-making for targeted health interventions to improve men's health outcomes.

References

1. Ministry of Health Malaysia. National Men's Health Plan of Action Malaysia 2018 - 2023; Ministry of Health Malaysia: Putrajaya, Malaysia, 2018.
2. Ang Zen Yang, Wilfred Mok Kok Hoe, Chew Cheng Hoon, Diane Chong Woei Quan, Fun Weng Hong, Sondi Sararaks, Wan Mohd Shariffuddin Zainudin, Zakiah Mohd Said. Men's Health in Malaysia - Report Card 2024. Institute for Health Systems Research, Selangor, Malaysia: 2024.

FHHMPP05 / 192

Do Mental Health Issues Relate to Risky Sexual Behaviour in Adolescents? Findings from the Adolescent Health Survey 2022, Malaysia

Noor Aliza Lodz¹, Mohd Aznuddin Abd Razak¹

¹Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: draliza.lodz@moh.gov.my

Summary

Adolescent risky sexual behaviour poses serious public health concerns, leading to unintended pregnancies, sexually transmitted infections (STIs), and psychological effects. The World Health Organization (WHO) highlights adolescence as a crucial developmental phase where mental health issues can influence decision-making, increasing vulnerability to unsafe sexual practices. This study aims to determine the association between mental health issues and risky sexual behaviour. Data was analysed using descriptive analysis for the prevalence (%), simple logistic regression (SLogR) and multiple logistic regression (MLogR) for the association between mental health status and risky sexual behaviour.

Keywords

Adolescent, Risky sexual behaviour, mental health, Malaysia

Introduction

Adolescent risky sexual behaviour is a global public health concern, leading to unintended pregnancies, sexually transmitted infections (STIs), and psychological effects. The World Health Organization (WHO) highlights adolescence as a critical period where mental health issues influence decision-making, increasing vulnerability to risky sexual practices. Studies suggest adolescents with depression, anxiety, and stress are more prone to impulsivity and unsafe sexual behaviours¹. However, limited research exists on this relationship in Malaysia. While Malaysia has policies addressing adolescent sexual and mental health, national-level data linking both remain scarce. This study examines the association between mental health issues and risky sexual behaviour among Malaysian adolescents. Findings will provide crucial insights for designing targeted interventions to enhance adolescent well-being.

Materials and Methods

This study analysed data from the Adolescent Health Survey 2022, a cross-sectional study conducted in Malaysia from June to July 2022. Using multistage stratified sampling, 36,000 secondary school students (Form 1 to Form 5) participated through a self-administered questionnaire. The survey assessed mental health issues (loneliness, lack of close friends, depression) and risky sexual behaviour (sexual debut before age 14, multiple sexual partners, condom/non-contraceptive use). Independent variables included mental health and sociodemographic factors, while the dependent variable was risky sexual behaviour. A respondent was classified as engaging in risky sexual behaviour if they answered "yes" to any defined risk criteria. Data analysis included descriptive analysis for prevalence (%) and logistic regression

(simple (SLogR) and multiple logistic regression (MLogR)) to assess associations between mental health and risky sexual behaviour.

Results and Discussion

The prevalence of depression among adolescents in Malaysia was 26.9%, while having no close friends and loneliness were 4.2% and 16.2%, respectively. For risky sexual behaviour, the prevalence among adolescents was 7.3%. Among mental health variables, only depression was significantly associated with risky sexual behaviour (aOR 1.37, 95% CI: 1.21-1.55, $p < 0.001$), while loneliness (aOR 1.07, $p = 0.534$) and lack of close friends (aOR 0.98, $p = 0.828$) showed no association. This highlights the role of depression in adolescent risk-taking, supporting prior research linking psychological distress to unsafe sexual practices^{1,2}. Among demographic factors, younger adolescents (Form 1) had higher odds (aOR 1.79, 95% CI: 1.47-2.20, $p < 0.001$) compared to Form 5, aligning with studies showing that younger teens lack sufficient knowledge about sexual health³. Males were more likely to engage in risky sexual behaviour than females (aOR 1.64, 95% CI: 1.41-1.89, $p < 0.001$). Ethnicity also played a role, with Indian adolescents having the highest risk (aOR 1.96, 95% CI: 1.51-2.55, $p < 0.001$), while Chinese adolescents were less likely to engage in such behaviour compared to Malays (aOR 0.77, 95% CI: 0.63-0.94, $p = 0.010$). Parental marital status was a significant predictor, with adolescents uncertain about their parents' marital status having the highest risk (aOR 2.22, 95% CI: 1.66-2.97, $p < 0.001$). These findings align with research linking parental instability to adolescent risk-taking⁴.

Table 1: Factors associated with Risky Sexual Behaviour among School Adolescents in Malaysia

Factors	Crude OR (95% CI)	p -Value a	Adj. OR (95% CI)	p -Value b
Form				
1	1.80 (1.47, 2.20)	<0.001**	1.79 (1.47, 2.19)	<0.001**
2	1.24 (1.00, 1.55)	0.050**	1.22 (0.98, 1.52)	0.076
3	0.93 (0.77, 1.12)	0.457	0.92 (0.76, 1.10)	0.350
4	1.01 (0.82, 1.24)	0.950	1.01 (0.82, 1.24)	0.964
5	1	-	1	-
Sex				
Female	1	-	1	-
Male	1.56 (1.35, 1.80)	<0.001**	1.64 (1.41, 1.89)	<0.001**
Ethnicity				
Malay	1	-	1	-
Chinese	0.77 (0.63, 0.94)	0.10	0.77 (0.63, 0.94)	0.010**
Indian	1.90 (1.47, 2.47)	<0.001**	1.96 (1.51, 2.55)	<0.001**

Bumiputera Sabah	0.75 (0.48, 1.15)	0.179	0.78 (0.50, 1.22)	0.271
Bumiputera Sarawak	1.29 (0.89, 1.88)	0.179	1.28 (0.89, 1.83)	0.189
Others	1.13 (0.83, 1.54)	0.443	1.08 (0.78, 1.49)	0.646
<i>Parent Marital Status</i>				
I do not know	2.63 (1.97, 3.51)	<0.001**	2.22 (1.66, 2.97)	<0.001**
Married and living together	1	-	1	-
Married and living apart	1.25 (0.97, 1.62)	0.089	1.22 (0.94, 1.58)	0.140
Divorced	1.19 (0.98, 1.46)	0.073	1.22 (1.01, 1.46)	0.036**
Widow	1.15 (0.91, 1.46)	0.246	1.18 (0.92, 1.52)	0.193
Separated	1.23 (0.85, 1.78)	0.263	1.27 (0.89, 1.82)	0.192
<i>Lonely</i>				
Yes	1.06 (0.93, 1.21)	0.383	0.98 (0.84, 1.15)	0.828
No	1	-	-	-
<i>Have close friend</i>				
Yes	1	-	-	-
No	1.18 (0.95, 1.46)	0.136	1.07 (0.86, 1.34)	0.534
<i>Depression</i>				
Yes	1.18 (1.06, 1.31)	0.003**	1.37 (1.21, 1.55)	<0.001**
No	1	-	-	-

Conclusion

This study identifies demographics, familial factors, and depression as key contributors to adolescent risky sexual behaviour. Strong associations with education level, sex, ethnicity, parental marital status and depression highlight the need for targeted interventions. Future research should explore causal relationships and protective factors through longitudinal studies.

References

1. Karle A, Agardh A, Larsson M, Arunda MO. Risky sexual behavior and self-rated mental health among young adults in Skåne, Sweden - a cross-sectional study. *BMC Public Health*. 2023;**23**(1):9.
2. Tesfaye Y, Negash A, Gebrehiwot TT, Tessema W, Anand S, Ahmed G, et al. Is There Association between Risky Sexual Behaviors and Depression Symptoms among Youth? A Case of Jimma University Students, Ethiopia. *Psychiatry J*. 2019;**2019**:3757656.
3. Mbarushimana V, Conco DN, Goldstein S. "Such conversations are not had in the families": a qualitative study of the determinants of young adolescents' access to sexual and reproductive health and rights information in Rwanda. *BMC Public Health*. 2022;**22**(1):1867.
4. Dierker P, Kühn M, Mönkediek B. Does parental separation moderate the heritability of health risk behavior among adolescents? *Soc Sci Med*. 2023 Aug 1;**331**:116070.

FHHMPP06 / 195

Maternal Morbidities (Obesity, Hypertension and Diabetes Mellitus) Influencing Caesarean Delivery Decisions in Malaysia.

Norlaila Hamid^{1*}, S Maria Awaluddin¹, Wan Sarifah Ainin Wan Jusoh¹, Norliza Shamsuddin¹, Norhafizah Sahril¹, Chan Yee Mang¹, Noor Ani Ahmad¹.

¹ *Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia*

*Corresponding author's email: norlailahamid@moh.gov.my

Summary

This study aims to determine the prevalence and maternal morbidities determinants of Caesarean section (CS) among Malaysian mothers. Data from a maternal and child health nationwide survey in Malaysia were analysed. Descriptive statistics and multiple logistic regression analyses were performed using IBM SPSS version 25.0 for 6359 mothers. Obese and overweight mothers had higher odds of CS, as did mothers with hypertension and diabetes. This study underscores the influence of maternal morbidities on CS rates in Malaysia. Addressing modifiable risks through targeted interventions can reduce unnecessary CS rates and improve maternal and child health.

Keywords

Caesarean section, maternal morbidities, childbirth, interventions, Malaysia

Introduction

Caesarean section (CS) rates have been rising globally, with maternal morbidities such as obesity, diabetes mellitus, and hypertensive disorders contributing significantly to this trend (1). The study objectives were to determine the prevalence and factors associated with CS based on maternal morbidities.

Materials and Methods

This cross-sectional study used data from the 2022 Maternal and Child Health Survey. A multistage random sampling method was applied to select mothers with children aged less than two years. Data on mode of delivery, sociodemographic and maternal morbidities were analysed using descriptive statistics and multiple logistic regression with IBM SPSS version 25.0.

Results and Discussion

Table 1 showed that the study population comprised 6,359 mothers with children aged less than two years. The overall prevalence of CS was 26.2% (95% CI: 24.8, 27.7%). Mothers with hypertensive disorders exhibited the highest prevalence of Caesarean section at 43.0%, followed by those with diabetes mellitus (35.1%) and obesity (38.6%) ($p < 0.001$ for all) as shown in Table 2. Multivariable logistic regression identified that obese (aOR: 2.10, 95% CI: 1.71, 2.57) and overweight mothers (aOR: 1.35, 95% CI: 1.12, 1.62) had higher odds of CS, as did mothers with hypertension (aOR: 1.72, 95% CI: 1.33, 2.24) and diabetes (aOR: 1.43, 95% CI: 1.20, 1.71), see Table 3. This study reported an overall CS prevalence of 26.2% among mothers with

children aged less than two years, reflecting a rising trend from the previous rate of 20.7% observed in the first survey and aligning with global increases in CS rates (2). Maternal morbidities, particularly obesity and diabetes mellitus were strongly associated with CS increased risks of foetal macrosomia, labour dystocia, and obstetric complications necessitating surgical delivery (1,3). These are modifiable factors that could be addressed through targeted public health interventions, such as promoting healthy weight management and effective glycaemic control during pre-pregnancy and antenatal periods (4).

Table 1: Sociodemographic Characteristics of Mothers with Children Aged Less Than Two Years in the 2022 Maternal and Child Health Survey, N=6359.

Variables	n	%
Strata		
Urban	4439	69.8
Rural	1920	30.2
Age group (years)		
34 and below	4539	72.2
35 and above	1746	27.8
Level of education		
Primary	437	7.1
Secondary	3074	49.8
Tertiary	2657	43.1
Household income group		
Below 40%	4980	78.5
Middle 40%	1107	17.4
Top 20%	258	4.1
Ethnicity		
Malay	4963	78.7
Chinese	236	3.7
Indian	207	3.3
Other Bumiputera	619	9.8
Others	282	4.5
Total pregnancy		
5 and above	873	13.8
4 and below	5447	86.2

Table 2: Prevalence of CS among Mothers with Children Aged Less Than Two Years in the 2022 Maternal and Child Health Survey, N=6359.

Variables	N	%	Lower	Upper	P-value
Overall CS	1680	26.2	24.8	27.7	
Hypertensive disorder					
Yes	169	43.0	37.5	48.7	
No	1507	25.1	23.6	26.7	<0.001
Diabetes mellitus					
Yes	612	35.1	32.3	38.1	

No	1066	23.0	21.3	24.7	<0.001
BMI categories (WHO 1998) kg/m ²					
Underweight (< 18.5)	91	17.0	13.3	21.6	
Obese (≥ 30.0)	452	38.6	35.0	42.3	
Overweight (25.0-29.9)	488	27.3	24.8	30.1	
Normal (18.5-24.9)	617	21.7	19.9	23.7	<0.001

Table 3: Maternal Morbidities (Hypertensive Disorders, Diabetes Mellitus, and Obesity) Associated with Caesarean Section Among Mothers with Children Aged Less Than Two Years in the 2022 Maternal and Child Health Survey, N = 6,359

Variables	COR	95% CI		#AOR	95% CI		P-value
		lower	upper		lower	upper	
Hypertensive disorder							
Yes	2.25	1.76	2.87	1.72	1.32	2.23	<0.001
No	1.00	-	-	1.00	-	-	
Diabetes mellitus							
Yes	1.82	1.55	2.13	1.43	1.20	1.71	<0.001
No	1.00	-	-	1.00	-	-	
BMI categories (WHO 1998) kg/m ²							
Underweight (< 18.5)	0.74	0.55	1.00	0.84	0.62	1.14	0.256
Obese (≥ 30.0)	2.26	1.87	2.74	2.10	1.71	2.58	<0.001
Overweight (25.0-29.9)	1.36	1.15	1.60	1.35	1.12	1.62	0.002
Normal (18.5-24.9)	1.00	-	-	1.00	-	-	

#adjusted with all variables (age group, strata, state zone, education, ethnicity, occupation, household income, hypertension, diabetes mellitus, BMI category, total pregnancy, total antenatal care visit).

Conclusion

In conclusion, this study found that the overall prevalence of CS among mothers with children aged less than two years in Malaysia was 26.2%. Obesity emerged as the strongest predictor, significantly increasing the likelihood of CS, followed by hypertensive disorders and diabetes mellitus, which were notable clinical contributors. These findings underscore the importance of addressing maternal comorbidities and tailoring antenatal care interventions to mitigate the increasing rates of CS in Malaysia.

References

1. Gascho CLL, Leandro DMK, Ribeiro e Silva T, Silva JC. Predictors of cesarean delivery in pregnant women with gestational diabetes mellitus. *Rev Bras Ginecol e Obs / RBGO Gynecol Obstet.* 2017;39(02):060-5.
2. Institute for Public Health. National Health and Morbidity Survey (NHMS) 2016: Maternal and Child Health. Vol. II: Findings, 2016. Kuala Lumpur; 2016.
3. Brizan JB, Amabebe E. Maternal Obesity as a Risk Factor for Caesarean Delivery in Sub-Saharan Africa: A Systematic Review. *Life.* 2022;12(6).
4. Sparks JR, Ghildayal N, Hivert MF, Redman LM. Lifestyle interventions in pregnancy targeting GDM prevention: looking ahead to precision medicine. *Diabetologia.* 2022;65(11):1814-24.

FHHMPP07 / 198

Anxiety Symptoms Among Family Caregivers of Persons with Dementia in West Malaysia: Prevalence, Associated Factors and Its Effect on Quality of Life

Hashima E Nasreen¹, Syarifah Amirah binti Syed Ahmad¹

¹ Department of Community Medicine, International Islamic University Malaysia

Corresponding author's email: drnasreen@iium.edu.my

Summary

Scarce research exists on anxiety symptoms among family caregivers (FCs) of persons with dementia (PWD) in low- and middle-income countries. This study determined the prevalence and associated factors of anxiety symptoms and how anxiety influenced the quality of life (QOL) among FCs to PWD in West Malaysia. 121 FCs were recruited in this study. The prevalence of anxiety symptoms among FCs to PWD was 34.7%. FCs were protected from anxiety if they were currently married and had adequate social support. Caregiver's anxiety symptoms were negatively associated with QOL. Implementation of psychoeducational intervention may help improving FC's well-being in Malaysia.

Keywords

Anxiety symptoms, family caregivers, person with dementia, quality of life

Introduction

FCs of PWD typically act as informal caregivers who assist family members with dementia with daily activities, medical needs and provide emotionally support. They often prioritise the needs of the PWD, which lead to social isolation, financial strains, burden and disruptions of personal routines, contributing to a higher anxiety and depressive symptoms (1). As severity of dementia increases, the caregiver's physical and mental health become worsens, exacerbating poorer well-being and quality of life (2). Limited evidence exists on prevalence of anxiety symptoms in FCs of PWD in Asian countries. Thus, this study determined the prevalence and explored the associated factors of anxiety symptoms among FCs to PWD living at home in Malaysia.

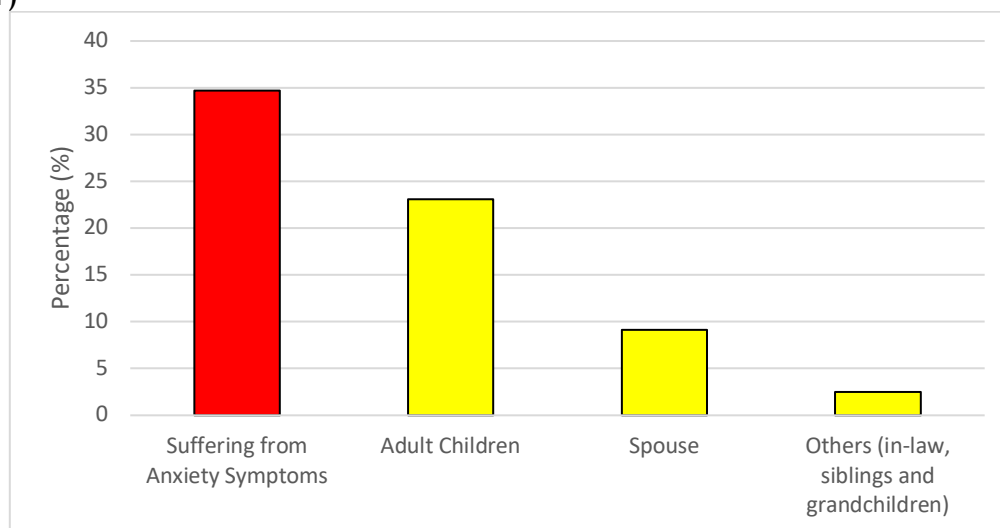
Materials and Methods

This is a cross-sectional study originated from the baseline survey of a randomised controlled trial (RCT) (3). The study participants were 121 primary FCs of clinically diagnosed PWD at any stage, at least 4-hrs/day for ≥ 6 -months in caregiving role, aged ≥ 18 years, reside in the same residence with PWD, able to read and understand Malay, and had telephone. The dyads were contacted over the telephone through the contact information obtained from the registries of psychiatry and memory clinics in Sultan Ahmad Shah Medical Centre (SASMEC), Hospital Tengku Ampuan Afzan (HTAA), Kuantan, and geriatric clinic in UKM Medical Centre (UKMMC), Kuala Lumpur to screen the primary FC to be recruited for the study. Anxiety symptoms was measured using anxiety subscale of Hospital Anxiety and Depression Scale with cut-off of >8 . Multiple logistic and linear regression analyses identified the associated factors of the FCs' anxiety symptoms and determine its association with their QOL.

Results and Discussion

The prevalence of anxiety symptoms among FCs in West Malaysia was 34.7% (Figure 1). Although spouses are often reported to take on the primary role as caregivers to PWD in other countries, such as Hong Kong and Australia (4), most of the caregivers in this study were adult children (23.1%) followed by spouses (9.1%) which aligns with the study from the neighbouring country, Indonesia (5).

Figure 1: Prevalence of Anxiety Symptoms and family caregivers of PWD in Malaysia (n=121)



The caregivers were protected from anxiety symptoms if they were currently married (AOR=0.24, 95% CI: 0.07-0.83), and if they had adequate perceived social support (AOR=0.97, 95% CI: 0.94-0.99), family support (AOR=0.96, 95% CI: 0.85-0.98), friends support (AOR=0.91, 95% CI: 0.89-0.99) and significant others support (AOR=0.92, 95% CI: 0.87-0.99) (Table 1). The presence of social support may buffer the anxiety symptoms in FCs to PWD (2). Caregiver's anxiety symptoms were negatively associated with their QOL ($\beta = -0.47$, 95% CI: -13.23 - -6.96 , $p < 0.001$) (Table 2). This associations between anxiety symptoms and QOL is strongly influenced by personal distress, behavioural responses, and impaired abilities which diminishes the FCs capacity to maintain their QOL and well-being (2).

Table 1: Factors associated with caregiver's of PWD anxiety symptoms (n=121).

Factor	OR	95% CI	
		Lower	Upper
Marital Status (0=unmarried/divorced , 1=Married)	0.24	0.07	0.83
Social Support	0.97	0.94	0.99
Family support	0.96	0.85	0.98
Friends Support	0.91	0.89	0.99
Significant others support	0.92	0.87	0.98

Models were adjusted for caregiver's religion, marital status, age of PWDs and duration of care.

All support scales were measured numerically.

Table 2: Effect of anxiety symptoms on quality of life of family caregivers of PWD (n=121).

Factor	B	Beta (β)	p-value	95% CI	
				Lower	Upper
Income (0=≥4581, 1=<4581)	-3.610	-0.173	0.018	-6.580	-0.641
Social Support	0.155	0.256	0.001	0.066	0.245
Family support	0.337	0.206	0.006	0.098	0.575
Significant others support	0.448	0.280	<0.001	-12.939	-6.860
Caregiver's Anxiety Symptoms (0=No, 1=Yes)	-10.093	-0.465	<0.001	-13.227	-6.959

Models were adjusted for caregiver's religion, household income, comorbidity, and anxiety symptoms.

All social support were measured numerically.

Conclusion

Anxiety symptoms are highly prevalent among FCs of PWD in West Malaysia and negatively influence FCs' QOL. Implementation of psychoeducational intervention and support at the psychiatry and memory clinics may help improve the anxiety and QOL in FCs of PWD in west Malaysia.

References

1. Greaney ML, Kunicki ZJ, Drohan MM, Ward-Ritacco CL, Riebe D, Cohen SA. Self-reported changes in physical activity, sedentary behavior, and screen time among informal caregivers during the COVID-19 pandemic. *BMC Public Health*. 2021;21(1):1292.

2. Wilmer MT, Anderson K, Reynolds M. Correlates of quality of life in anxiety disorders: review of recent research. *Current psychiatry reports*. 2021;**23**:1-9.
3. Nasreen HE, Tyrrell M, Vikström S, Craftman Å, Syed Ahmad SAB, Zin NM, et al. Caregiver burden, mental health, quality of life and self-efficacy of family caregivers of persons with dementia in Malaysia: baseline results of a psychoeducational intervention study. *BMC Geriatr*. 2024;**24**(1):656.
4. Shim YS, Park KH, Chen C, et al. Caregiving, care burden and awareness of caregivers and patients with dementia in Asian locations: a secondary analysis. *BMC Geriatr*. 2021;**21**(1):1-10.
5. Putri YSE, Putra IGNE, Falahaini A, Wardani IY. Factors associated with caregiver burden in caregivers of older patients with dementia in Indonesia. *Int J Environ Res Public Health*. 2022;**19**(19):12437.

FHHMPP08 / 203

Urban-Rural Disparities in Contraceptive Use Among Women of Reproductive Age in Malaysia: A Cross-Sectional Analysis

Wan Sarifah Ainin Wan Jusoh¹, S Maria Awaluddin¹

¹ Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

*Corresponding author's email: wansarifahainin@moh.gov.my

Summary

Contraceptive use remains uneven between urban and rural populations. This cross-sectional study utilized data from the 2022 National Health Survey, which focused on women of reproductive age (WR). A total 1,609 married or in a union WR age were included in the analysis. The contraceptive prevalence rate was significantly higher in rural women (55.5%) than in urban women (38.5%), with modern contraceptive use also more common in rural areas (47.8%) compared to urban areas (28.5%) ($p < 0.001$). The findings highlight persistent urban-rural disparities in contraceptive use in Malaysia, with rural WR exhibiting higher prevalence rates.

Keywords

Contraceptive use, urban-rural disparities, reproductive health, Malaysia, family planning

Introduction

Contraceptive use is a crucial component of reproductive health and family planning. However, disparities in access and utilization persist between urban and rural populations (1). This study examines urban-rural differences in contraceptive use among WR in Malaysia.

Materials and Methods

This cross-sectional study utilized data from the 2022 National Health Survey, which focused on WR. A two-stage cluster random sampling method was employed to select eligible households. Sociodemographic and contraceptive use data were collected using validated questionnaires and stratified by urban and rural residence. The sample size was calculated using the two-proportion formula, assuming 95% confidence and 80% power. With expected contraceptive use of 22.0% (urban) and 13.6% (rural), the required sample size was 322 per group, totalling 644 participants (2). Complex sample descriptive statistics and cross-tabulation analyses were conducted using SPSS version 25.0 to examine urban-rural differences. The significance of group comparisons was assessed using the Rao-Scott chi-square test, with a p-value threshold of <0.05 indicating statistical significance.

Results and Discussion

The response rate was 86.6%, with a total of 1,877 respondents. However, only 1,609 WR were married or in a union and included in the analysis, comprising 1,140 from urban areas and 469 from rural areas. The contraceptive prevalence rate was significantly higher among rural WR (55.5%, 95% CI: 49.0, 61.8) compared to urban WR (38.5%, 95% CI: 33.6, 43.7) ($p < 0.001$). The higher use of modern contraceptive methods in rural areas (47.8%, 95% CI: 41.6, 54.1) compared to urban areas (28.5%,

95% CI: 24.3, 33.0) ($p < 0.001$) suggests better accessibility in rural settings (3). Among rural WR, contraceptive prevalence was higher among younger WR (64.1%), those with secondary education or below (59.1%), and housewives (62.7%). In contrast, among urban WR, only occupation was significantly associated with contraceptive use, with government employees having the highest prevalence (60.7%) and private-sector employees the lowest (26.0%) ($p < 0.001$) (Table 1). These findings suggest that WR working in the private sector may face challenges in accessing contraceptive services due to time constraints for public healthcare or the unaffordability of private options (4). This study also found no significant difference in contraceptive prevalence rates between WR who required partner permission and those who did not, in both rural and urban settings.

Conclusion

The findings highlight persistent urban-rural disparities in contraceptive use in Malaysia, with rural WR exhibiting higher prevalence rates. In rural areas, education and employment status significantly influenced contraceptive use, whereas in urban areas, private-sector employees had notably lower contraceptive prevalence, suggesting workplace-related barriers. Targeted policies, workplace-based interventions, and improved access to contraceptive services are essential to address these disparities and promote equitable reproductive healthcare.

References

1. Askew I, Raney L, Kerrigan M, Sridhar A. Family planning saves maternal and newborn lives: Why universal access to contraception must be prioritized in national maternal and newborn health policies, financing, and programs. *Int J Gynecol Obstet.* 2024;164(2):536-40.
2. Ba DM, Ssentongo P, Agbese E, Kjerulff KH. Prevalence and predictors of contraceptive use among women of reproductive age in 17 sub-Saharan African countries: A large population-based study. *Sex Reprod Healthc.* 2019;21(June):26-32.
3. Wai MM, Bjertness E, Htay TT, Liabsuetrakul T, Myint ANM, Stigum H, et al. Dynamics of contraceptive use among married women in North and South Yangon, Myanmar: findings from a cross-sectional household survey. *Contracept X.* 2020;2:100015.
4. Wahab SNA, Satar NHM, Tumin M. Urban Poor: Evidence of Barriers in Accessing Public Clinics in Kuala Lumpur, Malaysia. *Malaysian J Public Heal Med.* 2022;22(1):193-204.

Variables	Urban, N=1140			Rural, N=469		
	Using contraception	Not using	p-value	Using contraception	Not using	p-value
	n (%; 95% CI)	n (%; 95% CI)		n (%; 95% CI)	n (%; 95% CI)	
Age group (years)						
35 and above	270 (38.3; 32.2, 44.7)	323 (61.7; 55.3, 67.8)	0.910	126 (52.6; 44.6, 60.6)	126 (52.6; 44.6, 60.6)	0.004
34 and below	204 (38.9; 31.2, 47.1)	249 (61.1; 52.9, 68.8)		109 (64.1; 55.3, 72.1)	87 (35.9; 27.9, 44.7)	
Educational level						
Secondary & below	269 (36.1; 29.7, 43.0)	335 (63.9; 57.0, 70.3)	0.199	163 (59.1; 51.4, 66.5)	148 (40.9; 33.5, 48.6)	0.039
Tertiary	204 (42.3; 35.3, 49.6)	232 (57.7; 50.4, 64.7)		54 (42.3; 30.0, 55.6)	62 (57.7; 44.4, 70.0)	
State zone						
Peninsular	399 (37.9; 32.5, 43.6)	503 (62.1; 56.4, 67.5)	0.961	157 (49.8; 41.6, 58.0)	175 (50.2; 42.0, 58.4)	0.231
Sabah, Sarawak & Labuan	77 (41.8; 29.6, 55.1)	72 (58.2; 44.9, 70.4)		66 (66.4; 55.3, 75.8)	40 (33.6; 24.2, 44.7)	
Occupation						
Government	109 (60.7; 51.4, 69.3)	92 (39.3; 30.7, 48.6)	<0.001	38 (51.9; 36.1, 67.4)	36 (48.1; 32.6, 63.9)	0.021
Private employee	67 (26.0; 18.4, 35.3)	130 (74.0; 64.7, 81.6)		25 (51.4; 35.0, 67.4)	33 (48.6; 32.6, 65.0)	
Self-employed	59 (35.7; 23.7, 49.9)	81 (64.3; 50.1, 76.3)		24 (30.1; 17.6, 46.4)	34 (69.9; 53.6, 82.4)	
Housewife	237 (39.2; 31.9, 47.0)	264 (60.8; 53.0, 68.1)		132 (62.7; 52.6, 71.7)	106 (37.3; 28.3, 47.4)	
Household income						
Below 40%	164 (34.9; 26.8, 44.0)	208 (65.1; 56.0, 73.2)	0.325	142 (62.3; 53.9, 70.0)	116 (37.7; 30.0, 46.1)	0.050
Medium 40%	218 (37.9; 31.2, 45.0)	266 (62.1; 55.0, 68.8)		65 (45.5; 33.1, 58.6)	84 (54.5; 41.4, 66.9)	
Top 20%	93 (45.6; 34.5, 57.0)	100 (54.4; 43.0, 65.5)		16 (40.0; 19.7, 64.6)	15 (60.0; 35.4, 80.3)	
Ask partner's permission before seeking healthcare						
Yes	140 (39.3; 31.0, 48.3)	149 (60.7; 51.7, 69.0)	0.876	56 (47.4; 36.9, 58.3)	73 (52.6; 41.7, 63.1)	0.077
No	335 (40.2; 34.2, 46.5)	412 (59.8; 53.5, 65.8)		166 (59.2; 51.7, 66.4)	140 (40.8; 33.6, 48.3)	
Experience controlling behaviour from their partner						
Yes	180 (42.5; 34.5, 51.0)	195 (57.5; 49.0, 65.5)	0.284	73 (50.0; 40.4, 59.6)	87 (50.0; 40.4, 59.6)	0.197
No	296 (36.9; 30.8, 43.5)	378 (63.1; 56.5, 69.2)		150 (55.5; 49.0, 61.8)	128 (41.9; 34.3, 50.0)	

Table 1: Urban-Rural Differences in Sociodemographic Factors Associated with Contraceptive Use Among WR in Malaysia

Protecting the Future: Vaccine Hesitancy Among Malaysian Mothers of Children Under Two Years Old

Norain Ab Wahab¹, S Maria Awaluddin¹, Eida Nurhadzira Muhammad¹, Chong Zhuo Lin¹, Norliza Shamsuddin¹, Nazirah Alias¹, Foong Ming Moy², Noor Ani Ahmad¹.

¹ *Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia*

² *Department of Social and Preventive Medicine, Faculty of Medicine, University of Malaya*

Corresponding author's email: norain.ab@moh.gov.my

Summary

Vaccine hesitancy remains a public health concern, impacting immunization coverage and the control of vaccine-preventable diseases. This study aimed to determine the prevalence and sociodemographic determinants of vaccine hesitancy among Malaysian mothers of children under two years old. A nationwide cross-sectional household survey was conducted in 2022, involving 5,930 mothers aged 15-49, using the validated Malay version of the Parent Attitudes About Childhood Vaccines (PACV) questionnaire. The overall prevalence of vaccine hesitancy was 4.6% (95% CI: 3.8, 5.5), with higher rates observed among mothers with primary education, housewives, and those from lower-income households. These findings highlight the need for targeted interventions to enhance vaccine confidence among at-risk populations.

Keywords

Vaccine hesitancy, Malaysia, PACV, immunisation, parental attitudes

Introduction

Vaccine hesitancy is a well-documented barrier to achieving high immunization rates and preventing vaccine-preventable diseases. The Parent Attitudes About Childhood Vaccines (PACV) questionnaire is a validated tool for assessing parental concerns regarding childhood vaccinations (1,2). This study aimed to determine the prevalence of vaccine hesitancy among Malaysian mothers and identify key sociodemographic.

Materials and Methods

A nationwide cross-sectional household survey was conducted in 2022. A multistage sampling approach was employed to select households with children under five years old to address maternal and child health topics. The sample size was determined using a single proportion formula, yielding a minimum required sample of 5,390 participants. The study specifically analyzed responses from 5,930 mothers of children under two years old, as responses from fathers and guardians were too few for meaningful analysis. Data were collected using the validated Malay version of the 15-item PACV questionnaire, where a total score of ≥ 50 indicated vaccine hesitancy (1). Sociodemographic characteristics of the mothers were also recorded. Statistical analyses were conducted using IBM SPSS version 29.0, accounting for the complex survey design. Associations between vaccine hesitancy and sociodemographic factors were examined using complex sample frequency analyses and cross-tabulations, with a significance level of $p < 0.05$. This study received ethical

approval from the Medical and Research Ethics Committee (MREC), Ministry of Health, Malaysia (NMRR-20-959-53329).

Results and Discussion

A total of 5,930 mothers participated in the study Table 1. The prevalence of vaccine hesitancy was 4.6% (95% CI: 3.8, 5.5) (see Table 2). Vaccine hesitancy was significantly higher among mothers with a primary education level (9.3%), housewives (5.7%), and those from lower-income households (below 40% income bracket: 5.4%) compared to their higher-educated and employed counterparts ($p < 0.001$ for both education and employment status; $p = 0.003$ for income level). No significant differences were observed based on urban versus rural residence ($p = 0.139$) or ethnicity ($p = 0.119$). These findings highlight the role of socioeconomic factors in shaping parental vaccine attitudes, suggesting that lower education and financial constraints may contribute to vaccine hesitancy (3). Addressing these disparities through targeted health education campaigns and improved healthcare outreach, particularly in lower-income communities, may help build vaccine confidence and increase immunization rates (4,5).

Table 1: Sociodemographic characteristics of mothers aged 15-49 who participated in this study (N=5,930)

Mothers' variable	N (%)	Mothers' variable	N (%)
Strata		Working status	
Urban	4184 (70.6)	Government or semi	879 (14.8)
Rural	1746 (29.4)	Private	1112 (18.8)
		Self-employed	472 (8.0)
Ethnicity		Housewife	3458 (58.3)
Malay	4658 (78.5)		
Chinese	224 (3.8)	Household income	
Indian	194 (3.3)	Below 40%	4601 (77.8)
Other Bumiputera	599 (10.1)	Middle 40%	1166 (19.7)
Others	249 (4.2)	Top 20%	148 (2.5)
Level of education			
Primary	394 (6.6)		
Secondary	2974 (50.2)		
Tertiary	2548 (43.0)		

Table 2: Prevalence of Vaccine Hesitancy Versus Vaccine Confidence Among Mothers in Malaysia and Its Associated Sociodemographic Factors(N=5930)

Variables	Vaccine Hesitant			Vaccine Confident			p-value
	N	%	(95% CI)	N	%	(95% CI)	
Overall	267	4.6	(3.8, 5.5)	5663	95.4	(94.5, 96.2)	-
Strata							
Urban	186	4.2	(3.3, 5.2)	3998	95.8	(94.8, 96.7)	
Rural	81	5.6	(4.0, 7.8)	1665	94.4	(92.2, 96.0)	0.139
Ethnicity							
Malay	215	4.7	(4.0, 5.5)	4443	95.3	(94.5, 96.0)	

Chinese	6	3.9 (1.5, 9.7)	218	96.1 (90.3, 98.5)	
Indian	6	1.7 (0.7, 4.0)	188	98.3 (96.0, 99.3)	
Other Bumiputera	20	2.7 (1.7, 4.3)	579	97.3 (95.7, 98.3)	
Others	20	8.0 (3.9, 15.7)	229	92.0 (84.3, 96.1)	0.119
Level of education					
Primary	39	9.3 (5.4, 15.5)	355	90.7 (84.5, 94.6)	
Secondary	151	5.0 (4.0, 6.1)	2823	95.5 (93.9, 96.0)	
Tertiary	77	2.9 (2.0, 4.1)	2471	97.1 (95.9, 98.0)	<0.001
Working status					
Government or semi	15	1.3 (0.7, 2.3)	864	98.7 (97.7, 99.3)	
Private	33	3.0 (1.8, 5.2)	1079	97.0 (94.8, 98.2)	
Self-employed	28	5.6 (3.4, 9.2)	444	94.4 (90.8, 96.6)	
Housewife	191	5.7 (4.7, 7.0)	3267	94.3 (93.0, 95.3)	<0.001
Household income					
Below 40%	238	5.4 (4.5, 6.6)	4363	94.6 (93.4, 95.5)	
Middle 40%	28	2.4 (1.3, 4.6)	1138	97.6 (95.4, 98.7)	
Top 20%	1	0.3 (0.0, 2.3)	147	99.7 (97.7, 100.0)	0.003

Conclusion

This study provides the first large-scale national assessment of vaccine hesitancy among Malaysian mothers using the PACV questionnaire. While overall hesitancy remains low, mothers with lower education, housewives, and those from lower-income groups exhibit significantly higher hesitancy levels. These findings highlight the need for targeted interventions to improve vaccine acceptance among at-risk populations, ultimately ensuring broader immunization coverage and better public health outcomes.

References

1. Mohd Azizi FS, Kew Y, Moy FM. Vaccine hesitancy among parents in a multi-ethnic country, Malaysia. *Vaccine*. 2017;35(22):2955-61.
2. Opel DJ, Taylor JA, Zhou C, Catz S, Myaing M, Mangione-Smith R. The relationship between parent attitudes about childhood vaccines survey scores and future child immunization status: a validation study. *JAMA Pediatr*. 2013 Nov;167(11):1065-71.
3. Yao X, Fu M, Peng J, Feng D, Ma Y, Wu Y, et al. Socioeconomic disparities in childhood vaccine hesitancy among parents in China: The mediating role of social support and health literacy. *Hum Vaccines Immunother*. 2025;21(1).
4. Wong LP, Wong PF, AbuBakar S. Vaccine hesitancy and the resurgence of vaccine preventable diseases: the way forward for Malaysia, a Southeast Asian country. *Hum Vaccines Immunother* [Internet]. 2020;16(7):1511-20. Available from: <https://doi.org/10.1080/21645515.2019.1706935>
5. McIntosh EDG, Janda J, Ehrich JHH, Pettoello-Mantovani M, Somekh E. Vaccine Hesitancy and Refusal. *J Pediatr* [Internet]. 2016;175:248-249.e1. Available from: <http://dx.doi.org/10.1016/j.jpeds.2016.06.006>

Streamlining Excellence: A Protocol for Standardising Healthcare Quality Professionals' Roles and Functions in the Ministry of Health Malaysia

Normaizira Hamidi¹, Nurhayati Shahrudin¹, Divya Nair Narayanan¹, Samsiah Awang¹, Khalidah Maruan¹, Izzatur Rahmi Mohd Ujang¹, Nur Ezdiani Mohamed¹, Roslina Supadi¹, Mariyah Mohamad¹

¹Centre for Healthcare Quality Research, Institute for Health Systems Research, National Institutes of Health, Ministry of Health

Corresponding author's email: normaizira.h@moh.gov.my

Summary

Healthcare Quality Professionals (HQPs) are essential for ensuring high-quality healthcare and driving improvements within healthcare systems, but in Malaysia, their roles and functions lack consistency across units and levels within the Ministry of Health. This research protocol aims to evaluate current Quality Improvement (QI) roles and functions, and develop standardised roles and functions through a validation. A four-step approach will be used: document review, Nominal Group Technique, online survey, and expert panel validation. The findings will inform the development of a QI Competency Framework for HQPs at state, hospital, and district health office levels.

Keywords

Healthcare quality professional, workforce development, roles and functions, research protocol, ministry of health

Introduction

The MOH has implemented various Quality Improvement (QI) initiatives under the Quality Assurance Programme, supported by governance structures from national to facility levels¹. However, inconsistencies in the roles and functions of Healthcare Quality Professionals (HQPs) across different units and levels have led to confusion, inefficiencies, and challenges in coordination. The lack of standardised roles prevents HQPs from fully understanding their responsibilities, hinders effective collaboration, and impairs clarity in task execution. This ambiguity increases the risk of overlapping duties or critical gaps, undermining healthcare quality governance. Consequently, HQPs face difficulties in delivering consistent service quality, compromising the ministry's efforts to uphold high healthcare standards. This protocol describes the method to develop and validate standardised QI roles and functions tailored to the specific requirements of HQPs at the state health department (JKN), hospital, and district health office (PKD) levels.

Materials and Methods

This multi-method study adapts methodologies from Liang et al. and Zafošnik et al. using a four-step approach^{2,3}. Step 1 involves a comprehensive review of job descriptions and *sasaran kerja utama* to identify quality improvement (QI) tasks currently performed by HQPs. In Step 2, the Nominal Group Technique (NGT) will engage HQPs in prioritising key tasks. Step 3 gathers broader input through an online

survey distributed to HQPs not participating in the NGT, facilitated via Google Forms. Step 4 concludes with expert panel validation to ensure the comprehensiveness and standardisation of roles. Data analysis will include qualitative content analysis of job descriptions and NGT discussions, along with descriptive statistical analysis of survey responses. Eligible HQPs must be employed in a Quality Unit, have at least one year of QI experience for NGT participation, at least three years of QI experience for expert panel validation, and be willing to participate.

Results and Discussion

This protocol describes a comprehensive methodology to identify and define the QI roles and functions of HQPs in Malaysia, as well as to develop and validate standardised roles tailored to their specific needs. Strength of this study is multi-methods design which is robust methods to enhance the validity and reliability of the findings. By focusing on job descriptions, key work targets, and quality improvement (QI) tasks, it ensures practical relevance to the operations of quality units within the Ministry of Health Malaysia. The use of the Nominal Group Technique (NGT) promotes structured, equitable participation, fostering consensus while minimising bias. An online survey extends the reach to capture feedback from a broader audience of HQPs, addressing representation gaps. Finally, expert panel validation enhances reliability and aligns HQP roles and functions with governance and quality improvement objectives at all levels of the Ministry, ensuring robust and actionable outcomes.

The methodology has several limitations. First, the reliance on participant input introduces potential bias, as the Nominal Group Technique (NGT) is inherently qualitative and involves a small sample size. To enhance representation, a purposive selection strategy with predefined criteria was employed to include participants from State (JKN), hospital, and PKD levels. Second, expert panel validation may reflect subjective opinions that do not fully capture on-ground challenges. Third, the study's multi-step process is resource- and time-intensive, posing a risk of delays within the 15-month timeline. Additionally, there is a risk of overemphasizing current practices due to reliance on existing job descriptions and *sasaran kerja utama*, potentially limiting innovation in defining future roles. Finally, technological barriers may arise, as the online survey's dependence on Google Forms could limit participation in areas with poor internet connectivity or among HQPs with limited digital proficiency.

Conclusion

This study will standardise HQP roles in Malaysia through a systematic approach. By evaluating job descriptions and targets, prioritising tasks, and validating findings, it ensures suitability for each governance level while enhancing consistency in quality improvement. The findings will support the development of a QI Competency Framework for HQPs at state, hospital and PKD levels.

Acknowledgments

We would like to express our deepest appreciation to the quality officers from JKN, hospital, and PKD for their invaluable contribution and support throughout the course of this study. Their cooperation and dedication are essential in advancing our research and ensuring its success.

References

1. Ministry of Health Malaysia. Quality Manual: National Indicator Approach (NIA).
2. Liang Z, Leggat SG, Howard PF, et al. What makes a hospital manager competent at the middle and senior levels. *Aust Heal Rev.* 2013;**37**(5):566-73.
3. Zafošnik U, Cerovečki V, Stojnić N, Belec AP, Klemenc-Ketiš Z. Developing a competency framework for training with simulations in healthcare: a qualitative study. *BMC Med Educ.* 2024;**24**(1):1-9.

The Risk of Health Status of 2024 Pre-Hajj Medical Examination in Malaysia Hajj Pilgrim (MyVAS Outcomes)

Khairulaizat Mahdin¹, Mohd Azmi Suliman¹, Iesza Raihan Ali², Azah Abdul Samad³, Muhammad Shafiq Samsudin⁴, Maheshwara Rao Appannan², Salmiah Baharudin.⁵

¹ Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

² Digital Health Division, Ministry of Health Malaysia

³ Family Health Development Division, Ministry of Health Malaysia

⁴ Tabung Haji, Malaysia

⁵ Disease Control Division, Ministry of Health Malaysia

Corresponding author's email: khairulaizat@moh.gov.my

Summary

Every year, around 2.5 million Hajj pilgrims gather in Mecca to perform Hajj¹. This study explores the output of health screening conducted for prospective Malaysian Hajj pilgrim in 2024. There were 31,518 prospective pilgrims underwent a pre-Hajj health screening using the MyVAS system. Among them, 38.79% considered as “fit without comorbidities” and 54.04% were classified as “fit with stable comorbidities” while the others are considered high risk or failed. Those aged above 60 years are less likely to be fit. These findings underscore the need for comprehensive screening, especially for older pilgrims, to minimize health risks and ensure a safe pilgrimage.

Keywords

Hajj pilgrim, pre-Hajj, health status, medical examination

Introduction

Hajj is a spiritually significant yet physically demanding journey. Recognizing the intrinsic link between spiritual fulfilment and physical health, Malaysia's Pre-Hajj medical examination (PHME) serves as a crucial checkpoint to ensure pilgrims are fit to travel². Conducted in collaboration with the Ministry of Health and Tabung Haji, the PHME evaluates pre-existing conditions, determines fitness for the journey, and provides tailored health advice. This study aims to investigate the prevalence of various health conditions and assesses the screening system's ability to predict potential health risks. Information from this study could provide our understanding of pre-Hajj health challenges and inform targeted interventions to enhance the safety and overall experience of Malaysian pilgrims. This study gaps primarily concern the effectiveness of the screening system and its correlation with long-term health outcomes.

Material and Methods

This study employed a descriptive, cross-sectional design using secondary quantitative data from MyVAS, a healthcare provider platform for the MySejahtera application of the Ministry of Health (MOH). MyVAS functions as a digital platform for Hajj Pilgrims' Health Management, enabling certified medical officers to conduct pre-Hajj health screenings, record assessments, and categorize outcomes. Based on MOH guidelines³, medical officers classified pilgrims as fit without comorbidities, stable comorbidities, abnormal TUG/30STS (Timed Up and Go, followed by a 30-

Second Sit-to-Stand test), high-risk requiring further evaluation, or unfit for the examination.

The study analysed records of 31,518 prospective pilgrims. Univariate analysis summarized variables such as gender, age, examination outcomes, and health risks. A Chi-Square test was conducted to determine the association between age groups and examination results. All statistical analyses were conducted using SPSS version 26.0 to ensure a systematic evaluation of Malaysian Hajj pilgrims' health profiles. Data privacy and patient confidentiality were strictly maintained throughout the study, ensuring all personal all personal information was anonymized and securely stored.

Results and Discussion

The 2024 pre-Hajj screening revealed that 57% of the 31,518 Malaysian pilgrims were females, while 43% were males. The predominant age group was 51-59 years (32.1%), followed by those aged 60 and above (29.8%), 41-49 years (20.7%), and below 40 years (17.3%). According to the MyVAS assessment, 54.04% were deemed “fit with stable comorbidities” and 38.79% “fit without comorbidities.” In contrast, 2.71% of the pilgrims failed the health examination, mainly due to cardiovascular diseases, followed by endocrine and metabolic diseases, 1.87% recorded abnormal TUG and 30STS test results, 1.37% required further evaluation, and 1.22% were classified as high risk.

A Chi-Square analysis indicated a significant association between age and examination outcomes ($p < 0.001$), suggesting that older pilgrims are more susceptible to adverse health findings (Table 1). The relatively higher failure rate compared to the high-risk classification emphasizes that many older pilgrims present with manageable health issues that could benefit from early intervention.. These findings advocate for enhanced screening protocols and customized health management strategies to address the unique needs of older pilgrims, thereby reducing potential complications and ensuring a safer Hajj experience.

Table 1: 4x6 Chi-Square Analysis of Health Screening Outcomes Across Age Groups (n = 31,518)

Age in Group	Screening Outcome, n (%)					
	no comorbid*	stable comorbid*	abnormal TUG and 30 STS*	high risk*	Requires Further Evaluation	Failed Health Examination
<40 years	4,003 (32.7%)	1,331 (7.8%)	15 (2.6%)	22 (5.7%)	34 (7.9%)	55 (6.4%)
41-49years	3,441 (28.1%)	2,872 (16.9%)	27 (4.6%)	37 (9.6%)	69 (15.9%)	90 (10.5%)
51-59years	3,276 (26.8%)	6,235 (36.6%)	106 (18.0%)	131 (34.0%)	139 (32.1%)	243 (28.4%)
>60 years and above	1,505 (12.3%)	6,594 (38.7%)	440 (74.8%)	195 (50.6%)	191 (44.1%)	467 (54.6%)

Chi-Square test, $\chi^2 = 5970$, $p < 0.001$, * Fit to Perform Hajj

Conclusion

In conclusion, a significant number of Malaysian pilgrims did not meet the health standards required for Hajj, with more individuals failing the screening than being classified as high risk. This highlights the importance of comprehensive assessments and early interventions to protect pilgrims' health during the pilgrimage. These findings also suggest policy and practice implications, such as improving health screening guidelines and promoting health education among pilgrims.

Acknowledgments

We would like to thank the Director-General of Health Malaysia, for his permission to publish this poster

Reference

1. Lokman M, Sa'adan M. Implikasi Wabak COVID-19 Terhadap Istita'ah Kesihatan untuk Menunaikan Ibadah Haji: The Implications of the COVID-19 Outbreak on Health's Ability for Performing Hajj. *RABBANICA - Journal of Revealed Knowledge*. 2022;3(2):151-70.
2. Tabung Haji. Pemeriksaan Kesihatan | Tabung Haji [Internet]. 2024. www.tabunghaji.gov.my/ms/pemeriksaan-kesihatan (accessed 20 Feb 2025)
3. Bahagian Kawalan Penyakit. Portal Rasmi Kementerian Kesihatan Malaysia. 2024. Garis Panduan Pemeriksaan Bakal Jemaah Haji Edisi 10.

Prevalence and Determinants of Parental Monitoring Among Malaysian Adolescents

Noor Syaqlah Shawaluddin¹, Tuan Mohd Amin Tuan Lah¹, Maznieda Mahjom¹, Nur Hamizah Nasaruddin¹, Nazirah Alias¹, Mohd Ruhaizie Riyadzi¹, Thamil Arasu Saminathan¹, Nur Faraeein Zainal Abidin¹, Lim Kuang Kuay¹, S Maria Awaluddin¹

¹ *Institute for Public Health, National Institute of Health, Malaysia*

Corresponding author's email: noorsyaqlah@moh.gov.my

Summary

This study examines the association between sociodemographic factors and parental monitoring among adolescents. Indian adolescents and those with married parents experienced the highest monitoring, while FT Labuan had the lowest. The findings highlight the crucial role of parental monitoring in adolescent development and the need for targeted interventions to improve parent-adolescent relationships. Strengthening monitoring can help reduce high-risk behaviours and promote healthier growth. Future research should focus on strategies to improve parental monitoring across diverse populations.

Keywords: Adolescent, Parental monitoring, Malaysia

Introduction

Adolescence is a crucial stage influenced by biological, psychological, and social factors, increasing vulnerability to high-risk behaviours like substance abuse, delinquency, and risky sexual activity. While a strong parent-child bond offers protection, studies show a global decline in parental connectedness and monitoring, especially in Western and Asian countries^{2,3}. Given the crucial role of parental monitoring in shaping adolescent behaviour, this study aims to identify the sociodemographic factors associated with parental monitoring among adolescents.

Materials and Methods

This cross-sectional study utilised data from the Adolescent Health Survey 2022. A two-stage stratified cluster sampling method was used to select respondents. Sociodemographic and parental monitoring data were collected using validated questionnaires by answering questions on an optical mark recognition (OMR) answer sheet. Descriptive statistics and chi-square tests were conducted using SPSS version 28 to analyse the association between sociodemographic factors and parental monitoring, based on profile characteristics in a complex sampling design. The level of significant differences between the two groups is based on the p-value of less than 0.05.

Results and Discussion

The study achieved a 99.6% response rate, with 33,523 adolescents participating and an overall parental monitoring prevalence of 33.4%. Male adolescents experienced higher parental monitoring (aOR = 1.21, 95% CI: 1.12, 1.30). Among ethnic groups, Indian adolescents reported the highest levels (aOR = 2.21, 95% CI: 1.82, 2.70), followed by Chinese adolescents (aOR = 1.15, 95% CI: 1.03, 1.28), with no significant

differences for other groups. Adolescents with married parents and/or living together had greater parental monitoring (aOR = 1.35, 95% CI: 1.26, 1.44). This finding aligns with previous research indicating that intact family structures contribute to more consistent parental supervision, which is crucial for adolescent development and well-being⁴. At the state-level, FT Labuan had lower monitoring levels (aOR = 0.70, 95% CI: 0.59, 0.84), while Perlis had higher levels (aOR = 1.24, 95% CI: 1.04, 1.48). These state-level differences may be influenced by varying degrees of urbanisation, socioeconomic factors, and cultural expectations of parental monitoring. These findings highlight the sociodemographic influences on parental monitoring and the need for targeted interventions to enhance supervision, particularly in low-monitoring regions, to mitigate adolescent risk behaviours and support positive development. Future research should examine underlying mechanisms and strategies to strengthen parental involvement⁵.

Table 1: Parental monitoring based on sociodemographic profiles among adolescents

Variables	Total (N)	Prevalence (%)	Parental Monitoring	
			COR (95% CI)	AOR (95% CI)
Overall	33523	33.4		
Age group				
13 years old	7216	32.7	1.00	1.00
14 years old	6902	32.3	0.98 (0.88, 1.09)	0.98 (0.89, 1.09)
15 years old	6460	33.7	1.05 (0.94, 1.17)	1.06 (0.94, 1.18)
16 years old	6756	34.3	1.08 (0.95, 1.22)	1.09 (0.96, 1.24)
17 years old	6189	34.1	1.07 (0.97, 1.17)	1.09 (0.99, 1.19)
Sex				
Male	15493	35.5	1.20 (1.12, 1.29)	1.21 (1.12, 1.30)***
Female	18030	34.1	1.00	1.00
Ethnicity				
Malay	23125	32.0	1.00	1.00
Chinese	5085	34.3	1.11 (1.00, 1.23)	1.15 (1.03, 1.28)**
Indian	1556	49.9	2.12 (1.75, 2.56)	2.21 (1.82, 2.70)***
Bumiputera Sabah	1722	32.8	1.04 (0.94, 1.14)	1.16 (0.99, 1.35)
Bumiputera Sarawak	1241	30.5	0.93 (0.79, 1.10)	1.05 (0.87, 1.26)
Others	794	29.6	0.90 (0.73, 1.09)	0.96 (0.78, 1.17)
Parental marital status				
Married & living together	26806	34.6	1.33 (1.24, 1.42)	1.35 (1.26, 1.44)***
Living apart	6703	28.6	1.00	1.00
State				
Johor	2005	34.4	1.01 (0.81, 1.26)	0.94 (0.77, 1.15)
Kedah	2172	35.6	1.06 (0.81, 1.39)	1.00 (0.78, 1.28)
Kelantan	2138	32.5	0.93 (0.76, 1.13)	0.95 (0.79, 1.16)
Melaka	1986	34.6	1.02 (0.85, 1.22)	0.99 (0.83, 1.18)

Negeri Sembilan	2210	32.9	0.94 (0.76, 1.18)	0.85 (0.67, 1.08)
Pahang	2171	32.5	0.93 (0.77, 1.11)	0.91 (0.77, 1.08)
Penang	2044	35.7	1.07 (0.90, 1.26)	0.96 (0.80, 1.15)
Perak	2126	36.7	1.11 (0.90, 1.26)	1.05 (0.86, 1.27)
Perlis	2004	38.8	1.22 (1.01, 1.47)	1.24 (1.04, 1.48)*
Selangor	2048	32.1	0.91 (0.74, 1.12)	0.83 (0.67, 1.02)
Terengganu	2219	33.4	0.96 (0.78, 1.19)	1.00 (0.82, 1.21)
Sabah	2086	31.5	0.89 (0.74, 1.06)	0.85 (0.68, 1.06)
Sarawak	2189	30.8	0.86 (0.72, 1.03)	0.84 (0.70, 1.02)
FT K. Lumpur	2114	34.5	1.02 (0.82, 1.26)	0.95 (0.77, 1.17)
FT Labuan	2033	27.2	0.72 (0.60, 0.86)	0.70 (0.59, 0.84)***
FT Putrajaya	1978	34.2	1.00	1.00

FT = Federal Territory, *p<0.05, **p<0.01, ***p<0.001

Conclusion

Parental monitoring varies by sociodemographic factors, with Indian adolescents receiving the highest levels and those in married or cohabiting households experiencing greater monitoring. Monitoring is notably lower in FT Labuan. Targeted interventions are needed to enhance parental monitoring for adolescents with limited supervision, promoting their well-being and healthy development.

References

1. Sawyer SM, Azzopardi PS, Wickremarathne D, et al. The age of adolescence. *Lancet Child Adolesc Heal*. 2018;**2**(3):223-8.
2. Resnick MD, Bearman PS, Blum RW, Bauman KE, Harris KM, Jones J, et al. Protecting Adolescents From Harm: Findings From the National Longitudinal Study on Adolescent Health. *JAMA* 1997 Sep 10;278(10):823-32. <https://doi.org/10.1001/jama.1997.03550100049038>
3. Wang M, Sheikh-Khalil S. Does parental involvement matter for student achievement and mental health in high school? *Child Dev*. 2014;**85**(2):610-25.
4. Baig T, Ganesan GS, Ibrahim H, Yousuf W, Mahfoud ZR. The association of parental involvement with adolescents' well-being in Oman: evidence from the 2015 Global School Health Survey. *BMC Psychol*. 2021;**9**(1):1-9.
5. Kågesten A, Gibbs S, Blum RW, Moreau C, Chandra-Mouli V, Herbert A, et al. Understanding factors that shape gender attitudes in early adolescence globally: A mixed-methods systematic review. *PLoS One*. 2016;**11**(6):1-36.

Prevalence of Pre-Pregnancy Comorbidities among Mothers in Malaysia and the Association with Hypertensive Disorder in Pregnancy

Maznieda Mahjom¹, Mohd Shaiful Azlan Kassim¹, Kishwen Kanna Yoga Ratnam¹, S Maria Awaluddin¹, Lim Kuang Kuay¹, Noor Syaqlah Shawaluddin¹, Tuan Mohd Amin Tuan Lah¹, Farah Nabilah Ahmad Zainuddin¹, Dzarifah Hanis Md Sairi¹

¹Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: drmaznieda@moh.gov.my

Summary

Pre-existing medical conditions among mothers potentially increase the risk of complications during pregnancy. This study examines the prevalence of pre-pregnancy comorbidities and their association with hypertensive disorders in pregnancy (HDP). This study used data from a nationwide survey of 6,358 mothers. The results show that 9.3% of mothers had at least one pre-pregnancy comorbidity, with asthma (3.2%) and diabetes mellitus (2.9%) being the most common conditions. Mothers with pre-pregnancy comorbidities had a significantly higher risk of developing HDP (adjusted OR: 3.6, 95% CI: 2.6-5.0, $p < 0.001$). Precise action, identification and intervention of pre-pregnancy comorbidities could significantly improve maternal and foetal health.

Keywords

pre-pregnancy comorbidities, hypertensive disorders in pregnancy, maternal health, cross-sectional, Malaysia

Introduction

Pre-pregnancy health plays a critical role in influencing maternal and perinatal outcomes, with existing medical conditions potentially increasing the risk of complications during pregnancy¹. In particular, hypertensive disorders in pregnancy (HDP) are a significant public health concern, contributing to maternal and neonatal morbidity and mortality worldwide^{2,3}. Understanding the prevalence of pre-pregnancy comorbidities and their association with HDP is crucial for developing effective prevention and intervention strategies. This study aims to determine the prevalence of pre-pregnancy comorbidities among mothers aged 15-49 years in Malaysia and assess their impact on the likelihood of developing HDP.

Materials and Methods

This study used data from the 2022 National Health and Morbidity Survey (NHMS), a nationally representative survey in Malaysia. A two-stage cluster random sampling method was employed to select women aged 15-49 who had given birth in the last two years. Participants were asked whether they had ever been diagnosed by a doctor with any of the following pre-pregnancy conditions before their most recent childbirth: hypertensive disorders, diabetes mellitus, heart disease, thalassaemia, thyroid disease, asthma, or epilepsy. Additionally, they were asked whether they had ever been diagnosed with hypertensive disorders during pregnancy, and the nurses confirmed the responses by checking their antenatal cards. Sociodemographic data were also collected using validated questionnaires. Descriptive statistics and

complex sample logistic regression analyses were conducted using SPSS version 25.0. A p-value of less than 0.05 was considered statistically significant.

Results and Discussion

A total of 6,360 mothers participated in this study. The sociodemographic analysis revealed that most participants were under 35 years old (72.1%), Malay (78.7%), and residing in urban areas (69.8%). A large proportion had secondary (49.8%) or tertiary education (43.1%), and nearly 60% were unemployed or housewives. The study revealed that 9.3% of mothers had at least one pre-pregnancy comorbidity, as shown in Table 1. Among the specific conditions assessed, asthma (3.2%) and diabetes mellitus (2.9%) were the most commonly reported, followed by thalassaemia (1.8%) and hypertensive disorders (1.5%). Thyroid disease (0.6%) and epilepsy (0.5%) were the least common. Notably, the presence of multiple pre-pregnancy comorbidities was rare, with 8.1% of women having one condition whereas only 0.9% had two. The association between pre-pregnancy comorbidities and hypertensive disorders in pregnancy was significant. Mothers with pre-pregnancy comorbidities faced a significantly higher risk of developing HDP, with an adjusted odds ratio (OR) of 3.6 (95% CI: 2.6-5.0, $p < 0.001$). This association remained statistically significant even after adjusting for sociodemographic factors. These findings suggest that pre-existing health conditions substantially increase the likelihood of hypertensive complications during pregnancy. Given the strong association between pre-pregnancy comorbidities and HDP, early intervention strategies—including preconception screening, lifestyle modifications, and enhanced maternal healthcare services—are crucial in reducing pregnancy-related complications in Malaysia^{1,3-5}.

Table 1: The prevalence of pre-pregnancy comorbidities by each selected disease and the number of comorbidities among mothers in Malaysia

Variables	N	Weighted percentage	95% CI	
			Lower	Upper
Type of selected disease				
Hypertensive disorder	98	1.5	1.2	1.9
Diabetes mellitus	215	2.9	2.4	3.4
Thyroid disease	31	0.6	0.4	0.9
Thalassemia	114	1.8	1.5	2.2
Asthma	178	3.2	2.7	3.9
Epilepsy	27	0.5	0.3	0.8
Number of comorbidities				
1	523	8.1	7.3	9
2	62	0.9	0.7	1.2
3	5	-	-	-
4	2	-	-	-
5	1	-	-	-
6	1	-	-	-
7	6	-	-	-
Pre-pregnancy comorbidities	600	9.3	8.4	10.2

(any of the above diseases)				
-----------------------------	--	--	--	--

Table 2: The Association of pre-pregnancy comorbidities with hypertensive disorder in pregnancy among mothers in Malaysia

Pre-pregnancy comobities	Hypertensive disorders in pregnancy					Crude OR (95% CI)	#Adjusted OR (95% CI)
	Yes		No				
	n	% (95% CI)	n	% (95% CI)			
Yes	109	18.1 (14.4, 22.3)	489	81.9 (77.7, 85.5)	***	4.0 (2.9, 5.3)***	3.6 (2.6, 5.0)***
No	269	5.3 (4.6, 6.1)	5467	94.7 (93.9, 95.4)		1.0	1.0

*** p value <0.001, #adjusted with state zone, strata, age group, educational level, working status, ethnicity, and household income.

Conclusion

Pre-pregnancy comorbidities are found to be prevalent among Malaysian mothers and have a strong association with conditions of hypertensive pregnancy. Improved early detection, public health education, policies of preconception care, and access to healthcare can alleviate complications and improve both newborn and mothers' outcomes in Malaysia.

References

1. National Institute for Health and Care Excellence. Intrapartum care for women with existing medical conditions or obstetric complications and their babies. National Institute for Health and Care Excellence. United Kingdom; 2019.
2. Ratnam KKY, Suliman MA Bin, Sui WK, et al. Prevalence of hypertension in pregnancy and its associated sociodemographic factors among mothers aged 15-49 years old in Malaysia. *Arch Public Heal*. 2024;**82**(1).
3. Maged AM, Elsherief A, Hassan H, et al. Maternal, fetal, and neonatal outcomes among different types of hypertensive disorders associating pregnancy needing intensive care management. *J Matern Neonatal Med*. 2020;**33**(2):314-21.
4. Pinheiro TV, Brunetto S, Ramos JGL, et al. Hypertensive disorders during pregnancy and health outcomes in the offspring: A systematic review. *J Dev Orig Health Dis*. 2016;**7**(4):391-407.
5. Jabatan Kesihatan Negeri Terengganu. Caring For Pregnant Women With Medical Conditions. Jabatan Perubatan, Hospital Sultanah Nur Zahirah. Kuala Terengganu; 2024.

Gross motor developmental delay among children aged 6 to 59 months in Malaysia, 2022

Nur Hamizah Nasaruddin¹, S Maria Awaluddin¹, Noor Syaqlah Shawaluddin¹, Khaw Wan-Fei¹, Nazirah Alias¹, Tham Sin Wan¹, Sharifah Nazeera Syed Anera², Wan Shakira Rodzlan Hasani³, Sulhariza Husni Zain¹

¹ Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

² Sector for Biostatistics & Data Repository, National Institutes of Health, Ministry of Health Malaysia

³ Gombak District Health Office, Ministry of Health Malaysia

Corresponding author's email: dr_nurhamizah@moh.gov.my

Summary

This study assessed the prevalence and factors associated with gross motor developmental delay among Malaysian children aged 6-59 months using data from the National Health and Morbidity Survey 2022. The prevalence was 1.0%, affecting an estimated 20,627 children. Children aged 12-23 months were nearly three times more likely to experience gross motor delay. Low birth weight was the strongest associated factor, underscoring the importance of adequate maternal nutrition. Strengthening maternal care and raising parental awareness are crucial for early detection and intervention.

Keywords

Children, milestone, gross motor, delay, risk factors

Introduction

Gross motor development in children involves large muscles for mobility. Delay occurs when age-specific milestones like sitting, standing, or walking are unmet. Gross motor delay may stem from neurodevelopmental disorders or temporary factors like sociodemographic, nutrition, or health-related influences^{1,2}. Early intervention can improve outcomes, but this requires early detection. Identifying associated factors enables timely diagnosis and interventions, benefiting children's long-term outcomes and reducing caregiver burden. This study aims to determine the prevalence of gross motor developmental delay and its associated factors among children aged 6-59 months in Malaysia.

Materials and Methods

This population-based cross-sectional study analysed data from the National Health and Morbidity Survey (NHMS): Maternal and Child Health, conducted in Malaysia from August to October 2022. NHMS employed a two-stage stratified random sampling design, covering all states and federal territories. Trained nurses conducted developmental assessments using a validated tool, adapted from the Denver Developmental Screening Chart. Children who did not meet age-specific gross motor milestones were classified as having gross motor developmental delay. Data from 15,240 children aged 6-59 months were analysed to determine the prevalence and factors associated with gross motor developmental delay, using complex sampling design analysis in SPSS version 23.

Results and Discussion

The prevalence of gross motor developmental delay in Malaysia was 1.0%, affecting an estimated 20,627 children aged 6-59 months. This marks an increase from 0.6% (12,843 children) in 2016, raising concerns about the potential factors (3). Although the highest prevalence was observed among children aged 6-11 months (1.4%), multivariable logistic regression revealed that the risk of delay became more pronounced in children aged 12-23 months (AOR: 2.8, 95% CI: 1.07, 7.60, $p=0.037$), where delays included the inability to stand without assistance, stand independently, or walk independently. This highlights the need for early detection and intervention in children under 24 months to reduce long-term developmental challenges². Healthcare providers must raise parental awareness of movement-based activities to enhance motor skills and prevent delays, while also encouraging prompt medical advice if red flags appear. Additionally, Malays (AOR: 3.5, 95% CI: 1.68, 7.21, $p=0.001$) and Chinese (AOR: 3.3, 95% CI: 1.05, 10.28, $p=0.041$) have significantly higher odds of motor delay. Cultural norms may influence the measurement of early childhood development, clinical interpretation, and children's responses to assessments⁴. Low birth weight (AOR: 3.7, 95% CI: 2.01, 6.81, $p<0.001$) showed the strongest association with gross motor delay, aligning with a systematic review linking intrauterine malnutrition to delayed development⁵. Given this strong association, ensuring maternal nutrition and educating expectant mothers are key to promoting foetal growth and early motor development.

Table 1: Prevalence and factors associated with gross motor developmental delay among children aged 6 to 59 months in Malaysia, 2022

Characteristics	Estimated population	Prevalence (95% CI)	AOR (95% CI)	<i>p</i> -value
Malaysia	20,627	1.0% (0.78, 1.20)		
Age group				
48-59 months	4,432	1.0% (0.59, 1.57)	2.6 (0.89, 7.31)	0.080
36-47 months	5,360	1.2% (0.74, 1.80)	2.6 (0.95, 7.14)	0.062
24-35 months	1,934	0.4% (0.17, 0.83)	Ref	
12-23 months	5,870	1.2% (0.87, 1.77)	2.8 (1.07, 7.60)	0.037
6-11 months	3,031	1.4% (0.82, 2.42)	2.8 (0.99, 7.78)	0.052
Sex				
Boy	11,946	1.1% (0.81, 1.48)	1.4 (0.84, 2.39)	0.196
Girl	8,681	0.8% (0.62, 1.15)	Ref	
Ethnicity				
Malay	14,376	1.1% (0.88, 1.36)	3.5 (1.68, 7.21)	0.001
Chinese	3,360	1.1% (0.53, 2.46)	3.3 (1.05, 10.28)	0.041
Indian	1,025	1.1% (0.31, 3.54)	3.5 (0.79, 15.83)	0.098
Others	1,866	0.5% (0.25, 0.82)	Ref	
BMI for age				
Wasting (<-2SD)	2,090	1.0% (0.55, 1.88)	1.2 (0.61, 2.55)	0.541
Overweight (>2SD)	1,988	1.5% (0.73, 3.10)	2.1 (0.95, 4.75)	0.067
Normal	14,116	0.8% (0.62, 1.06)	Ref	

Residency				
Urban	15,247	1.0% (0.78, 1.29)	1.3 (0.74, 2.31)	0.352
Rural	5,380	0.9% (0.58, 1.34)	Ref	
Gestation				
Preterm (<38 weeks)	5,285	3.1% (2.01, 4.79)	1.8 (0.97, 3.46)	0.061
Full-term	15,342	0.8% (0.61, 1.00)	Ref	
Birthweight				
Low (<2.5kg)	7,076	3.4% (2.28, 5.04)	3.7 (2.01, 6.81)	0.000
Normal	11,989	0.7% (0.53, 0.92)	Ref	

Conclusion

Despite appearing low, the rising prevalence now exceeds 20,000 children, highlighting the need to strengthen maternal and child health programs. Training healthcare providers and educating parents on child development may improve early interventions, support childhood development, and reduce delays.

References

1. Shevell MI, Majnemer A, Rosenbaum P, et al. Etiologic determination of childhood developmental delay. *Brain Dev.* 2001;**23**(4):228-35.
2. Mitiku K, Nega T, Arefaynie M, et al. Gross motor developmental delay and associated factors among under-five children attending public health facilities of Dessie city, Ethiopia. *BMC Pediatr.* 2023;**23**(1):638.
3. Institute for Public Health, National Health and Morbidity Survey (NHMS) 2016: Maternal and Child Health. Vol. II: Findings. 2016, National Institutes of Health, Ministry of Health Malaysia.
4. Rao N, Mirpuri S, Sincovich A, et al. Overcoming challenges in measuring early childhood development across cultures. *Lancet Child Adolesc Health.* 2020;**4**(5):352-4.
5. Boonzaaijer M, Suir I, Mollema J, et al. Factors associated with gross motor development from birth to independent walking: A systematic review of longitudinal research. *Child Care Health Dev.* 2021;**47**(4):525-61.

Potentially preventable hospitalisations among older adults: analysis of hospitalisations in the Ministry of Health facilities between 2015 and 2020

Melody Soong Yin Yin¹, Ang Zen Yang¹, Tang Kar Foong¹, Shakirah Md. Sharif¹, Lim Wern Han², Fun Weng Hong¹, Alif Haikal Md Razman¹, Nur Aleeya Syakila Muhamad Subian¹, Sondi Sararaks¹

¹ *Centre for Health Outcomes Research, Institute for Health Systems Research, National Institutes of Health, Ministry of Health Malaysia*

² *School of Information Technology, Monash University Malaysia*

Corresponding author's email: melodysy@moh.gov.my

Summary

Healthcare systems are affected by potentially preventable hospitalisations (PPHs), which disproportionately impact older adults. This study aimed to describe PPH trends among patients aged 60 and above admitted to Malaysian public hospitals. Chronic ambulatory care-sensitive conditions (cACSCs) accounted for 13.9-14.5% of total hospitalisations among older adults, with PPH rates remaining unchanged over the study period. Cardiovascular and respiratory conditions were the leading causes of PPH, and male patients consistently had higher PPH rates. These findings highlight the need to explore strategies for improving cACSC management in primary and outpatient care to reduce PPH and improve health outcomes.

Keywords

Preventable hospitalisations, ACSC, older adults, Malaysia, cardiovascular diseases

Introduction

Older adults are more likely to experience potentially preventable hospitalisations (PPHs) for chronic ambulatory care-sensitive conditions (cACSCs) that could have been avoided with timely and effective primary or outpatient care. Understanding local cACSC trends is vital, given the rapidly ageing Malaysian population, and hospitalisations among this population are often more costly and associated with poorer outcomes¹. Older adults are known to have an increased risk of chronic diseases, functional decline, and unmet healthcare needs due to barriers to accessing care², further increasing the risk of PPH. Demographic factors such as age, gender, and socioeconomic factors influence hospitalisation rates, affecting healthcare utilisation¹. Analysing these patterns can help improve primary or outpatient care management of cACSCs, reduce PPH³, and relieve pressure on hospitals, allowing resource reallocation for improved care delivery and health outcomes among older adults. This study aims to analyse PPH trends among older adults hospitalised in the Ministry of Health (MOH) Malaysia facilities.

Materials and Methods

MOH hospitalisation data of older adults aged ≥60 (2015-2020) were sourced from the Malaysian Health Data Warehouse. PPH was defined as admissions for discharge diagnoses corresponding to the International Statistical Classification of Diseases

(ICD-10) codes for cACSC (angina, asthma, chronic obstructive pulmonary disease (COPD), chronic kidney disease, convulsions/epilepsy, diabetes mellitus (DM), heart failure (HF), hypertension, iron-deficiency anaemia (IDA) and ischaemic heart disease⁴ for those aged below 74 were identified for the analysis of cACSC-related hospitalisation. Hospital mortality episodes and hospitalisations for those aged 75 and above (considered complex multimorbidity cases) were classified as non-preventable. To avoid duplication, hospital transfers were merged into a single episode based on the first admission diagnosis. Analysed variables include age, gender, and ICD-10 codes. Age was categorised into five-year groups (60-64, 65-69, 70-74). Descriptive analyses analysed trends and patterns in PPH due to cACSC. Statistical analysis was conducted using R.

Results and Discussion

Between 2015 and 2020, the cACSC hospitalisations trend for older adults in Malaysia remained unchanged, accounting for 13.9-14.5% of total older adult hospitalisations. These findings align with those reported in the United States, where the proportion of PPH among those aged 65 and older showed a steady pattern from 2010 to 2014¹. COPD, HF, and angina were the top three leading causes of cACSCs, contributing a total of 56.0-60.8% of all cACSCs hospitalisations yearly (Figure 1). Between 2015 and 2019, COPD was the main contributor to PPHs, with the highest hospitalisation recorded in 2019 (n = 17,441). Notably, in 2020, the recorded cases for most conditions decreased, likely due to the COVID-19 pandemic.

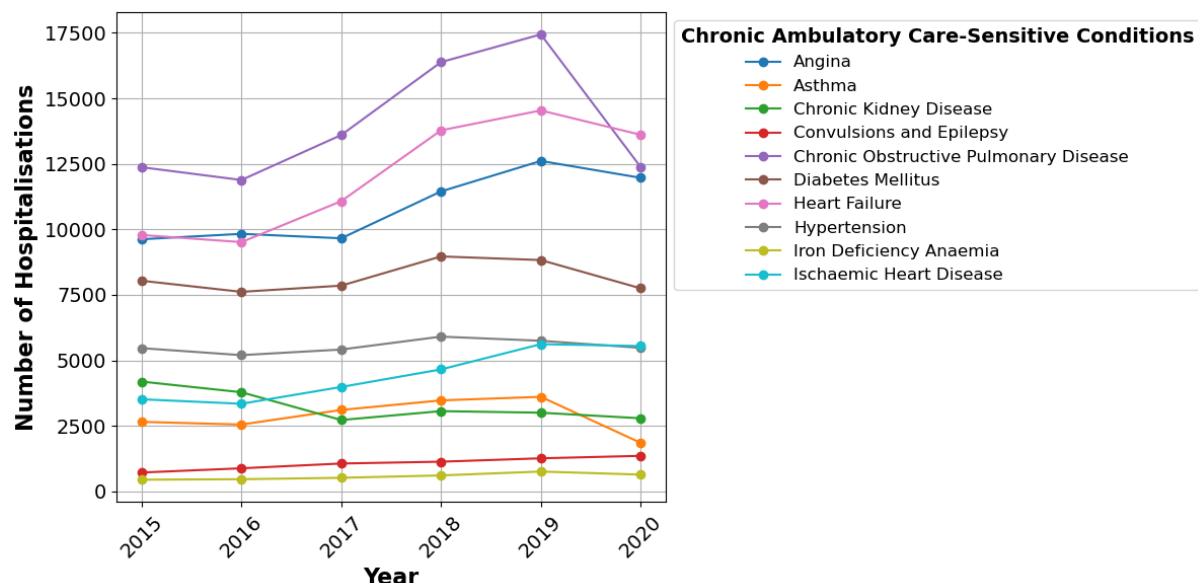


Figure 1. Number of hospitalisations by cACSC between 2015 and 2020.

Across all years, males consistently accounted for a greater proportion of PPHs (15.7-16.4%) compared to females (11.9-12.3%). This trend aligns with a study in Singapore (1991-1998) among individuals aged 65 years and above, which reported PPH rates of 22.8% for males and 18% for females⁵. The study suggested that women, as more frequent users of healthcare, are more likely to receive earlier diagnoses and regular treatment, preventing hospitalisations. However, a study in the United States presents a contrasting trend. Among individuals aged 65 and above, PPH rates were higher in females than in males. In 2010, the proportion of PPHs was 17.8% in females

and 15.5% in males, while in 2014, it was 16.7% in females and 14.2% in males¹. Gender-stratified findings revealed that COPD was the leading cACSC among males throughout the study period. In contrast, among females, DM was the top cACSC from 2015 to 2016, but this was replaced by HF from 2017 onwards. For both genders, PPHs due to convulsion/epilepsy and IDA remain the lowest among all cACSCs from 2015 to 2019 (Figure 2).

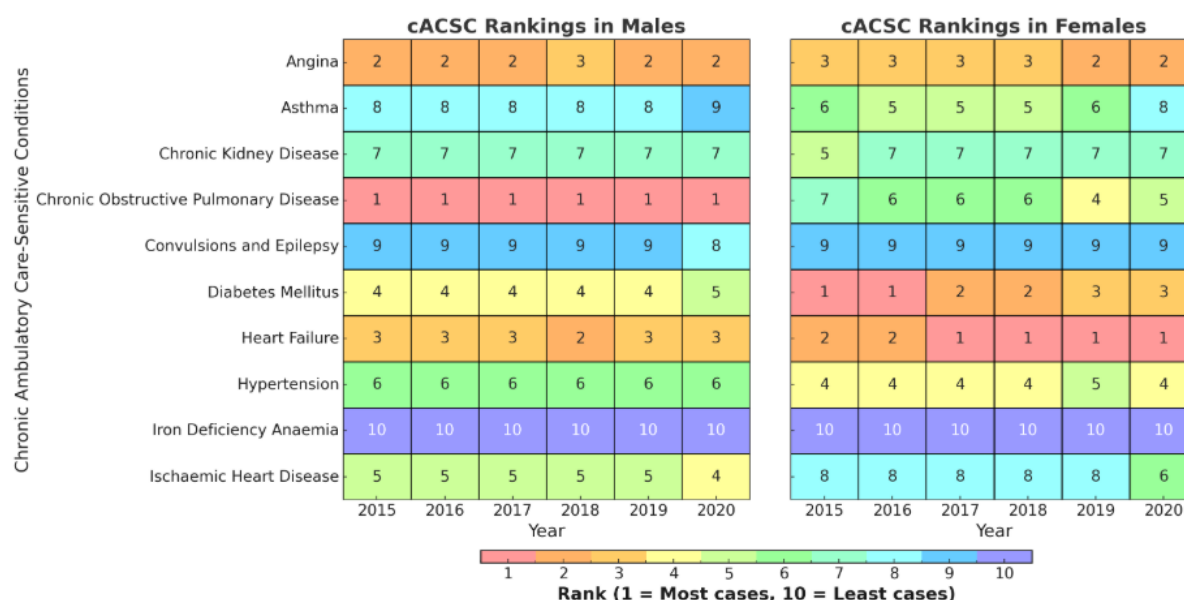


Figure 2. Comparison of cACSC rankings between males and females between 2015 and 2020.

Conclusion

COPD, HF, and angina are leading causes of PPH among older adults. The exploration into the proportion of leading causes of PPH showed gender differences. These findings emphasise the importance of exploring cACSC management in primary and outpatient care to help reduce the PPH rates, especially among groups with a higher PPH proportion.

References

1. Mahmoudi E, Kamdar N, Furgal A, et al. Potentially preventable hospitalizations among older adults: 2010-2014. *The Annals of Family Medicine*. 2020;**18**(6):511-9.
2. Chauhan S, Patel R, Kumar S. Prevalence, factors and inequalities in chronic disease multimorbidity among older adults in India: analysis of cross-sectional data from the nationally representative Longitudinal Aging Study in India (LASI). *BMJ Open*. 2022;**12**(3):e053953.
3. Yang T, Dixon A, Gao H. Emergency hospital admissions for ambulatory care-sensitive conditions: identifying the potential for reductions. 2012 2 Apr 2012.
4. Shakirah MS, Fun WH, Jailani AS, et al. Research summary: Defining Malaysia's Chronic Ambulatory-Care Sensitive Conditions Through Collaborative Consensus. Selangor: Institutes for Health Systems Research; 2024.
5. Niti M, Ng T-P. Avoidable hospitalisation rates in Singapore, 1991-1998: assessing trends and inequities of quality in primary care. *Journal of Epidemiology & Community Health*. 2003;**57**(1):17-22.

FHHMPP16 / 230

Reasons and factors associated with contraceptive non-use among married Orang Asli women: Findings from the Orang Asli Health Survey 2022

Muhamad Khairul Nazrin Khalil¹, Nurhafizah Sahril¹, Filza Noor Asari¹, Noor Syaqlah Shawaluddin¹, Muhammad Faiz Mohd Hisham¹

¹ Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia
Corresponding author's email: nazrin.k@moh.gov.my

Summary

This study explores contraceptive non-use among married Orang Asli women in Malaysia using data from the 2022 Orang Asli Health Survey. Non-use prevalence was 46.2%, below the national average of 57.2%. Main reasons included a desire to conceive and unspecified factors. Multivariable analysis showed higher non-use among older women and urban residents, while multiparous women were less likely to report non-use. Findings suggest the need for targeted family planning efforts to address barriers specific to this marginalised group.

Keywords

Contraception, family planning, birth control, reproductive health, Malaysia

Introduction

Contraceptive non-use remains a public health issue in Malaysia, shaped by cultural and ethnic factors. The Orang Asli, an indigenous group in Peninsular Malaysia, exhibit lower non-use rates than the national average¹, suggesting distinct healthcare and socio-cultural influences. This study aims to explore the factors and reasons contributing to contraceptive non-use among married Orang Asli women.

Materials and Methods

Data were derived from the 2022 Orang Asli Health Survey, a cross-sectional survey conducted across three localities and main tribal groups in Peninsular Malaysia using a two-stage stratified sampling design. Detailed information about the survey's methodology is available in the OAHS technical report². The study focused on married or in-union (living with partner) Orang Asli women of reproductive age. Contraceptive non-use was defined as not using any form of contraception, including women who had never used it or who had discontinued its use. All the data was managed and analysed using IBM SPSS version 28. The relationship between each independent variable and contraceptive non-use was first tested. Univariable associations were tested, followed by multivariable logistic regression using the enter method to identify significant predictors.

Results and Discussion

The study involved 3,249 Orang Asli women of reproductive age, with a contraceptive non-use rate of 46.2%, lower than the national average of 57.2%³. Among non-users, 41.4% wished to conceive. Other reasons included concerns about

side effects (9.1%), discomfort (7.9%), healthcare advice (4.2%), menopause (3.7%), spousal opposition (3.1%), cost and supply issues (1.2% each), belief-related factors (0.9%), and unspecified reasons (27.6%). Multivariable logistic regression showed higher odds of non-use among women aged 35 and above [adjusted Odds Ratio (aOR)= 2.66] and urban dwellers [aOR= 1.84]. Conversely, multiparous women [aOR= 0.40] were less likely to report contraceptive non-use.

These results indicate that non-use is shaped by age, residence, and parity. The higher rates among urban women may reflect barriers such as cost, limited information, and low awareness. Cultural attitudes and insufficient provider support may also play a role. Additionally, multiparous women may have already reached their desired family size thus increasing the need for contraception use⁴. The high proportion of unspecified reasons suggests a communication gap between healthcare providers and the community, possibly due to low awareness, lack of trust in contraceptives, or socio-cultural barriers to discussing reproductive health⁵.

Conclusion

This study provides valuable insights into the contraceptive practices of married Orang Asli women, revealing a lower prevalence of contraceptive non-use compared to the national average. Key factors such as age, residence, and parity were found to influence contraceptive non-use, suggesting that targeted interventions are needed to address the unique barriers faced by this population. Future research should focus on exploring the underlying knowledge, attitudes, and barriers to contraceptive use among Orang Asli women, as well as examining the unmet need for family planning services within this community.

References

1. Manaf R, Ismail S, Hassan H. Family Planning Practice Among Married Orang Asli Women in Sepang District and Its Associated Factors. *Malaysian Journal of Medicine and Health Sciences*. 2019;15:2636-9346.
2. Institute for Public Health (IPH) 2024. Technical Report Orang Asli Health Survey (OAHS) 2022.
3. Institute for Public Health (IPH) 2023. Technical Report National Health and Morbidity Survey (NHMS) 2022: Maternal and Child Health, Malaysia.
4. Boah M, Adokiya MN, Hyzam D. Prevalence and factors associated with the utilisation of modern contraceptive methods among married women of childbearing age in Yemen: a secondary analysis of national survey data. *BMJ Open* 2023;13:e071936. doi: 10.1136/bmjopen-2023-071936
5. Wiebe ER, Henderson A, Choi J, et al. Ethnic Korean women's perceptions about birth control. *Contraception*. 2006;73(6):623-627.

Table 1: The prevalence and factors associated with contraceptive non-use (N=3,249)

Socio-demographic Characteristics	Count	(%)	95% CI		Crude OR	p-value	Adjusted OR	p-value
			Lower	Upper				
OVERALL	1500	46.2	40.90	51.60				
Age Group								
15-19	110	49.5	39.50	59.63	REF		REF	
20-34	713	41.1	35.88	46.45	0.71 (0.44, 1.15)	0.158	1.20 (0.74, 1.95)	0.462
35 and above	677	52.7	45.94	59.27	1.13 (0.70, 1.83)	0.607	2.66 (1.56, 4.53)	<0.001
Tribe								
Senoi	602	44.4	36.24	52.89	REF		REF	
Proto Malay	550	48.6	41.50	55.78	1.18 (0.76, 1.85)	0.451	1.23 (0.77, 1.97)	0.386
Negrito	348	43.4	37.91	49.00	0.96 (0.64, 1.44)	0.837	1.04 (0.70, 1.55)	0.840
Strata								
Urban	168	63.4	55.42	70.70	2.13 (1.39, 3.27)	<0.001	1.84 (1.05, 3.22)	0.034
Fringe	649	46.5	39.61	53.46	1.07 (0.73, 1.58)	0.730	1.02 (0.67, 1.55)	0.936
Remote	683	44.8	38.28	51.49	REF		REF	
Education Level								
No Formal Education / not completed primary	606	48.0	42.32	53.65	REF		REF	
Minimum completed primary school	891	45.2	38.51	52.06	0.90 (0.69, 1.17)	0.407	0.98 (0.73, 1.31)	0.863
Occupation Status								
Employed	436	45.4	38.63	52.33	0.95 (0.78, 1.16)	0.623	0.91 (0.73, 1.14)	0.406
Not working / Housewife / Homemaker	1062	46.6	41.40	51.92	REF		REF	

Monthly Household Income								
Less than RM500	651	47.0	38.94	55.30	REF		REF	
RM500 - RM999	308	44.0	34.03	54.47	0.88 (0.56, 1.41)	0.598	0.83 (0.52, 1.30)	0.402
RM1,000 - RM1,999	447	47.1	42.59	51.70	1.00 (0.70, 1.44)	0.986	0.96 (0.69, 1.34)	0.825
RM2,000 or more	91	42.5	32.11	53.70	0.83 (0.48, 1.44)	0.510	0.70 (0.44, 1.09)	0.111
Parity								
Nulliparous or primiparous	683	55.2	49.71	60.58	REF		REF	
Multiparous	817	40.5	34.93	46.39	0.55 (0.47, 0.65)	<0.001	0.40 (0.32, 0.50)	<0.001

Table 2: Reason for contraceptive non-use among married Orang Asli women (N=1,500)

* "Others" refers to unspecified reasons not covered by the listed options.

* Missing data n=112 (7.5%)

Reasons	Frequency	%
Desires to conceive	574	41.4
Others*	383	27.6
Contraceptive side effects	126	9.1
Uncomfortable	109	7.9
Advice from health practitioner	58	4.2
Menopause	51	3.7
Impermissible by husband	43	3.1
Expensive	16	1.2
Supply issue	16	1.2
Belief (Faith)	12	0.9

Prevalence and Factors Associated with Anaemia among Women of Reproductive Age among Orang Asli in Malaysia

Muhammad Azri Adam Adnan¹, Norizzati Amsah¹, Norlaila Hamid¹, Mohd Khairul Nadzrin Khalil¹

¹Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia
Corresponding author's email: muhammadazri.a@moh.gov.my

Summary

Anaemia remains a global health concern, with a 29.9% prevalence among women of reproductive age (WRA) in 2019. In Malaysia, 38.6% of Orang Asli WRA had anaemia, exceeding national averages. This study, using data from the Orang Asli Health Survey 2022, found higher odds of anaemia among younger women, those in remote areas, and individuals from the Proto-Malay and Negrito tribes. Contributing factors may include poor diet, limited healthcare, and socioeconomic disparities. Addressing food security, improving healthcare access, and enhancing nutrition education are essential to reducing anaemia and improving overall health outcomes for this population.

Keywords

Anaemia, Orang Asli, Women of reproductive age, Socioeconomic Disparities

Introduction

Anaemia is a global public health concern, with WHO reporting a 29.9% prevalence among women of reproductive age (WRA) in 2019¹. In Malaysia, NHMS 2019 reported that anaemia affected 29.9% of non-pregnant women of reproductive age and 19.3% of pregnant women in 2022. Anaemia, linked to poor nutrition, reduces productivity and harms maternal and neonatal health. The indigenous Orang Asli face socioeconomic disparities, such as limited access to healthcare, poor nutrition, food insecurity, and inadequate water and sanitation, which increase their risk of anaemia. Despite studies on Orang Asli health, research on anaemia among Orang Asli WRA is limited. This study examines its prevalence and associated factors.

Materials and Methods

This study utilised data from the 2022 Orang Asli Health Survey (OAHS), a cross-sectional study employing a complex sampling design. The target population comprised all Orang Asli residing in non-institutional living quarters across Peninsular Malaysia. The present analysis focused specifically on women of reproductive age (15-49 years). Data were collected through face-to-face interviews using structured questionnaires. Anaemia was assessed using the HemoCue® Hb 201 system and classified according to World Health Organization (WHO) criteria: haemoglobin levels below 12.0 g/dL for non-pregnant women and below 11.0 g/dL for pregnant women. Descriptive statistics were used to estimate the prevalence of anaemia, while multiple logistic regression was conducted to identify associated factors.

Results and Discussion

A total of 4,504 respondents were included in the study, with a response rate of 96.3%. The overall prevalence of anaemia was 38.6% (95% CI: 34.7-42.6), with the highest prevalence observed among women aged 40-49 years (48.4%) (Table 2). Multiple logistic regression analysis showed that women aged 15-19 years (aOR: 1.36, 95% CI: 1.14-1.65), those from remote areas (aOR: 1.79, 95% CI: 1.14-2.77), and individuals from the Proto-Malay (aOR: 1.56, 95% CI: 1.07-2.71) and Negrito (aOR: 1.46, 95% CI: 1.07-2.00) tribes had significantly higher odds of anaemia (Table 3). This study highlights the high prevalence of anaemia among Orang Asli women of reproductive age in Malaysia, exceeding the national average reported in previous NHMS surveys^{2,3}. The increased burden of anaemia among Orang Asli women may be attributed to their status as a minority population that often faces substantial and persistent disparities in the socioeconomic determinants of health⁴. Additionally, our findings confirm that residing in remote areas significantly increases the odds of anaemia, likely due to limited healthcare access, poor nutritional status, and challenging living conditions⁵. Furthermore, this study found that the prevalence of anaemia was significantly higher among women from the Proto-Malay and Negrito tribes, which is consistent with findings from previous studies. These disparities may be influenced by variations in dietary habits, cultural practices, and healthcare accessibility among different Orang Asli subgroups.

Table 1: Sociodemographic Distribution of Orang Asli Women aged 15 to 49 years
N=4504

Variables	n	%
Age group		
15-19	812	18.0
20-29	1278	28.4
30-39	1585	35.2
40-49	829	18.4
Locality		
Urban	394	8.8
Fringe	2060	45.7
Remote	2050	45.5
Tribe		
Senoi	1939	43.1
Proto-Malay	1524	33.8
Negrito	1041	23.1

Table 2: Prevalence of anaemia among Orang Asli women aged 15 to 49 years by sociodemographic characteristic N=4504

Sociodemographic characteristics	Anaemia		
	Unweighted count	Estimated Population	Prevalence (95% CI)
Overall	1770	19927	38.6 (34.7-42.6)
Age group			
15-19	397	4159	41.0 (36.7-45.4)
20-29	594	6755	33.9 (31.3-36.6)
30-39	435	4805	37.7 (32.5-43.3)
40-49	344	4209	48.4 (42.3-54.3)
Locality			
Urban	140	206	35.5 (27.6-44.3)

Fringe	778	14307	37.6 (32.8-42.6)
Remote	852	5414	41.6 (37.2-46.1)
Tribe			
Senoi	700	9741	34.7 (29.0-40.9)
Proto-Malay	606	9697	43.1 (37.2-49.2)
Negrito	464	489	44.8 (39.2-50.6)

Table 3: Factors associated with anaemia among orang Asli women aged 15 to 49 years in Malaysia N=4504

Variables	Crude Odd Ratio	Confidence Interval	p-value	Adjusted Odd Ratio	Confidence Interval	p-value
Age group						
15-19	1.55	1.31-1.83	0.001	1.36	1.14-1.65	0.003*
20-29	Ref			Ref		
30-39	0.79	0.63-0.99	0.037	0.85	0.65-1.10	0.187
40-49	1.15	0.94-1.30	0.163	1.22	1.00-1.51	0.055
Locality						
Fringe	1.09	0.716-1.669	0.675	1.40	0.90-2.12	0.142
Remote	1.29	0.856-1.946	0.220	1.79	1.14-2.77	0.012*
Urban	Ref				Ref	
Tribe						
Proto-Malay	1.43	1.00-2.05	0.001	1.56	1.07-2.71	0.022*
Negrito	1.53	1.08-2.17	0.018	1.46	1.07-2.00	0.018*
Senoi	Ref			Ref		

Conclusion

This study highlights a significant burden of anaemia among Orang Asli women of reproductive age, with risk factors including younger age, remote residence, and tribal affiliation. Targeted interventions addressing healthcare accessibility, nutrition, and socioeconomic disparities are essential to mitigate anaemia and improve overall health outcomes in this vulnerable population.

References

1. World Health Organization. Anaemia in women and children 2025. www.who.int/data/gho/data/themes/topics/anaemia_in_women_and_children
2. https://www.who.int/data/gho/data/themes/topics/anaemia_in_women_and_children
3. Ganapathy SS, Aris TH, Ahmad NA, et al. National Health and Morbidity Survey 2019: Non-Communicable Diseases, Healthcare Demand and Health Literacy.
4. Institute for Public Health (IPH) 2023. Technical Report National Health and Morbidity Survey (NHMS) 2022: Maternal and Child Health, Malaysia
5. Ngui R, Lim YA, Chong Kin L, et al. Association between anaemia, iron deficiency anaemia, neglected parasitic infections and socioeconomic factors in rural children of West Malaysia. *PLoS neglected tropical diseases*. 2012;**6**(3):e1550.
6. Allali S, Brousse V, Sacri AS, et al. Anemia in children: prevalence, causes, diagnostic work-up, and long-term consequences. *Expert review of hematology*. 2017;**10**(11):1023-8.

Outpatient Healthcare Utilisation Inequalities Among Older Adults in Malaysia - A Multi-Dimensional Analysis

Awatef Amer Nordin¹, Suhana Jawahir¹, Iqbal Ab Rahim¹, Adilius Manual¹, Jabrullah Ab Hamid¹, Nur Elina Abdul Mutalib¹, Devi Shantini Rata Mohan¹, Sarah Nurain Mohd Noh¹

¹Centre for Health Equity Research, Institute for Health Systems Research, National Institutes of Health, Ministry of Health Malaysia
Corresponding author's email: awatef.an@moh.gov.my

Summary

Assessing health inequalities is vital to achieving universal health coverage. Both simple and complex measures are used, often considering sub-populations. Older adults typically have greater health needs and higher healthcare utilisation. This study examined outpatient healthcare utilisation among older Malaysians using three cycles of a national survey. It focused on inequalities by age, locality, education, and wealth, revealing gaps across these domains. The findings suggest multiple factors influence outpatient healthcare utilisation patterns, highlighting the need for more in-depth assessment to understand the underlying causes.

Keywords

Health Equity, Health Inequalities, Older Adults, Healthcare Utilisation, National Survey

Introduction

Health inequalities refer to observable differences in health between advantaged and disadvantaged groups¹. Understanding these disparities is essential for ensuring optimal health outcomes for all and equitable healthcare access. Older adults, being more vulnerable and requiring frequent care², are likely to experience such disparities. Incorporating the social determinants of health framework helps elucidate how living conditions contribute to healthcare access inequality. This study examines the patterns and trends of outpatient healthcare utilisation and inequalities among older adults in Malaysia from 2011-2019, based on four dimensions: age, locality, education, and wealth.

Materials and Methods

This study used secondary data from the 2011, 2015, and 2019 National Health and Morbidity Survey (NHMS), focusing on individuals aged 60 and above. Outpatient healthcare utilisation was defined as having visited an outpatient facility within the past two weeks. Descriptive analyses were performed using STATA 18, with appropriate sampling weights. Inequality assessments covered four dimensions -Age (60-69, 70-79, 80+), locality (urban/rural), education level (no formal, primary, and secondary+), and wealth group (B40, M40, and T20). A simple inequality measure - the Difference - was calculated referencing the most “advantaged” subgroup (e.g. 60-69, urban, secondary education and above, T20), against the most “disadvantaged” (e.g. 80+, rural, no formal education, B40)^{1,3}.

Results and Discussion

Across 2011-2019, by age, locality, and education, advantaged sub-groups consistently had lower utilisation of outpatient care. For wealth, the advantaged sub-group showed the lowest utilisation for outpatient care in 2015 and 2019 (Figure 1). Next, the gap in inequalities showed varying trends (Figure 2). Age-related inequality showed a gradual decline over time, with utilisation levels becoming nearly equal by 2019, indicating minimal disparity. Education and wealth showed an increase from 2011, with the largest inequality gaps in 2015, which reduced by more than half in 2019. By locality, the inequality gap gradually increased across the years, becoming almost two-fold in 2019, in contrast to 2011.

These trends may be influenced by underlying factors such as health needs, health seeking behaviour, and health literacy⁴. Lower utilisation by advantaged subgroups may result from having better health status, alternatives to accessing healthcare, and greater engagement in preventive care. Nevertheless, the increasing inequality between urban and rural sub-populations hint that there could be higher health needs in rural areas, enablers to access services such as outreach services in rural areas, or availability of digital health in urban areas.

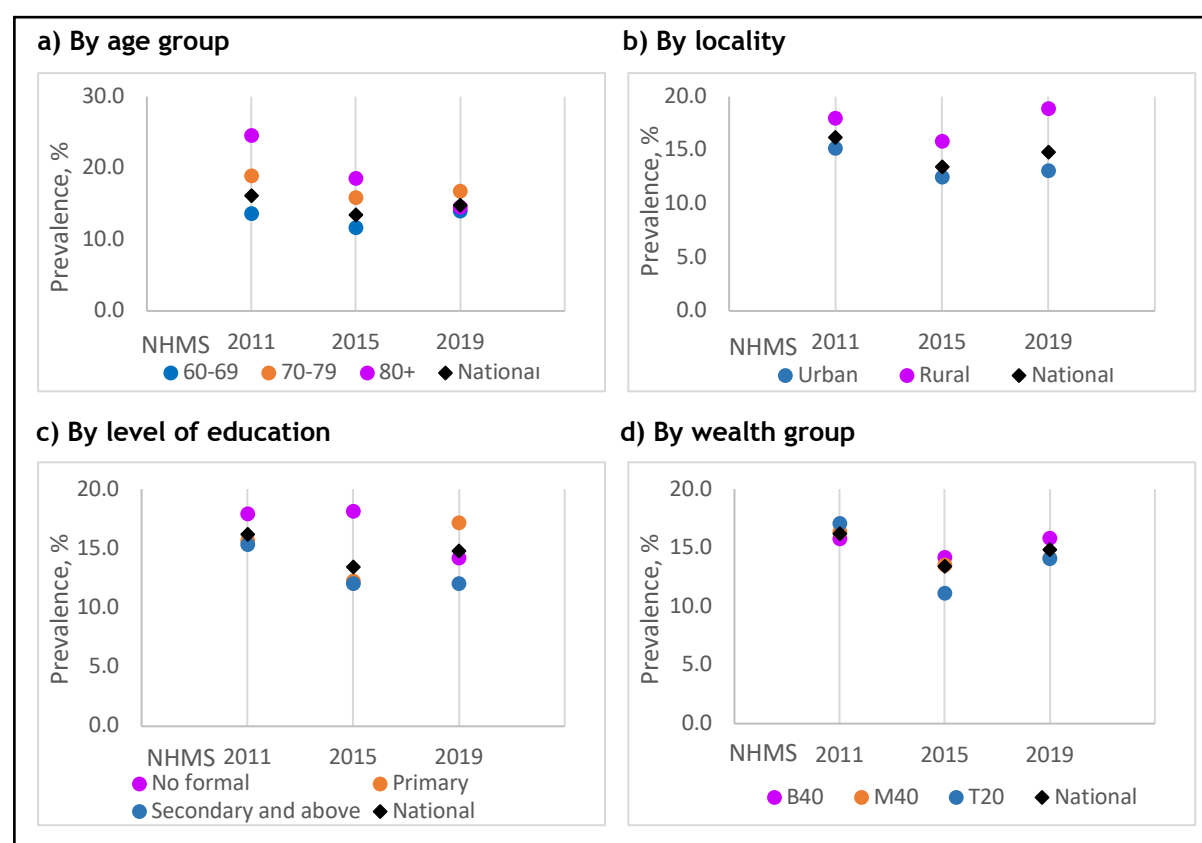


Figure 1: Trend of prevalence of outpatient healthcare utilisation, stratified by age, locality, level of education, and wealth group.

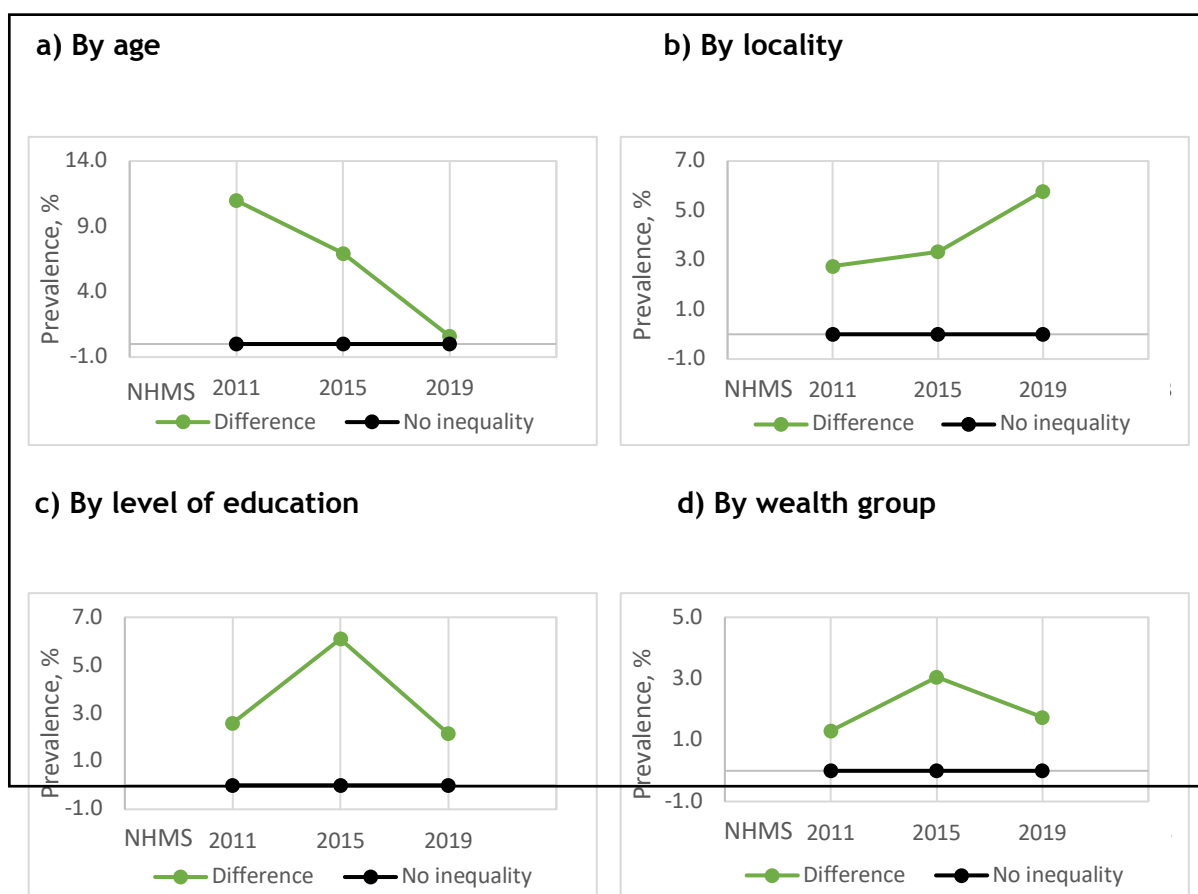


Figure 2. Trend of differences in outpatient healthcare utilisation, stratified by age, locality, level of education, and wealth group.

Limitations of this study are the cross-sectional nature of the study, which limits causality and temporality, and the nature of difference as an inequality measure, which focuses on comparison between two sub-groups (advantaged and disadvantaged), potentially masking inequalities experienced by intermediate groups. For example, in the wealth dimension, the middle-income group (M40) is not directly compared. Consequently, further assessments using multiple summary measures are important to obtain an overall picture in the assessment of inequalities.

Conclusion

Health equity analysis begins with assessing health inequalities, with simple inequality measures being a starting point. Potential reasons for inequalities in healthcare utilisation are variations in health needs and accessibility issues. Understanding underlying factors can foster initiatives towards equity-oriented planning and delivery of health services towards universal health coverage.

Acknowledgement

Authors wish to thank the Director-General of Health Malaysia for his permission to publish this study.

References

1. World Health Organization (WHO). Health inequality monitoring: harnessing data to advance health equity. Geneva: WHO; 2024. Accessed 1 April, 2025. <https://www.who.int/data/inequality-monitor/tools-resources>.
2. Jin X, Liu Y, Hu Z, et al. Vulnerable Older Adults' Identification, Geographic Distribution, and Policy Implications in China. *Int J Environ Res Public Health*. 2021;**18**(20):10642.
3. World Health Organization (WHO). Health Equity Assessment Toolkit: Software for exploring and comparing health inequalities in countries. Version 6.0. Geneva: WHO; 2024. Accessed 1 April, 2025. https://srhdpeuwpubsa.blob.core.windows.net/whdh/HIDR/HEAT_HEATPlus_technical_notes.pdf
4. Andersen RM. Revisiting the Behavioral Model and Access to Medical Care: Does it Matter? *J Health Soc Behav*. 1995;**36**(1):1.

Trends In Glycaemic Control: Evaluating Medical Nutrition Therapy Outcomes Over Time In Public Healthcare Clinics

Murnizar Mokhtar^{1*}, Nurul Huda Ibrahim¹, Norasimah Binti Kassim², Mohammad Zulkarnain Mohammad Ikhrum³, Rozlinizam Kudori⁴, Aisyah Muhamad⁵, John Kong Jian Pei⁶, Mohd Fauzee Mohd Zaki⁷, Siah Woan Yie⁸

¹Centre for Nutrition Epidemiology Research, Institute for Public Health, National Institute of Health, Ministry of Health of Malaysia

²Family Health Development Division, Ministry of Health of Malaysia

³Klinik Kesihatan Merlimau, Ministry of Health of Malaysia

⁴Klinik Kesihatan Sg Chua, Ministry of Health of Malaysia

⁵Klinik Kesihatan Batu Pahat, Ministry of Health of Malaysia

⁶Klinik Kesihatan Bintulu, Ministry of Health of Malaysia

⁷Klinik Kesihatan Bandar Jerantut, Ministry of Health of Malaysia

⁸Klinik Kesihatan Batu Berendam, Ministry of Health of Malaysia

Corresponding author's email: murnizarmokhtar@moh.gov.my

Summary

This study evaluates trends in glycaemic control among type 2 diabetes mellitus (T2DM) patients receiving Medical Nutrition Therapy (MNT) in Malaysian public healthcare clinics before and during/post-COVID-19 (2017-2022). A retrospective cohort design was used to assess differences in HbA1c outcomes across two time periods. Significant improvements in HbA1c were observed in both periods. However, a greater mean HbA1c reduction was recorded pre-pandemic. These findings underscore the importance of standardised MNT delivery and the need to address barriers faced during disruptive periods such as pandemics.

Keywords:

Medical Nutrition Therapy (MNT), Type 2 Diabetes Mellitus (T2DM), Glycaemic Control, COVID-19, HbA1c, Public Healthcare

Introduction

Medical Nutrition Therapy (MNT) is a cornerstone of diabetes management and involves personalised dietary counselling provided by qualified dietitians using structured and evidence-based nutrition intervention. It aims to improve glycaemic control and overall metabolic outcomes. Evaluating its outcomes is crucial due to the variability in effectiveness and the need to optimise delivery, particularly within public healthcare settings. The COVID-19 pandemic posed unique challenges to healthcare delivery, including MNT. This study aimed to compare the effectiveness of MNT in improving HbA1c levels among adults with T2DM before (2017-2019) and during (2020-2022) the pandemic, using routine clinical data.

Materials and Methods

This retrospective cohort study analysed clinical audit data of 4,680 adults with T2DM (HbA1c >8.0%) who attended at least one MNT session at public health clinics across Malaysia. Patients with chronic kidney disease, psychiatric illness, pregnancy, or those who were bedridden were excluded.

Medical Nutrition Therapy (MNT) in this study refers to structured, individualised dietary counselling by trained public health dietitians, guided by national clinical practice guidelines. Each session focused on macronutrient distribution, carbohydrate counting, meal planning, and lifestyle modifications. Delivery methods varied between face-to-face (pre-pandemic) and virtual or hybrid formats (during pandemic), with an effort to maintain standardisation through structured protocols.

Grouping and Variables:

- Group 1 (2017-2019): Pre-pandemic period (n=1,879)
- Group 2 (2020-2022): Pandemic period (n=2,801)

Statistical Analysis: Patients were divided into two groups: 2017-2019 (n=1,879) and 2020-2022 (n=2,801). Baseline characteristics were compared using descriptive statistics. Paired t-tests were used to assess within-group changes in HbA1c. Independent t-tests compared HbA1c change between periods. ANCOVA was used to compare post-MNT HbA1c between groups, adjusting for baseline HbA1c. Chi-square test assessed the proportion of patients achieving target HbA1c ($\leq 6.5\%$).

Results and Discussion

The mean age was higher in 2017-2019 (60.5 years) compared to 2020-2022 (56.7 years). Most patients were female (as shown in Table I). Mean baseline HbA1c was significantly higher in Group 1 (11.03 ± 1.91) compared to Group 2 (10.70 ± 1.85 ; $p < 0.001$). Post-MNT HbA1c also differed significantly between groups (Group 1: 8.21 ± 1.83 ; Group 2: 8.89 ± 1.87 ; $p < 0.001$).

Within-group analysis showed significant HbA1c reductions:

- Group 1: Mean reduction of -2.65%
- Group 2: Mean reduction of -1.87%

The between-group difference in HbA1c change was also significant (mean difference: -0.78%).

ANCOVA analysis confirmed that the 2017-2019 group achieved significantly lower post-MNT HbA1c (adjusted mean 8.29%) compared to the 2020-2022 group (adjusted mean 8.89%), after controlling for baseline HbA1c ($F=141.29$, $p<0.001$; partial eta squared= 0.041). The proportion of patients achieving target HbA1c ($\leq 6.5\%$) was higher in 2017-2019 (13.5%) than in 2020-2022 (11.8%), though this difference was not statistically significant ($p=0.087$, Chi-square test).

Table I: Baseline Characteristics

Variable	Group 1:2017-2019 (n=1,879)	Group 2:2020-2022 (n=2,801)
Mean Age (years)	60.5 ± 11.0	56.7 ± 11.7
Female (%)	67.1%	62.3%
Pre-MNT HbA1c	11.03 ± 1.91	10.70 ± 1.85

Table II: Glycaemic Outcomes Before and After MNT

HbA1c Outcome	Group 1:2017-2019 (n=1,879)	Group 2:2020-2022 (n=2,801)	p-value
Mean pre-MNT HbA1c (%)	11.03 ± 1.91	10.70 ± 1.85	<0.001
Raw Mean post-HbA1c*	8.38 ± 1.74	8.83 ± 2.00	<0.001
Mean change in HbA1c (post-pre)	2.65 ± 1.73	1.87 ± 2.14	<0.001
Adjusted mean (ANCOVA)	8.29 ± 0.039	8.89 ± 0.032	<0.001
HbA1c ≤6.5% (% of patients)	13.5% (253/1879)	11.8% (330/2801)	0.087

*Source: Descriptive / t-test

Interpretation

The greater effectiveness of MNT before the pandemic may reflect better access to in-person services, more structured follow-up, or fewer barriers to lifestyle adherence. During the pandemic, MNT delivery and patient engagement may have been compromised, despite similar baseline HbA1c levels.

Conclusion

MNT was effective in reducing HbA1c levels in both pre- and during-pandemic periods. However, glycaemic outcomes were significantly better in the 2017-2019 group. Disruptions in care delivery during the COVID-19 pandemic may have influenced the effectiveness of MNT. Standardised, continuous, and accessible MNT delivery is crucial in sustaining glycaemic control among patients with T2DM.

References

1. Morris SF, Wylie-Rosett J. Medical Nutrition therapy: a key to diabetes management and prevention. *Clin Diabetes*. 2010;**28**(1):12-18.
2. Ministry of Health Malaysia. Clinical Practice Guidelines: Management of Type Diabetes Mellitus, Sixth Edition. Putrajaya: Ministry of Health, Malaysia; 2020.
3. SSami W, Ansari T, Butt N, et al. Assessment of a Dietary Consultation Model for Effective Diabetes Care in Saudi Population using Partial Least Squares Estimation. *Pakistan Journal of Statistics and Operation Research*. 2018;**14**:447.
4. Sawada M, Ohkuma K, Aihara M, et al. Impact of the COVID-19 pandemic on the glycemic control, eating habits, and body compositions of people with diabetes mellitus: A retrospective longitudinal observational study. *J Diabetes Investig*. 2023;**14**(2):321-328.

Uncovering Gaps in Colorectal Cancer Screening Uptake Among Urban Community-Dwelling Elderly

Aidalina Mahmud¹, Mohd Erfan Edros¹

¹Department of Community Health, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia

Corresponding author's email: aidalina@upm.edu.my

Summary

This study investigated the prevalence of colorectal cancer (CRC) screening using FBOT among elderly people in Klang Valley. Only about 1 in 5 had done the test. Women, educated individuals, and those advised by doctors were more likely to participate. Many did not feel at risk or did not know about the test. The study shows that better education, doctor support, and clearer health messages are needed to help more seniors get screened early.

Keywords

Colorectal cancer, fecal occult blood test, screening, elderly, urban

Introduction

Colorectal cancer (CRC) is a major health concern in Malaysia, especially among individuals aged 50 and above. Despite being preventable and treatable when detected early, many cases are diagnosed late. The Ministry of Health (MOH) offers free CRC screening using the faecal occult blood test (FOBT) at public health clinics, yet the uptake remains low^{1,2}. This is particularly worrying in urban areas like Klang Valley, where access to healthcare is generally good. The problem lies not in service availability but in underutilisation.

This study aimed to measure the prevalence of CRC screening uptake via FOBT among elderly individuals registered with Pusat Aktiviti Warga Emas (PAWE) in Klang Valley, and identify factors associated with screening behaviour, using the Andersen Healthcare Utilisation Model as a guiding framework. The model looks at three main groups of factors: predisposing (e.g., age, sex, education)³, enabling (e.g., access, physician advice), and need-related factors (e.g., perceived risk, knowledge).

Materials and Methods

A cross-sectional study was conducted among participants from 27 PAWE centers. Stratified random sampling was used. Data were collected using a self-administered, validated questionnaire. Variables included demographic information, CRC knowledge, access to healthcare, perceptions of benefits and barriers, and screening history. Analysis was performed using SPSS version 29.0. Both descriptive statistics and logistic regression were used to determine prevalence and significant predictors.

Results and Discussion

A total of 423 respondents completed the survey, most of whom were female (81.8%) and Malay (79.6%), with a mean age of 64.4 years. Only 21.6% reported ever undergoing colorectal cancer (CRC) screening via fecal occult blood test (FOBT), consistent with prior findings of low screening uptake even in urban settings.

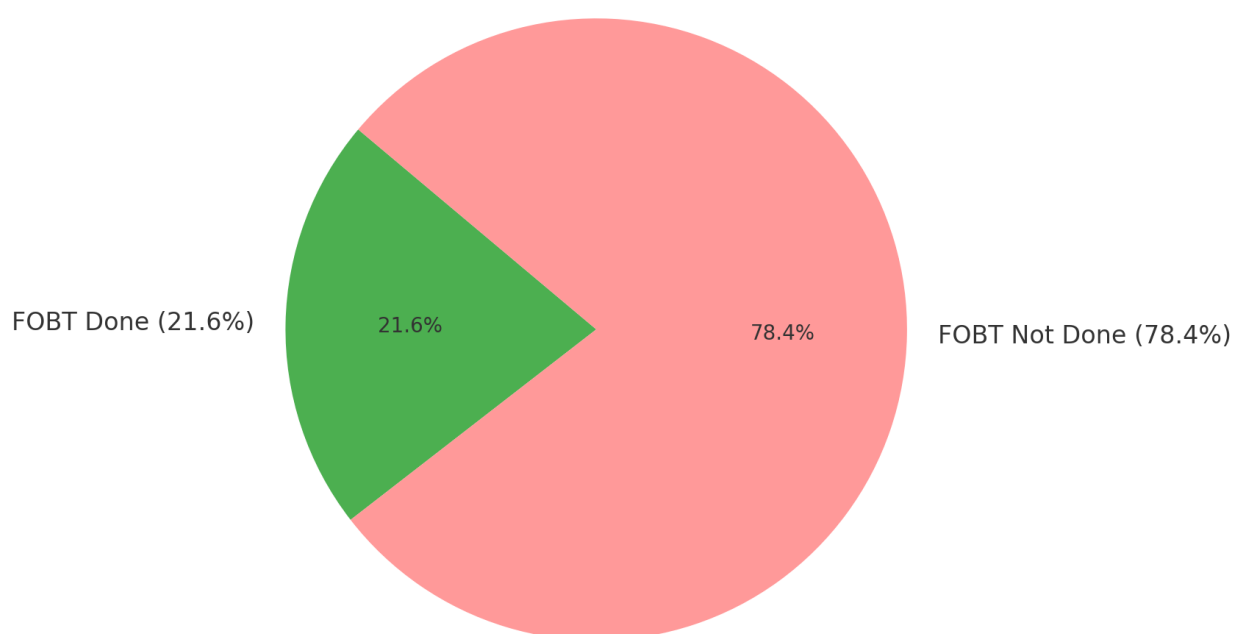


Figure 1: Overall CRC Screening Uptake (FOBT)

In the multivariate analysis, females were over twice as likely to have been screened compared to males (aOR = 2.42; 95% CI: 1.15-5.10), and those with higher education were about twice as likely (aOR = 2.11; 95% CI: 1.01-4.42). Doctor's recommendation was the strongest predictor: individuals advised by a doctor were about 8.8 times more likely to have undergone screening (aOR = 8.85; 95% CI: 4.9-15.9). Moderate perceived barriers were linked to higher screening odds (aOR = 2.11; 95% CI: 1.06-4.22), while low perceived susceptibility was associated with 2.3 times lower odds (aOR = 0.433; 95% CI: 0.231-0.813). Table 1 shows regression analysis for factors associated with CRC screening.

Table 1: Multivariate Logistic Regression Results for key predictors

Predictor	aOR	95% CI	- p value
Female vs Male	2.417	1.145 - 5.101	0.021
Higher Education vs. lower	2.114	1.012 - 4.416	0.046
Doctor Recommendation vs. none	8.85	4.9 - 15.9	< 0.001
Moderate Perceived Barriers vs. low	2.113	1.058 - 4.220	0.034
Low Perceived Susceptibility vs. high	0.433	0.231 - 0.813	0.009

Personal beliefs and healthcare provider engagement were stronger influences than physical access, as most respondents lived within 5 km of a health clinic. Despite free, nationally available screening, uptake remains poor due to low awareness, weak risk perception, and lack of proactive provider advice, raising concerns of late-stage diagnoses and treatment burdens.

With Malaysia set to become an aged nation (15% aged 60+ by 2030), early CRC detection is critical. The CRC Strategic Plan 2021-2025 targets 40% screening coverage by 2030, but behavioural barriers must be addressed. Recommendations include training healthcare providers to routinely recommend FOBT, running culturally tailored awareness campaigns, and using PAWE centres as hubs for screening promotion. Targeted outreach to men and those with lower education is also needed, as these groups showed lower participation.

Conclusion

In conclusion, this study shows CRC screening uptake among elderly individuals in Klang Valley is low, despite available services. Key influencing factors include sex, education level, doctor recommendation, perceived barriers, and perceived susceptibility. Addressing these issues through targeted education, healthcare provider involvement, and community engagement is essential to improve early detection rates and reduce the national CRC burden.

References

1. Ministry of Health Malaysia. National Strategic Plan for Colorectal Cancer 2021-2025 (NSPCRC). Putrajaya: Disease Control Division, Ministry of Health Malaysia; 2021.
2. Bujang MA, Suli Z, Abu-Hassan MR, et al. Factors associated with CRC screening via immunochemical fecal occult blood test in an average-risk population from a multiethnic, middle-income setting. *Asian Pac J Cancer Prev*. 2021;22(10):3179-3185.
3. Chan MW, Chean KY, Maideen SFK, et al. The intention and uptake of colorectal cancer screening after a brief health education program in a Malaysian primary care setting. *Malays Fam Physician*. 2021;16(2):2-9.
4. Tamin NSI, Chandran A, Mustapha FI, et al. Overview of colorectal cancer screening programme in Malaysia. *Med J Malaysia*. 2020;75(5):451-455.
5. Leung DY, Chow KM, Lo SW, et al. Contributing factors to colorectal cancer screening among Chinese people: A review of quantitative studies. *Int J Environ Res Public Health*. 2016;13(5):E506.

Incidence and types of medication transcription errors in healthcare facilities in Malaysia

Norazida Ab Rahman¹, Ee Vien Low², Fateha Kamaruddin³, Asilah Che Ayub³, Sue Chin Chong³, Noridayu Tumiran³, Norafidah Idris³

¹ Institute for Clinical Research, National Institutes of Health, Ministry of Health Malaysia

² Institute for Health Systems Research, National Institutes of Health, Ministry of Health Malaysia

³ Pharmacy Practice and Development Division, Pharmaceutical Services Programme, Ministry of Health Malaysia

Corresponding author's email: norazida.ar@moh.gov.my

Summary

Medication error represents avoidable harm that occurs within the healthcare system. This study aimed to quantify transcribing errors reported via the national reporting system and describe the incidence, characteristics of errors, and error outcomes. The large proportion of transcribing errors were associated with incorrect dose, incorrect frequency, and incorrect drug. Work and environment were factors frequently cited as contributing to errors. The identification of transcribing errors and associated factors provides insight to improve pharmacy practice and patient safety.

Keywords

Medication error, pharmacy, transcribing error, patient safety

Introduction

Medication error (ME) can lead to harm in patients and medication safety is part of the Malaysian Patient Safety Goal. The Medication Error Reporting System (MERS), a voluntary reporting system, was established for healthcare professionals to report information on the occurrence of MEs in their respective settings. This study was aimed to determine the incidence of MEs due to transcription errors, factors potentially associated with the errors, and error outcomes.

Materials and Methods

This was a retrospective cross-sectional study using data from the MERS database. All ME reports submitted between 1 January 2018 and 31 December 2022 from Ministry of Health facilities were identified. ME reports classified as “data entry system error” and occurred during the process of interpreting and transferring information of medication orders (prescriptions) were included for analysis and coded as transcribing errors. Descriptive statistics were employed and comparison between groups were analysed using Chi-square or Fisher's exact test. All data were analysed using STATA SE 15.1.

Results and Discussion

Between 2018 and 2021, a total of 265 194 MEs were reported and 4.5% (n=12 049) were transcribing errors. Overall, the incidence of transcribing errors was 34.9 event per one million prescriptions processed. Hospitals contributed 47.4% of the errors while the rest were reported at the primary care clinics (52.6%). Most events were

reported in facilities with partial health information system (pharmacy-based) (97.5%). The errors consisted of dose error (incorrect dose, 48.6%; incorrect frequency, 19.9%), drug error (incorrect drug, 13.3%; incorrect patient, 6.3%), dosage form error (incorrect dosage form, 4.8%), omission error (omission of drug, 3.7%), labelling error (incorrect instruction, 0.5%), and others. While majority of the errors did not reach patients, there were 17 events classified as category E and F (caused temporary harm). Top factors cited as contributing to the errors were work and environment, which included peak hours (41.3%) and heavy workload (35.4%). The errors were also attributed to staff distraction (35.4%) and illegible prescription (2.8%). Implementation of a fully electronic medication order and dispensing systems at the healthcare facilities could potentially reduce the likelihood of transcribing errors, although it could also introduce new types of error stemming from the interaction with technology¹⁻³.

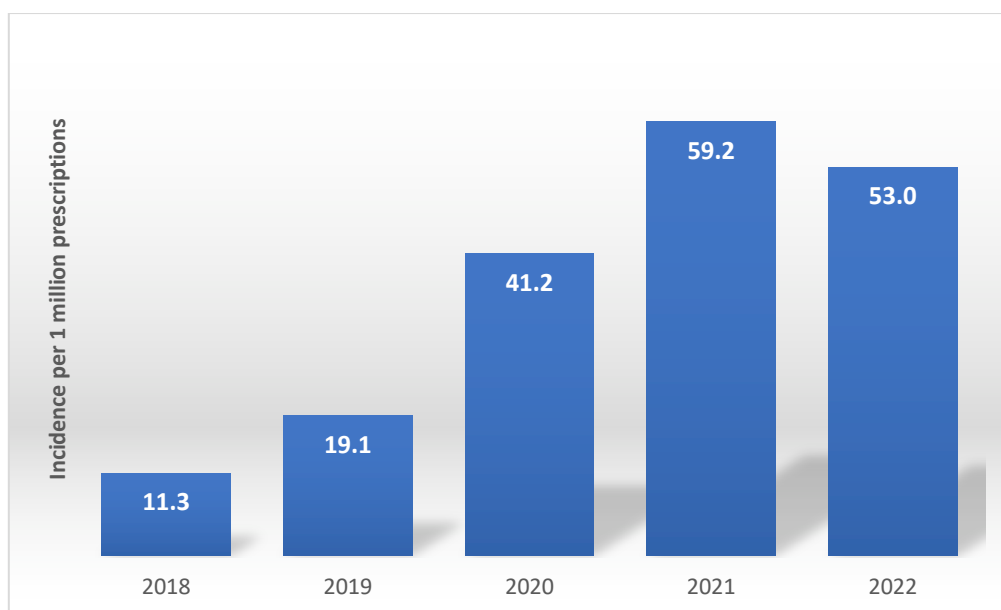


Figure 1: Incidence of transcribing errors per total number of prescriptions, 2018 to 2022

Table 1: Characteristics of medication errors due to transcribing errors

	Number of events, n	Percentage, %
N	12049	
Facility - type		
Hospital	5706	47.4 %
Clinic	6343	52.6 %
Facility - status of health information system ^a		
Full-based	277	2.3%
Pharmacy-based	11758	97.5%
Manual	61	0.5%
Not specified	14	0.1%
Time of event		
Office hours ^b	11327	94.0 %
Outside office hours	722	6.0 %
Error reached patient		
Yes	534	4.4 %
No	11515	95.6 %

Table 2 Error types and outcomes

	Full-based, n (%)	Pharmacy-based, n (%)	P value*
Error type			0.187
Dose error			
Incorrect dose	121 (43.7)	5739 (49.1)	
Incorrect frequency	54 (19.5)	2352 (20.1)	
Drug error			
Incorrect drug	44 (15.9)	1554 (13.3)	
Incorrect patient	17 (6.1)	738 (6.3)	
Dosage form error			

Incorrect dosage form	13 (4.7)	564 (4.8)
Omission error		
Omission of drug	17 (6.1)	428 (3.7)
Labelling error		
Incorrect instruction	1 (0.4)	63 (0.5)
Other transcribing error	10 (3.6)	259 (2.2)
Error outcome		<0.001
A: Potential error, events have potential to cause incident	1 (0.4)	80 (0.7)
B: Actual error - did not reach patient (near miss)	242 (87.4)	11132 (95.2)
C: Actual error - caused no harm	26 (9.4)	393 (3.4)
D: Additional monitoring required - caused no harm	7 (2.5)	75 (0.6)
E: Treatment/intervention required - caused temporary harm	1 (0.4)	10 (0.1)
F: Initial/prolonged hospitalisation - caused temporary harm	-	3 (<0.1)
Not specified	-	4 (<0.1)

* Chi-square test for comparison between groups.

Conclusion

Although transcribing errors accounted for less than 5% of all medication errors reported, these can be prevented with appropriate interventions. These findings can inform efforts to improve pharmacy practices and services, design interventions, and reduce harm to patients.

References

1. Jheeta S, Franklin BD. The impact of a hospital electronic prescribing and medication administration system on medication administration safety: an observational study. *BMC Health Serv Res.* 2017;**17**(1):547.
2. Westbrook JI, Reckmann M, Li L, et al. Effects of two commercial electronic prescribing systems on prescribing error rates in hospital in-patients: a before and after study. *PLoS Med.* 2012;**9**(1):e1001164.
3. Korb-Savoldelli V, Boussadi A, Durieux P, et al. Prevalence of computerized physician order entry systems-related medication prescription errors: A systematic review. *Int J Med Inform.* 2018;**111**:112-22.

Global Research Trends on Paediatric Obesity: A Bibliometric Analysis from 1994 to 2023

Mohd Azmi Bin Suliman¹, Tham Sin Wan¹, Thamir Arasu Saminathan¹

¹ Institute for Public Health, National Institutes of Health, Ministry of Health, Malaysia
Corresponding author's email: azmi.suliman@moh.gov.my

Summary

This bibliometric analysis explores global research trends on paediatric obesity using Scopus data covering 1994 to 2023. Almost 40,000 authors published 12,774 articles, with notable growth in the first two decades and a plateau in recent years, which may be attributed to publication saturation. Key contributors and commonly used keywords such as body mass index, physical activity, and insulin resistance were identified. These findings provide insight into research focus areas, influential authors, and evolving interests in paediatric obesity.

Keywords

Paediatric Obesity, Bibliometric Analysis, Science Mapping, Research Trend, Child Health

Introduction

Overweight and obesity in children and adolescents result from an imbalance between energy intake and energy expenditure. The global prevalence of childhood overweight and obesity has risen dramatically, from 8% in 1990 to 20% in 2022, becoming a major public health concern due to its long-term health consequences¹. Bibliometric analysis helps to identify key research trends, influential publications, and collaboration patterns within a field. It is particularly valuable for understanding the evolving scientific landscape and guiding future research directions. This bibliometric analysis aims to explore the global research landscape on paediatric obesity, focusing on publication trends, influential authors, and common keywords.

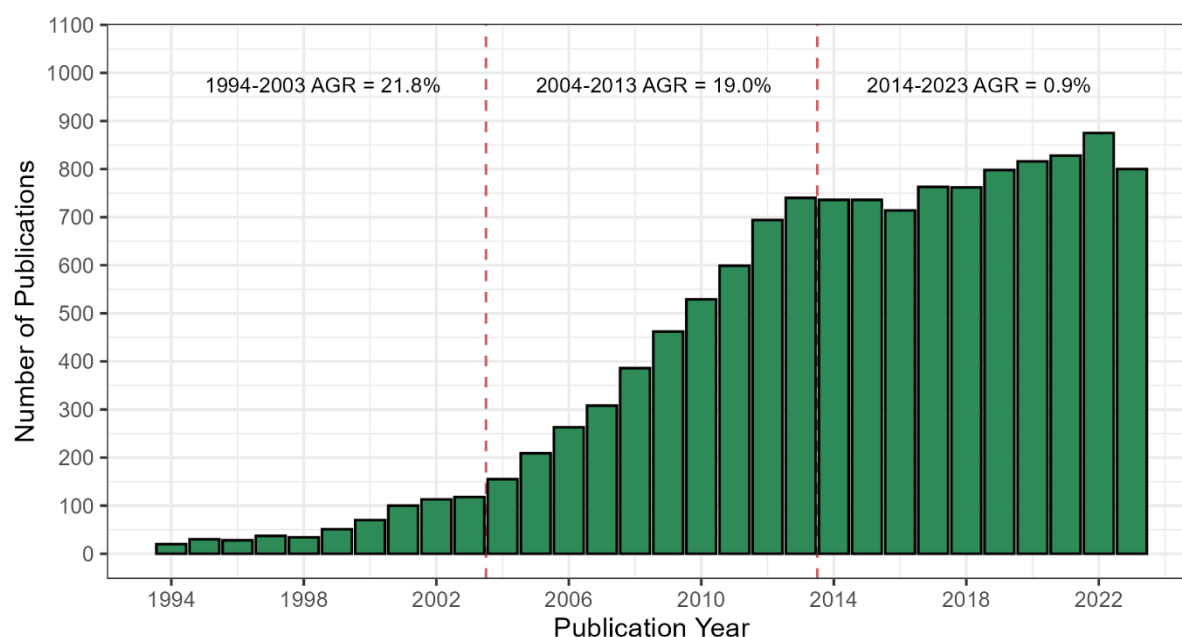
Materials and Methods

Bibliographic data on publications related to paediatric obesity were extracted from the Scopus database in February 2025 using title-based search terms such as "paediatric obesity," "childhood obesity," "adolescent obesity," and related variants. Only original research articles published between January 1994 and December 2023 were included in the analysis. The search was limited to 2023 because bibliographic data are considered more stable and reliable after at least two years². The bibliometric analysis was conducted using R and RStudio to identify influential authors, commonly used keywords, and publication trends.

Results and Discussion

Between 1994 and 2023, 12,774 research articles were published by 39,972 authors across 2,444 journals. Historical trends from 1994 revealed a rapid increase in publication output during the first two decades. While publication volume remained high between 2014 and 2023, averaging approximately 700-850 articles annually, the overall growth rate stagnated in the last decade. This early surge likely reflects growing academic interest and expanding publication opportunities, while the more

recent plateau may indicate field maturity or publication saturation rather than waning interest³.



AGR: Annual Growth Rate, Average AGR 1994-2023 = 13.6%

Figure 1: Number of Publications of articles related to Paediatric Obesity, 1994 - 2023

The top five most productive authors in each decade are shown in Table 1. Several authors maintained high productivity over time, such as Caprio S., who published 12 articles between 1994 and 2003, 37 between 2004 and 2013, and 32 more between 2014 and 2023 (ranked 7th). Similarly, Arslanian S. consistently contributed across the last two decades, with 34 publications between 2004 and 2013 and 31 publications (ranked 8th) in the most recent decade. Based on their sustained contributions, these authors may be considered authoritative in the field (3).

Table 1: Most Productive Authors, 1994-2023

1994-2003			2004-2013			2014-2023		
Authors	R	n	Authors	R	n	Authors	R	n
Story M.	1	18	Reinehr T.	1	43	Thivel D.	1	45
Borkenstein MH.	2	13	Goran MI	2	38	Sartorio A.	2	41
Neumark-Sztainer D.	2	13	Caprio S.	3	37	Hol JC.	3	38
Sudi K.	2	13	Arslanian S.	4	34	Kelishadi R.	4	36
Caprio S.	5	12	Daniels SR.	5	32	Pereira B.	5	35
Dietz WH.	5	12						
Gallistl S.	5	12						

R: Rank, n: number of publications

Beyond core terms like obesity, overweight, paediatric, children and adolescent, frequently used keywords included body mass index, physical activity, and insulin resistance, reflecting key research themes. Terms such as leptin, metabolic syndrome, exercise, and body composition also appeared consistently, highlighting continued interest in metabolic and lifestyle-related factors.

1994-2003		2004-2013		2014-2023	
Authors' Keywords	n	Authors' Keywords	n	Authors' Keywords	n
Body Mass Index	59	Body Mass Index	239	Physical Activity	387
Leptin	17	Physical Activity	175	Body Mass Index	372
Physical Activity	17	Insulin Resistance	141	Insulin Resistance	265
Body Composition	16	Metabolic Syndrome	116	Metabolic Syndrome	227
Insulin Resistance	14	Exercise	76	Exercise	132

Table 2: Most common Authors' Keywords outside core keywords, 1994-2023

Conclusion

This bibliometric analysis reveals sustained research interest in paediatric obesity, with an early rapid increase in publication volume followed by a stable output trend in the last decade. Influential authors and recurring keywords highlight key research areas and potential collaborations, offering valuable insights for future studies in this important public health field.

References

1. World Health Organization: WHO. Obesity and overweight [Internet]. 2024. Available from: <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight>
2. Donthu N, Kumar S, Mukherjee D, et al. How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research*. 2021; **133**:285-96.
3. Zupic I, Čater T. Bibliometric methods in management and organization. *Organizational Research Methods*. 2014;**18**(3):429-72.

Three Decades of Malnutrition Research Among Older Persons: A Bibliometric Analysis of Contributors and Research Themes

Mohd Azmi Bin Suliman¹, Tham Sin Wan¹

¹ Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: azmi.suliman@moh.gov.my

Summary

Using bibliometric analysis, this study examined research trends in malnutrition among older persons from 1994 to 2023. A total of 1,578 articles were retrieved from the Web of Science database and analysed using the 'bibliometrix' package in R. Key findings include the identification of productive authors, regional collaboration clusters, and evolving themes, ranging from clinical outcomes to geriatric syndromes such as frailty and sarcopenia. Most contributions came from Europe and Asia. The results highlight limited global collaboration and suggest the need for more integrated research to address the growing burden of malnutrition in ageing populations.

Keywords

Older person malnutrition, Bibliometric analysis, Science mapping, Ageing Population, Nutritional Assessment

Introduction

Malnutrition among older persons refers to a condition of undernutrition or nutrient deficiency caused by age-related physiological decline, chronic illness, or social and psychological barriers to adequate nutrition. Globally, the prevalence among older persons is estimated at 18.6%, while in Malaysia it is lower at 7.3%. Malnutrition in this population is associated with increased frailty, morbidity, mortality, and reduced quality of life^{1,2}. Understanding research trends in this field is essential as the world faces rapid population ageing. This study aimed to explore authorship patterns, international collaboration networks, and evolving research themes in malnutrition among older person from 1994 to 2023.

Materials and Methods

Bibliographic data were retrieved in April 2025 from the Web of Science database, using a title-based search that combined malnutrition-related terms (e.g., “malnutrit*”, “nutrition* deficien*”) with older person-related terms (e.g., “elder*”, “geriatric*”, “senior*”). A single database was used to maintain consistency in bibliographic metadata, as combining multiple databases such as PubMed and Scopus may lead to duplication and incompatible formats (4). A title-only search was applied to enhance specificity and minimise false positives from unrelated fields³. The search was limited to original research articles published between 1994 and 2023, excluding proceedings, book chapters, early access, withdrawn, or retracted publications. The year 2023 was chosen to ensure stable citation data³. Bibliometric analysis was performed in R using the ‘bibliometrix’ package to identify productive authors, map author collaboration networks, and analyse trends in author-supplied keywords over the three decades⁴.

Results and Discussion

Between 1994 and 2023, 1,578 articles were published by 7,717 authors. Table 1 shows the most productive authors in each decade. Cederholm T. consistently contributed across all decades, reflecting long-term scholarly influence (3).

Table 1: Top 5 Most Productive Authors, 1994-2023

1994-2003			2004-2013			2014-2023		
Authors	R	n	Authors	R	n	Authors	R	n
Cederholm, T.	1	9	DVDS, MAE. ^a	1	6	Visser, M.	1	19
Sullivan, DH.	2	6	Tsai, AC.	2	5	Volker, D.	2	17
Bories, PN.	3	4	Bosmans, JE.	3	4	De Groot, LCPGM.	3	10
Van Staveren, WA.	3	4	Enoki, H.	3	4	Iwasaki, M.	4	8
Campillo, B.	5	3	Kikutani, T.	3	4	Amaral, TF.	4	8

R: Rank, n: Numbers of Publication, ^aDVDS, MAE.: De Van Der Schueren, MAE.

Corresponding authors were affiliated with 73 countries, with the highest contributions from Europe (41.8%), followed by Asia (37.1%) and the Americas (16.2%). The author collaboration network, shown in Figure 1, reveals multiple clusters, suggesting strong intra-regional collaboration but limited interaction between regions. These findings highlight opportunities to enhance global research integration on malnutrition among older persons (5).

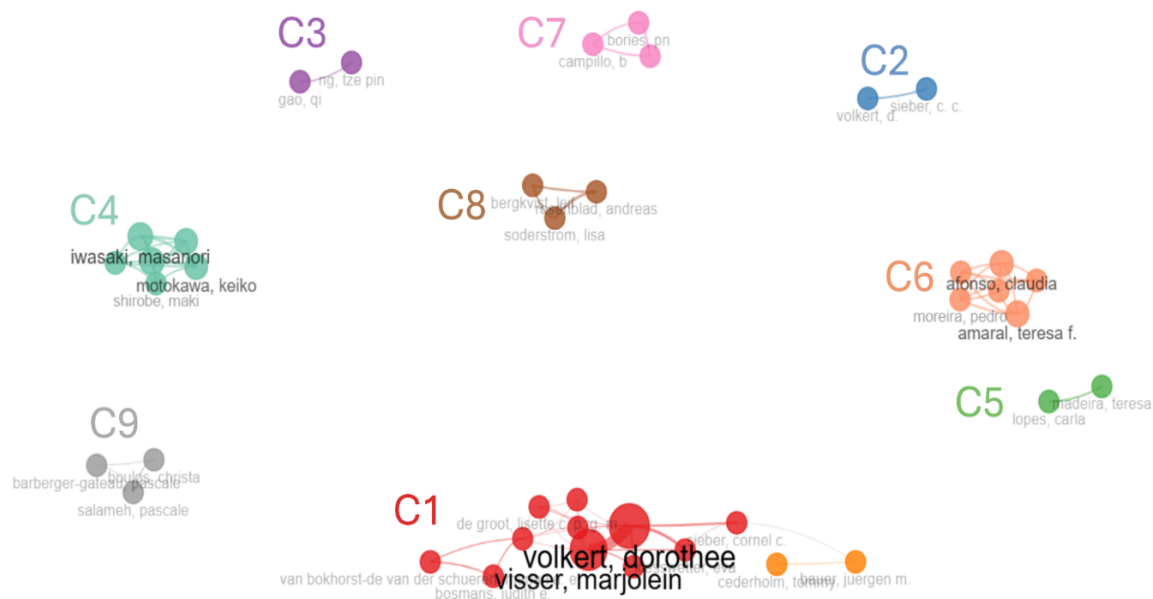


Figure 1: Author collaboration network. Author's Countries - Cluster 1: European - Netherlands, German, Sweden, Switzerland, Cluster 2: European - Switzerland German, Cluster 3: Singapore, Cluster 4: Japan, Cluster 5: Portugal, Cluster 6: Portugal, Cluster 7: France, Cluster 8: Sweden, Cluster 9: Lebanon & France.

Table 2 presents the most common author keywords after excluding core terms such as “malnutrition” and “older person”, revealing both consistent and evolving research themes³. Anthropometry and dietary intake appeared across all decades, reflecting their foundational role in nutrition research among older persons. Earlier studies focused on clinical outcomes such as protein-energy malnutrition, mortality, and hip fractures. During 2004-2013, cognitive concerns such as dementia and depression became more prominent. In the most recent decade, attention shifted toward geriatric syndromes, with frailty and sarcopenia emerging as dominant themes, alongside increasing focus on quality of life and functional outcomes.

Table 2: Most Common Authors' Keywords, 1994-2023 (n = 2,224)

1994-2003		2004-2013		2014-2023	
Authors' Keywords	n	Authors' Keywords	n	Authors' Keywords	n
Anthropometry	11	Dementia	9	Frailty	63
Albumin	10	Depression	9	Sarcopenia	59
PEM ^a	9	Albumin	8	Mortality	42
Mortality	6	Anthropometry	8	Depression	36
Hip fracture	5	Sarcopenia	8	Oral Health	22

n: Number of Publications, ^aPEM: protein-energy malnutrition

Conclusion

This bibliometric analysis highlights key contributors, regional collaboration patterns, and evolving research themes in malnutrition among older persons. Findings suggest a shift from clinical outcomes to broader geriatric concerns, with limited global collaboration, underscoring the need for more integrated, cross-regional research to support healthy ageing worldwide.

References

1. Salari N, Darvishi N, Bartina Y, et al. Global prevalence of malnutrition in older adults: a comprehensive systematic review and meta-analysis. *Public Health in Practice*. 2025;**9**:100583.
2. Ahmad MH, Salleh R, Man CS, et al. Malnutrition among the Elderly in Malaysia and Its Associated Factors: Findings from the National Health and Morbidity Survey 2018. *Journal of Nutrition and Metabolism*. 2021;**2021**:1-8.
3. Donthu N, Kumar S, Mukherjee D, et al. How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research*. 2021; **133**:285-96.
4. Aria M, Cuccurullo C. bibliometrix: An R-tool for comprehensive science mapping analysis. *Journal of Informetrics*. 2017;**11**(4):959-75.
5. Zupic I, Čater T. Bibliometric methods in management and organization. *Organizational Research Methods*. 2014;**18**(3):429-72.

Top-down Costing of Primary Healthcare Services in Malaysian Public Health Clinics

Marhaini Mostapha¹, Mohd Shaiful Jefri¹, Rima Marhayu Abdul Rashid², Noor Haslinda Ismail³, Tan Yui Ping¹, Mohd Shahri Bahari¹, Farhana Aminuddin¹, Sivaraj Raman¹, Nur Amalina Zaimi¹, Ee Vien Low¹ and Nor Zam Azihan Mohd Hassan¹

¹ Center of Health Economics Research, Institute for Health System Research, National Institutes of Health, Ministry of Health Malaysia

² Primary Medical Care Sector, Family Health Development Division, Ministry of Health Malaysia

³ Jelebu District Health Office, Ministry of Health Malaysia

Corresponding author's email: marhainimostapha@moh.gov.my

Summary

This study estimates the service costs of four key healthcare services at selected public primary healthcare facilities in Malaysia. A detailed understanding of these costs is crucial for designing benefit packages, informing budget planning, optimizing resource allocation, and supporting evidence-based policy making, particularly in the context of strengthening Malaysia's primary healthcare (PHC) system.

Keywords

Primary healthcare cost, Top-down costing, Health White Paper

Introduction

As the demand for primary health care (PHC) services grows and patient care needs evolve, health care system-wide transformation is critical (MOH, 2023). A core component of this transformation is the development of comprehensive benefit packages for PHC services. However, the absence of robust, nationwide cost data presents a significant barrier to effective planning and implementation on PHC services in Malaysia. This study aims to address the gap by analysing the cost structures of primary healthcare (PHC) services, focusing on four main services—primarily those with high disease burden which align with national health priorities. The analysis covers average annual costs, patient visits, cost per visit, and key cost drivers. Understanding cost differences helps improve spending efficiency and ensures quality, affordable care. Accurate cost data also guide reimbursement rates, budgeting, and resource allocation in line with Malaysia's Health White Paper goals (MOH 2023). These insights further support performance evaluation, spending tracking, and long-term sustainability of primary healthcare services^{1,2}.

Methods

This study examines the costs of PHC services from the perspective of the Ministry of Health Malaysia (MOH) using the Top-Down Costing methodology^{3,4}. Retrospective data from 2022 were used, with 118 public PHC clinics purposively selected to represent clinic types 1 to 7 (classified based on services provided and patient visit) ensuring variation in geographical regions and clinic sizes. The analysis focused on four key PHC services: Maternal and Child Health (MCH), Outpatient care, Non-Communicable Diseases (NCDs), and Screening. Cost data were allocated to each

service based on the number of staff and patient visits. Analysis was conducted using STATA statistical software (version 14.0), and one way sensitivity analysis to explore the impact of varying assumptions and inputs on the cost variations. Ethical approval was granted under NMRR-ID-24-01157-EOH.

Results and Discussion

Table 1 shows significant differences in the cost and utilisation of various PHC services. On average, MCH services recorded 27,573 visits annually, costing RM 1.98 million, while outpatient services had 22,904 visits, with a higher total cost of RM 2.09 million. Both service types had a cost per visit exceeding RM 110. NCD services had the highest utilization (33,404 visits) with the lowest cost per visit (RM 53.89). Screening services had the lowest utilisation (7,842 visits) and an annual cost of RM 0.38 million, with a cost per visit of RM 85.94. Meanwhile, variations in cost, service utilisation, and cost per visit were observed across clinic types 1 to 7. Figure 1 show that personnel costs emerged as the primary cost driver (38%), followed by drugs (25%), consumables (16%), and other expenses (15%), which include maintenance, utilities, and staff training. Medical assets accounted for the remaining 6%.

Table 1. Mean Annual cost, Utilisation and cost per visit

Primary health care services	Annual Cost (RM million)	Utilisation (no of visits)	Cost per visit (RM)
Maternal and Child health	1.98	27,573	114.20
Outpatient	2.09	22,904	115.64
Non-Communicable Disease	1.28	33,404	53.89
Screening	0.38	7,842	85.94

Based on result above, MCH service costs are higher may be due to the need for more personnel and time to support monthly antenatal checkups, postnatal visits up to 8 time per patient, and elderly screenings. Outpatient care includes consultations, lab tests, medications, and minor procedures. It also incurs additional costs for maintaining diagnostic tools and medical equipment, likely contributing to its high annual cost. However, both services warrant further evaluation to determine whether the costs reflect potential inefficiencies or genuinely higher resource requirements.

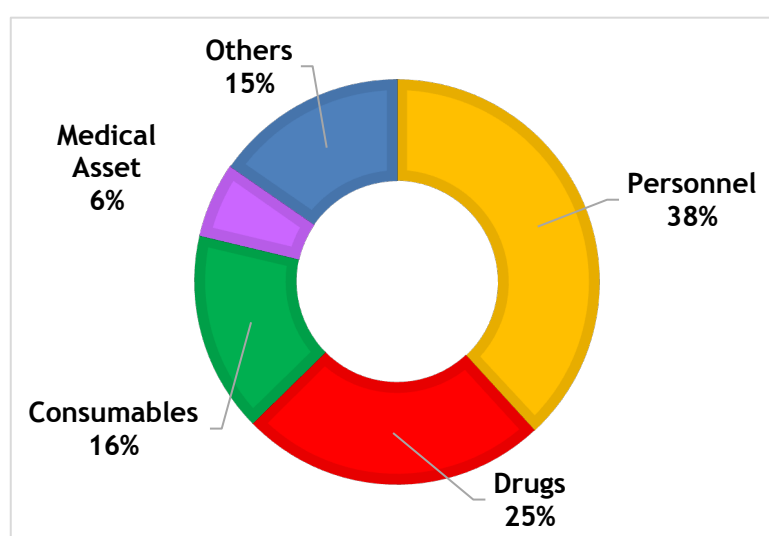


Figure 1. Cost Driver for primary health care services

The relatively low cost per visit for NCD services indicating cost efficiency while highlighting the NCD burden (highest patient visits) in public primary care. These findings suggest that policymakers should prioritise efficient NCD management models and consider task-shifting strategies in high-cost areas. However, a limitation of this study is that the top-down costing method estimates average costs, and did not capture individual-level or local variations in service delivery (variability is not presented).

Conclusion

The study highlights that NCD services to be most cost-effective, averaging RM53.89 per visit. Personnel costs were the main driver, making up 38% of total costs. The findings support policies to design equitable benefit packages, improve resource planning, cost benchmarking, and guide outsourcing decisions for a more efficient, sustainable PHC system.

References

1. Ministry of Health, Malaysia. Health White Paper for Malaysia. 2023;4.
2. Malaysia National Health Accounts. Expenditure on primary healthcare services. Kuala Lumpur: MNHA. 2022
3. Cunnama L, Sinanovic E, Ramma L, et al. Using Top-down and Bottom-up Costing Approaches in LMICs: The Case for Using Both to Assess the Incremental Costs of New Technologies at Scale. *Health Econ.* 2016;25 Suppl 1(Suppl Suppl 1):53-66.
4. Cashin C, Ozaltin A. Costing of Health Services for Provider Payment: A Practical Manual Based on Country Costing Challenges, Trade-offs, and Solutions. Joint Learning Network for Universal Health Coverage 2014.

Trends in Equality of Inpatient Care Utilisation for Middle-aged and Older Adults in Malaysia: Findings from the 2011, 2015, and 2019 National Health and Morbidity Surveys

Suhana Jawahir¹, Awater Amer Nordin¹, Devi Shantini Rata Mohan¹, Nur Elina Abdul Mutalib¹, Iqbal Ab Rahim¹, Jabrullah Ab Hamid¹, Adilius Manual¹, Sarah Nurain Mohd Noh¹

¹Centre for Health Equity Research, Institute for Health Systems Research, National Institutes of Health, Ministry of Health Malaysia, Malaysia

Corresponding author's email: suhana.j@moh.gov.my

Abstract

This study assessed the trends in the number of visits, public-private composition, and equality of inpatient care utilisation for middle-aged and older adults in Malaysia. Adults aged 45 and older from three nationwide community-based surveys were included. The overall trend in inpatient care utilisation and the distribution between public and private sectors remained unchanged from 2011 to 2019. Over time, reliance on the public sector expanded from the lowest two quintiles in 2011 to the lowest four in 2019, and socioeconomic inequality exists. Strengthening public-private partnerships is crucial to prevent widening disparities and to promote equitable access.

Keywords

Inpatient care, equity, healthcare utilisation, national survey, Malaysia

Introduction

Malaysia's demographic shift is driving up the demand for healthcare services¹, particularly for middle-aged and older adults with a higher burden of chronic diseases, disability, and other conditions². Inpatient (IP) care is a crucial aspect of healthcare, addressing evolving and complex health needs that outpatient services cannot fully manage. Socioeconomic status (SES) has been shown to be associated with healthcare access and utilisation³. This study aimed to assess the trends in the number of IP visits, the composition of public-private IP care utilisation, and the socioeconomic inequality of IP utilisation among middle-aged and older adults in Malaysia. By identifying service utilisation disparities, this study will offer insights to guide policy efforts towards enhancing healthcare delivery for populations with higher needs.

Materials and Methods

Secondary data analysis was conducted on adults aged 45 and older from three iterations of the National Health and Morbidity Survey (NHMS). A two-stage, stratified, proportional-to-size random sampling design was employed for these surveys to achieve a nationally representative sample. IP care utilisation was assessed by the annual mean number of visits to IP healthcare facilities per capita. SES was derived from adjusted adult equivalent values of monthly household income, ranked and grouped into quintiles, from poorest (Q1) to richest (Q5). We used the Concentration Curve and Concentration Index (CI) to assess inequality. A CI of 0

indicates equal use; negative means more use by the poor, positive by the rich. The analysis included 7706, 9242, and 5627 middle-aged and older adults in 2011, 2015, and 2019, respectively. Data analysis was conducted using STATA v18, accounting for sampling weights and study design.

Results and Discussion

Across the surveys, the overall trend in inpatient care utilisation (Figure 1a) and the distribution between public and private sectors (Figure 1b) remained unchanged. Reliance on the public sector increased, from the lowest two quintiles in 2011 to the lowest four in 2019 (Figure 2). From 2015 to 2019, more well-off groups (Q4 and Q5) are using public IP care, while from 2011 to 2019, fewer lower-income groups (Q1 and Q2) are using private IP care. This trend is reflected in the CI: for public care, it rose from -0.166 in 2015 ($p<0.001$) to -0.128 in 2019 ($p=0.002$), while for private care, it increased from 0.397 in 2011 ($p<0.001$) to 0.458 in 2019 ($p<0.001$) (Figure 3). IP care is known to cost more to the patient, with the private sector imposing fee-for-service charges, which make them unaffordable for many. In Malaysia, the public sector serves as a crucial safety net by offering heavily subsidised services at significantly lower costs, making it a more viable option for low-income individuals. The increasing utilisation of public inpatient care by more well-off groups, alongside potential underutilisation of the private sector, may be placing additional strain on public hospitals and signals a shift in healthcare utilisation patterns. Further research is warranted to determine whether these trends reflect changing provider preferences or broader systemic factors. However, the findings align with the literature, indicating that SES is associated with disparities in healthcare utilisation^{3,4}. Strengthening public-private partnerships is crucial to prevent widening disparities and to promote equitable access. The strength of this study is the large sample size, which enhances the generalisability of the findings. However, its cross-sectional design limits the ability to draw causal inferences.

Conclusion

This study highlights significant socioeconomic inequality in the IP care utilisation for middle-aged and older adults and their reliance on the public sector, which warrants attention. Strengthening public-private partnerships in healthcare delivery is crucial to promote equal access for those with higher needs while alleviating pressure on the public sector.

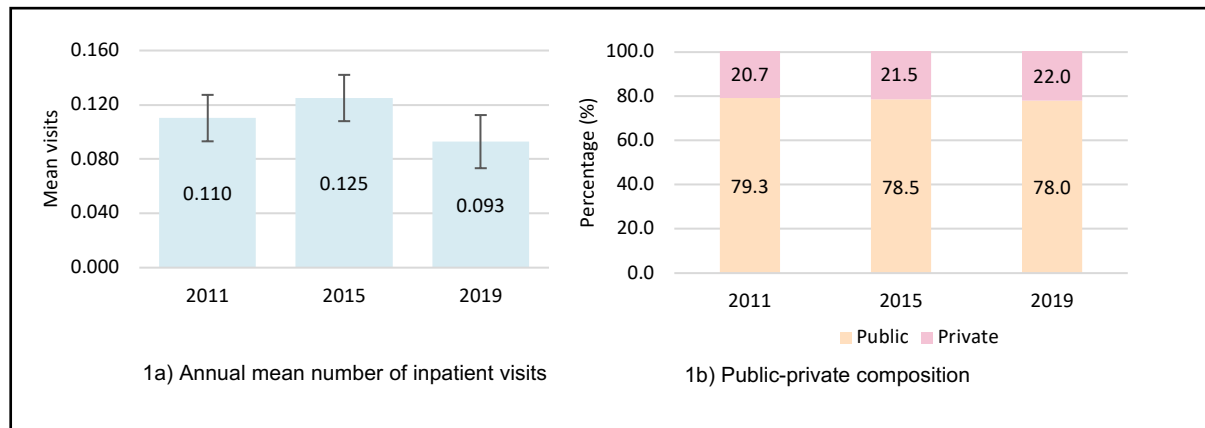


Figure 1. Annual mean number of inpatient visits (per capita) and public-private composition of inpatient care utilisation (NHMS 2011-2019)

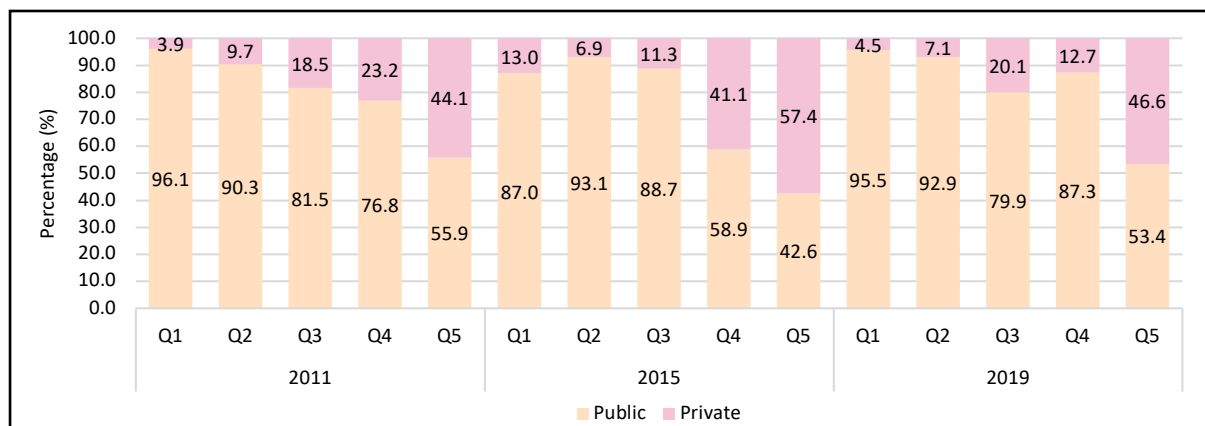


Figure 2. Public-private composition of inpatient care utilisation across income groups (NHMS 2011-2019)

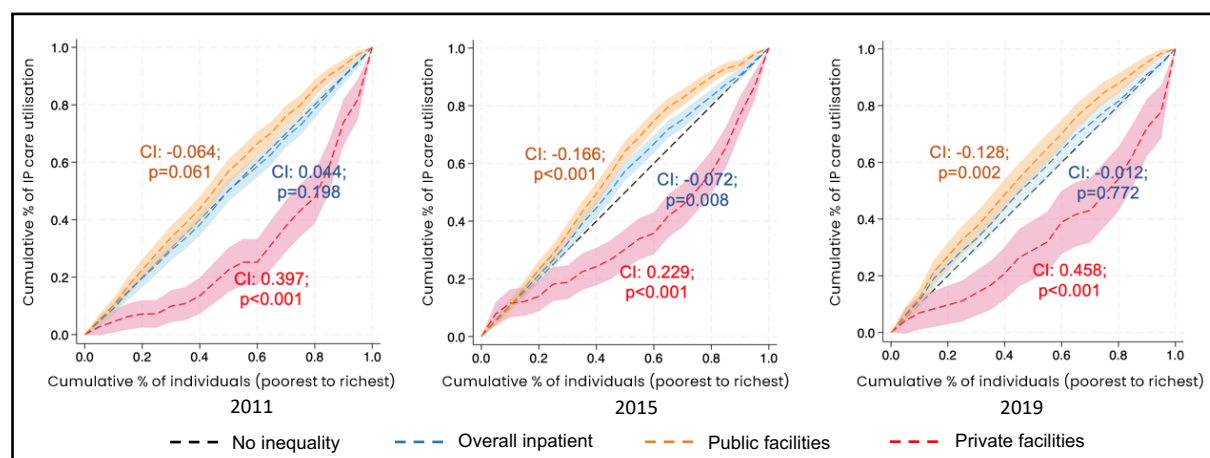


Figure 3. Concentration curves and indexes for the inpatient care utilisation (NHMS 2011-2019)

References

1. Abdullah JM, Ismail A, Yusoff MSB. Healthy ageing in Malaysia by 2030: needs, challenges and future directions. *Malays J Med Sci*. 2024;**31**(4):1-13. <https://doi.org/10.21315/mjms2024.31.4.1>
2. Ganapathy, Shubash & Jawahir, Suhana & Aris, Tahir & Ahmad, Noorani & Shauki, Nor & Krishnan, Manimaran & Alias, Nazirah & Mohd Yusoff, Muhammad Fadhli & Perialathan, Komathi & Rodzlan Hasani, Wan Shakira & Ab Rahim, Iqbal & Mat Rifin, Halizah & Tan, LeeAnn. (2020). NHMS 2019 - Non-Communicable Diseases, Risk Factors and other health problems.
3. Li X, Mohanty I, Chai P, Niyonsenga T. Healthcare utilization and its association with socioeconomic status in China: Evidence from the 2011-2018 China Health and Retirement Longitudinal Study. *PLoS One*. 2024 Mar 14;**19**(3):e0297025. doi: 10.1371/journal.pone.0297025. PMID: 38483924; PMCID: PMC10939203.
4. Health Policy Research Associates (HPRA), Institute for Health Systems Research (IHSR) and Institute for Health Policy (IHP). (2013). *Malaysia Health Care Demand Analysis: Inequalities in Healthcare Demand and Simulation of Trends and Impact of Potential Changes in Healthcare Spending*. Putrajaya: Ministry of Health Malaysia.

Utilisation of Medical Check-ups Among Older Adults in Malaysia: Findings from the National Health and Morbidity Survey (NHMS) 2023

Nur Hidayati Abdul Halim¹, Ang Zen Yang¹

¹ *Institute for Health System Research, National Institutes of Health, Ministry of Health Malaysia*

Corresponding author's email: nurhidayati.ah@moh.gov.my

Summary

This study explores the prevalence of medical check-up utilisation among Malaysians aged 50 and above and their self-rated health status. The overall prevalence was 43.28%, with the highest among those aged 70 to 79. Utilisation varied across age groups, highlighting gaps among the younger-old and the oldest-old. Most individuals who had a check-up rated their health positively. These findings suggest the need for targeted strategies to improve preventive care uptake among older adults.

Keywords

Medical check-up, older adults, preventive health, healthcare utilisation, Malaysia

Introduction

As Malaysia experiences demographic shifts toward an aging population, the need for accessible and regular preventive healthcare becomes increasingly urgent. Medical check-ups enable early detection and management of chronic conditions, improving long-term health outcomes and quality of life among older adults^{1,2}. However, the extent to which older Malaysians utilise such services remains unclear. Although past studies have examined multimorbidity and healthcare access in older Malaysians, specific patterns of preventive check-up use across different older age groups remain underexplored. Understanding age-related patterns of check-up utilisation and how they relate to perceived health status can inform more effective public health strategies. This study aims to assess the prevalence of medical check-up utilisation among adults aged 50 years and above and examine self-rated health among recent users of such services.

Materials and Methods

Secondary analysis of the Malaysian National Health and Morbidity Survey (NHMS) 2023 was performed, extracting data for respondents aged 50 years and above. The original survey employed stratified multistage sampling to ensure national representativeness, with stratification by region, urban/rural locality, and demographic characteristics. A total of 2,548 respondents aged 50 and above were included. After excluding 11 responses of “Don’t know” or “Refuse to answer” to the medical check-up item, response rate was 99.57%. Age groups were categorised as 50-59, 60-69, 70-79, and 80 years and above. Descriptive statistics were used to estimate prevalence of medical check-up utilisation with 95% confidence intervals. Among those who reported having a check-up in the past 12 months, self-rated health status was assessed and presented as proportions. Data were analysed using STATA 17.

Results and Discussion

The overall prevalence of medical check-up utilisation among adults aged 50 and above was 43.28% (95% CI: 40.02-46.61). Utilisation varied across age groups, with the highest reported prevalence among those aged 70-79 years at 48.87% (95% CI: 41.32-56.48), followed by the 60-69 age group at 46.05% (95% CI: 41.05-51.12). The lowest prevalence was observed among those aged 50-59 (39.44%; 95% CI: 34.97-44.09) and ≥ 80 years (38.99%; 95% CI: 25.86-53.94). While some differences in prevalence were noted across age groups, overlapping confidence intervals suggest that these variations should be interpreted cautiously. These findings indicate that medical check-up utilisation tends to increase with age, peaking in the 70-79 age group, before declining in the oldest age segment.

Table 1: Prevalence of medical checkup among adults ages 50 years and above, in the last 12 months (n=1,120).

Age group	Count	Estimated population	Percentage (%)	95% CI		RSE
				Lower	Upper	
Overall	1,120	2,992,364	43.28	40.02	46.61	3.88
50 - 59	441	5,989,684	39.44	34.97	44.09	5.89
60 - 69	444	5,114,837	46.05	41.05	51.12	5.58
70 - 79	197	2,874,506	48.87	41.32	56.48	7.95
≥ 80	38	468,333	38.99	25.86	53.94	18.79

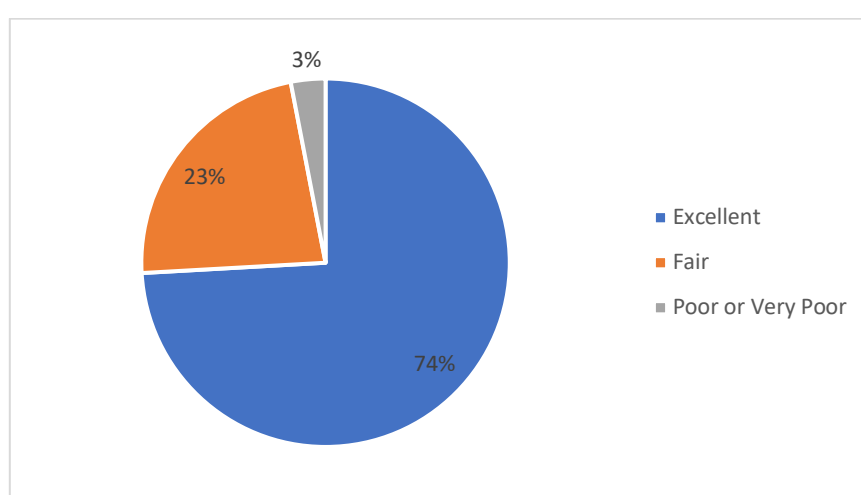


Figure 1: Self-rated health among those aged 50 years and above, and had medical check-up done (n=1,120).

Among those who had a medical check-up in the past year, 74.11% rated their health as excellent, 22.86% as fair, and 3.04% as poor or very poor. This suggests a positive correlation between engagement in preventive care and perceived health status. However, it is also possible that those who feel healthier are more likely to seek medical check-ups³.

The dip in utilisation among those aged 80 years and above may reflect barriers such as mobility limitations, lack of caregiver support, or reduced perceived benefit⁴. For the 50-59 age group, factors such as employment commitments or low perceived need may contribute⁵. These insights underscore the importance of policy efforts that prioritise age-tailored interventions to promote lifelong engagement with preventive health services and support healthier ageing outcomes.

Conclusion

Medical check-up utilisation among older Malaysians varies by age, with lower rates among the youngest and oldest groups. Future research should explore influencing factors and evaluate strategies to enhance access, motivation, and age-specific interventions to improve uptake and support healthy aging through early detection and chronic disease management.

References

1. Shariff Ghazali S, Seman Z, Zainuddin NH, et al. Prevalence and factors associated with multimorbidity among older adults in Malaysia: A population-based cross-sectional study. *BMJ Open*. 2021;**11**(10).
2. Loke YJ, Lim ES, Senadjki A. Health promotion and active aging among seniors in Malaysia. *J Health Res*. 2020;**35**(5):444-56.
3. Sahril N, Chan YM, Chan YY, et al. Poor Self-Rated Health and Associated Factors among Older Persons in Malaysia: A Population-Based Study. *Int J Environ Res Public Health*. 2023;**20**(5).
4. Mohd Rosnu NS, Singh DKA, Ludin AFM, et al. Enablers and Barriers of Accessing Health Care Services among Older Adults in South-East Asia: A Scoping Review. *Int J Environ Res Public Health*. 2022;**9**.
5. Lim XJ, Chew CC, Chang CT, et al. Perceived unmet needs of an age-friendly environment: A qualitative exploration of older adults' perspectives in a Malaysian city. *PLoS One*. 2023;**18**.

Maternal Mortality in Perak: A Decadal Epidemiological Review (2015-2024)

Raja Muhammad Raja Omar¹, Che Wan Ilmiyah², Masliza Mustafa³, Khoo Yi Yi³, Prem Kumar³, Husna Maizura Ahmad Mahir³.

¹ *Perak Tengah District Health Office, Ministry of Health Malaysia*

² *Kampar District Health Office, Ministry of Health Malaysia*

³ *Perak State Health Department, Ministry of Health Malaysia*

Corresponding author's email: husnamaizura@gmail.com

Summary

Maternal mortality remains a significant public health challenge in low- and middle-income settings like Perak, Malaysia. Data of 154 maternal mortality cases from 2015 to 2024 were analysed. Most cases involved Malaysian citizens, with a mean age of 31.7 years, 61.0% of deaths being preventable and 78.6% in Kinta district. Socioeconomic vulnerabilities were evident, with 93.5% of deceased mothers belonging to households with monthly incomes below RM 5,000. Direct causes contributed to 43.5% of maternal deaths, with pregnancy-related haemorrhage, infections, and hypertensive disorders being the leading causes. Poor antenatal care uptake was observed, highlighting the urgent need for targeted interventions.

Keywords

Maternal mortality, antenatal care, preventable deaths, family health, Malaysia

Introduction

Maternal mortality remains a significant global health issue. The Sustainable Development Goals (SDG) aim to reduce maternal mortality to less than 70 per 100,000 live births by 2030, but progress is uneven, particularly in regions with inadequate healthcare infrastructure, workforce shortages, and socioeconomic barriers. In Malaysia, maternal mortality has seen significant reductions over the past few decades, driven by advancements in healthcare infrastructure, antenatal services, and skilled birth attendance. However, regional disparities and vulnerabilities within certain subpopulations persist. Preventable causes dominate maternal mortality, with conditions like postpartum haemorrhage, hypertensive disorders, and infections accounting for a substantial proportion of deaths. Rural-urban disparities also contribute to maternal health issues. Addressing these challenges requires a multi-pronged approach that includes community-based interventions, policy reforms, and investments. This study aims to provide an epidemiological review of maternal mortality in Perak over 10 years (2015-2024), focusing on key socio-demographic, obstetric, and healthcare-related factors.

Materials and Methods

This was a cross sectional study to analyse the epidemiology of maternal mortality in Perak over 10 years (2015-2024). Maternal mortality was defined as the death of a woman from any cause related to or aggravated by pregnancy or its management (excluding accidental or incidental causes) during pregnancy, childbirth, or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy.

Data of 154 maternal mortality cases discussed during mortality meetings at both district and state levels was provided in hardcopy format by the Family Health Development Section, Perak State Health Department, Ministry of Health Malaysia. Descriptive analysis was conducted using Excel to identify the demographic characteristics of women who died due to maternal causes in Perak, examine case-specific factors, including the phase of death (antenatal, intrapartum, or postpartum), describe the leading causes of maternal deaths.

Results and Discussion

A total of 154 cases were analysed, with a mean maternal age of 31.7 years. The majority of deaths (78.57%) involved Malaysian citizens, while non-citizens accounted for 21.43%. Kinta district records high maternal mortality.

Ethnic composition revealed that Malays constituted the majority (55.85%) of deaths, while non-citizens (21.43%) and minority ethnic groups also faced elevated risks. Socio-economic vulnerabilities were evident, with 93.5% of households earning below RM 5000 monthly and 70.13% of deceased mothers being housewives or unemployed. Education levels were limited, as 65.59% of mothers attained only secondary schooling, and 11.03% had no formal education, further compounding their risks.

Regarding maternal health access, 73.38% of mothers had antenatal bookings, predominantly at government facilities (67.53%), while 26.62% were unbooked. Gravida analysis showed that first-time mothers (31.16%) and those with two or more pregnancies faced substantial risks. The phase of death revealed that most fatalities occurred postnatally (45.45%) and antenatally (39.61%).

The leading causes of death were haemorrhage in pregnancy (18.83%), infections (16.88%), and hypertensive disorders (14.29%). Non-obstetric causes, including cardiovascular (11.03%) and pulmonary disorders (5.85%), also contributed significantly. Preventable deaths accounted for 61.04% of cases, highlighting systemic issues in healthcare delivery. The place of death data revealed that 64.94% occurred in government facilities, home deaths (14.29%) and brought-in-dead cases (12.98%) pointed to delays in accessing emergency care. The classification of deaths showed that direct obstetric causes were responsible for 43.5%, while indirect causes (29.22%) and fortuitous events (24.68%).

Conclusion

The study reveals that maternal mortality in Perak is affected by various socio-demographic, cultural, and economic factors. Key issues include limited antenatal care and healthcare disparities. Major causes of death, like haemorrhage and infections, are preventable. Strengthening healthcare and community education is vital for reducing maternal mortality and ensuring equitable access to safe motherhood.

References

1. Chauke L. Improving access to emergency obstetric care in low- and middle-income countries. *Best Pract Res Clin Obstet Gynaecol.* 2025;**98**:102572.
2. Knight M, Bunch K, Tuffnell D, Shakespeare J, Kotnis R, Kenyon S, Kurinczuk JJ (Eds.) on behalf of MBRRACE-UK. Saving Lives, Improving Mothers' Care - Lessons learned to inform maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2015-17. Oxford: National Perinatal Epidemiology Unit, University of Oxford 2019.

3. Mahmood N, Nor NHM, Abdul-Ghani HA. Impact of national maternal health policies on maternal mortality in Malaysia. *Asia-Pacific Journal of Public Health*. 2018;**30**(4),345-352.
4. World Health Organization. Trends in Maternal Mortality: 2000 to 2017. Estimates by WHO, UNICEF, UNFPA, World Bank Group, and the United Nations Population Division. Geneva: WHO. 2019.
5. Yusof N, Abdul-Rahman NI, Aziz ARA. Regional disparities in maternal health outcomes in Malaysia: Challenges for universal health coverage. *Malaysian Journal of Public Health Medicine*. 2020;**20**(2),93-100.

Productivity Impact of Premature Death from Cardiac Arrest Outside Hospitals in Penang

Nor Zam Azihan Mohd Hassan¹, Mohd Shahri Bahari¹, Leong Yuen Chin², Farhana Aminuddin¹, Sivaraj Raman¹, Mohd Shaiful Jefri Nur Sham Kunusegaran¹, Nur Amalina Zaimi¹, Tan Yui Ping¹, Ee Vien Low¹, Marhaini Mostapha¹,

¹ *Centre of Health Economics Research (ChEER), Institute for Health Systems Research, National Institutes of Health, Ministry of Health Malaysia*

² *Emergency Department, Hospital Sungai Buloh, Ministry of Health Malaysia*

Corresponding author's email: norzam@moh.gov.my

Summary

This study estimates the productivity loss due to premature death among Out-of-Hospital Cardiac Arrest (OHCA) cases in Penang, Malaysia. Using a human capital approach, we assess the economic burden of OHCA across different demographic groups. The findings highlight substantial productivity loss, with significant variations by age, gender, and ethnicity, offering important insights for public health prioritization and emergency response planning.

Keywords

productivity loss, economic burden, out-of-hospital cardiac arrest, premature death, public health

Introduction

Out-of-Hospital Cardiac Arrest (OHCA) is a significant public health issue, marked by sudden cardiac dysfunction occurring outside healthcare facilities. It is associated with high mortality rates, particularly in low- and middle-income countries where emergency response systems are still developing and public awareness of cardiopulmonary resuscitation (CPR) remains low^{1,2}. In Malaysia, OHCA outcomes are poor, with survival-to-discharge rates below international benchmarks³. While clinical interventions and survival outcomes have received considerable attention, the economic burden—specifically the loss of productivity due to premature death—has not been thoroughly quantified. The human capital approach, which estimates the present value of future earnings lost due to early mortality, provides a meaningful method to assess these indirect costs⁴. Quantifying such losses can inform national policy and investment decisions, particularly for scaling up pre-hospital interventions like public access defibrillation and community-based CPR training.

Materials and Methods

This study utilised secondary data from the Penang Out-of-Hospital Cardiac Arrest (OHCA) Registry to estimate productivity loss due to premature death. Of the 5,052 OHCA cases recorded, 441 were excluded due to incomplete information, resulting in a final sample of 4,611 cases for analysis. The economic burden was estimated using the human capital approach, which calculates the present value of future earnings lost. Supplementary data were collected from the Department of Statistics Malaysia (DOSM), including age-specific labour force participation rates, median monthly wages, and employment rates. These parameters were incorporated into a

standardized formula to estimate the lifetime productivity loss for each fatal OHCA case (Figure 1) The analysis assumes a working age up to 65 years based on DOSM data, applying a 3% discount rate over a working life horizon.

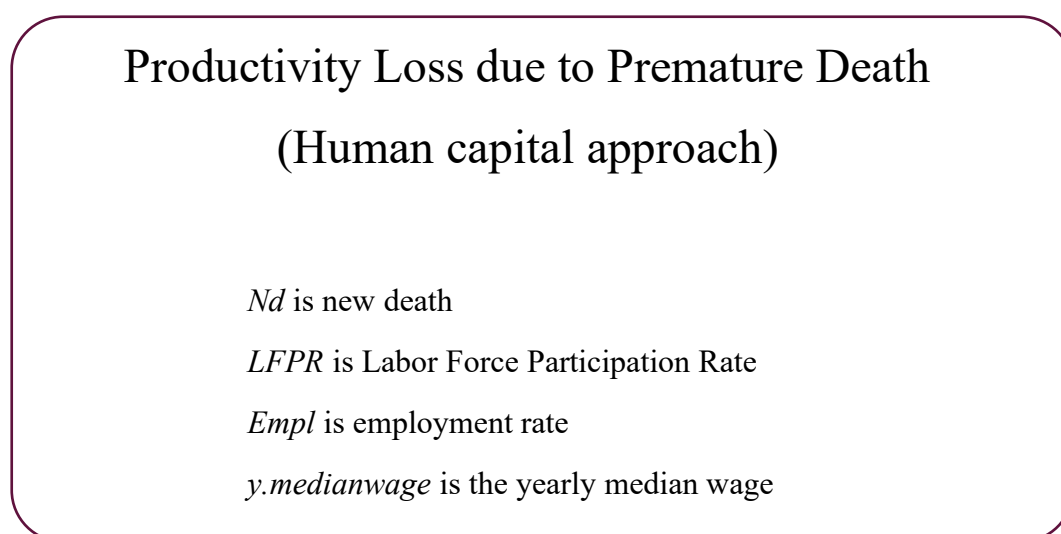


Figure 1: Productivity loss due to premature death using human capital approach

Statistical analyses assessed productivity loss across sociodemographic groups and AED use, using Kruskal-Wallis and Independent Samples t-tests based on data normality. Analyses were performed with Stata version 18.

Results and Discussion

The findings revealed that the average productivity loss per OHCA case in Penang was MYR 93,835.47 ($\pm 191,804.10$). This substantial figure represents the economic impact of OHCA-related premature death, especially in the lack of effective pre-hospital interventions.

Gender differences were statistically significant ($p < 0.01$), with males incurring a higher productivity loss (mean = MYR 129,430.20) compared to females (mean = MYR 51,012.98). This disparity reflects gender-based differences in incidence rate, workforce participation and average earnings⁵. Moreover, cases among the 30-39 age group incurred the highest loss (median = MYR 650,159.80 $\pm$ 39,826.45), highlighting the devastating economic consequences of OHCA occurring in individuals during peak earning years⁶.

Kruskal-Wallis test also revealed significant difference between different Ethnic groups. This could be associated with a combination of demographic patterns, age distribution at time of arrest, and employment sector differences across ethnic groups in Malaysia⁵.

Notably, while cases with AED use showed slightly higher productivity loss (mean = MYR 109,005.30) compared to those without AED use (mean = MYR 93,581.25), the difference was not statistically significant. This outcome might reflect the tendency for AEDs to be used in younger, more economically active individuals rather than indicating a poorer prognosis⁷. However, previous studies consistently show that AED use improves survival rates and neurological outcomes when applied promptly⁵.

Overall, the results demonstrate that poor outcomes in OHCA, especially when death occurs before hospital care, lead to significant economic losses. These findings support investment in early recognition, public access defibrillation, and community CPR training, which have been proven to improve survival and reduce societal burden⁵.

Table 1: Descriptions of Productivity Loss due to Premature Death for Out of Hospital Cardiac Arrest in Penang (n = 4,611)

Variables	N	Mean	SD	Median	IQR
Productivity Loss	4,611	93,835.47	191,804.10	0.00	43895.19

Table 2: Productivity Loss by Sociodemographic and Bystander AED Used (n = 4,611)

Variables	N	Mean	SD	Median	IQR	p value
Ethnicity[§]						<0.001***
Malay	1493	117,589.20	203,935.90	0.00	162,400.20	
Chinese	2439	52,011.13	144,051.50	0.00	0.00	
Indian	458	10,4009.50	196,335.80	0.00	125,326.40	
Foreigners	174	4,40573.00	251,727.30	589,333.00	359,397.50	
Others	47	12,6881.70	221,069.70	0.00	180,131.20	
Gender[#]						<0.001***
Female	2093	51,012.98	144,189.10	0.00	0.00	
Male	2518	129,430.20	217,504.20	0.00	180131.2	
Age Groups[§]						<0.001***
<20	16	110,299.10	570.17	110,299.10	1,104.13	
20-29	80	465,893.40	132,775.00	56,44420	245,149.80	
30-39	149	651,337.50	20,221.30	650,159.80	39,826.45	
40-49	306	552,206.20	91,897.59	531,749.80	137,079.70	
50-59	489	237,438.90	91,327.48	197,345.80	168,703.20	
>60	3571	3,222.37	10,740.86	0.00	0.00	
Bystander AED Used[#]						0.487
AED not used	4535	93,581.25	191,881.80	0	43,895.19	
AED used	76	109,005.30	187,723.10	0	162,400.2	

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

[§] Kruskal Wallis Test

[#] Independent T Test

Conclusion

Premature deaths from OHCA in Penang result in considerable productivity losses, disproportionately affecting specific demographics. Young adults and males represent the greatest economic loss, suggesting that early intervention strategies targeting high-risk populations may be both clinically and economically beneficial.

This study supports the need for enhanced community resuscitation capacity, including targeted AED deployment and public education, to reduce the economic burden of OHCA. Future efforts should focus on scaling up public access defibrillation, community CPR training, and investment in pre-hospital emergency response systems, while future research should explore the cost-effectiveness and long-term economic impact of these interventions in reducing productivity loss from OHCA

References

1. Schnaubelt S, Monsieurs KG, Semeraro F, et al. Clinical outcomes from out-of-hospital cardiac arrest in low-resource settings – A scoping review. *Resuscitation* 2020;**156**:137-45.
2. Ali Baig MN, Fatmi Z, Khan NU, et al. Effectiveness of chain of survival for out-of-hospital-cardiac-arrest (OHCA) in resource limited countries: A systematic review. *Resusc Plus* 2025;**22**:100874.
3. Ong MEH, Shin S Do, De Souza NNA, et al. Outcomes for out-of-hospital cardiac arrests across 7 countries in Asia: The Pan Asian Resuscitation Outcomes Study (PAROS). *Resuscitation* 2015;**96**:100-8.
4. Menzin J, Marton JP, Menzin JA, et al. Lost productivity due to premature mortality in developed and emerging countries: an application to smoking cessation. *BMC Med Res Methodol* 2012;**12**:87.
5. Graham Robert, McCoy MA., Schultz AM. Strategies to improve cardiac arrest survival : a time to act. The National Academies Press; 2015.
6. Coute RA, Nathanson BH, Kurz MC, et al. Annual and lifetime economic productivity loss due to adult out-of-hospital cardiac arrest in the United States: A study for the CARES Surveillance Group. *Resuscitation* 2021;**167**:111-7.
7. Daud A, Nawi AM, Aizuddin AN, et al. Factors and Barriers on Cardiopulmonary Resuscitation and Automated External Defibrillator Willingness to Use among the Community: A 2016-2021 Systematic Review and Data Synthesis. *Glob Heart* 2023;**18**:46.

A Review of Antimicrobial Stewardship Program in Primary Healthcare clinics in Perak, Malaysia

Hairul Izwan Abdul Rahman¹, Nur Afini Rozana Mohd Sani¹, Husna Maizura Ahmad Mahir¹

¹ Perak State Health Department, Ministry of Health Malaysia
Corresponding author's email: hairulizwan@yahoo.com

Summary

Perak has implemented comprehensive Antimicrobial Stewardship (AMS) initiatives to promote the responsible use of antimicrobials and control the spread of resistant organisms. Data of AMS clinical audit from 2020 to 2024 were analysed. 94.4% of Primary Healthcare clinics (PHC) have participated in the audit. The percentage of clinics that achieved score of 90% and above has increased from 25.1% in 2020 to 62.2% in 2024. Overall, the percentage of proper antibiotic prescription has increased from 58.1% in 2020 to 90.6% in 2024. Despite these successes, challenges persist, including ensuring adherence to AMS protocols and enhancing the competency of healthcare professionals in antibiotic prescribing. Appropriate interventions are essential to ensure sustainability of AMS program in PHC setting.

Keywords

Antimicrobial stewardship, primary healthcare clinics, Perak

Introduction

Antimicrobial resistance (AMR) poses a significant threat to global health, with misuse or overuse of antimicrobials being primary drivers of this issue. In Malaysia, AMR, which ranked fourth for causes of death in 2019, has led to substantial health challenges, including an estimated 3,500 deaths attributable to AMR and 14,000 deaths associated with AMR in 2019¹. Antimicrobial resistance (AMR) A review study also shows an increase in resistance patterns to the majority of antibiotics². A key component of Malaysia's AMS strategy is the "Protocol on Antimicrobial Stewardship (AMS) Program in Healthcare Facilities," which provides guidelines to strengthen AMS implementation across healthcare facilities. Additionally, community-based AMS interventions have been developed to address unregulated antibiotic use and enhance awareness among healthcare providers and the public. This study aims to evaluate trends of clinical audit score from all primary healthcare clinics in Perak from 2020 to 2024, to discuss successes and challenges during the implementation of AMS program and to suggest future directions to strengthen AMS program in Perak.

Materials and Methods

This was a cross sectional study to analyse the AMS clinical audit findings in Perak over 5 years (2020-2024). Proper antibiotic prescription was defined as the proper antibiotic prescription audit score of above 85%.

Audit data from participated PHC were analysed at district levels and results were sent to Perak State Health Department for compilation and further analyses. Findings were discussed in technical meetings and report format sent to the Family Health Development Division, Ministry of Health Malaysia. Descriptive analysis was conducted using Excel to evaluate the trends of antibiotic use score in Perak,

examine all clinical audit elements, including history taking, correct diagnosis and indication of antibiotic prescription based on National Antibiotic Guidelines (NAG).

Results and Discussion

Numbers of PHC participated in AMS audit has increased from 36 in 2020 to 84 in 2024. A total of more than 2000 outpatients (OPD) records were analysed annually from year 2020 to 2024. Excellent clinical audit score (>90%) has improved from 25.1% in 2020 to 62.2% in 2024 with overall good antibiotic prescription (score > 85%) increased from 58.1% in 2020 to 90.6% in 2024. By elements of AMS, health education regarding side effects and statement of drug allergies need to be emphasised to all prescribers, as it showed slow improvement ranging from 46.8% to 61.7% and 55.3% to 64.7% respectively. In terms of AMS district structure audit, all districts have achieved more than 80%, showing that all district health offices have achieved a high level of compliance with the essential components required for an effective AMS program. However, AMS program in PHC has some challenges and barriers such as of trained staff either specialists or laboratory infrastructures and technicians to support AMS activities. Some doctors also may view AMS policies as restrictions to clinical autonomy and in some PHC settings, prescribing antibiotics may be seen as a precautionary norm. Thus, it requires consistent education and reinforcement. To effectively address challenges in implementing AMS programs in these settings, targeted and practical interventions are essential. Education plays a central role especially training of healthcare providers on antimicrobial resistance and appropriate prescribing practices. This can be complemented by integrating clinical decision support tools and accessible guidelines into daily practice. Moreover, regular prescription audits with constructive feedback help identify areas for improvement while reinforcing accountability. Patient education is equally important in informing patients about the risks of antibiotic misuse can reduce unnecessary demand. Strengthening governance by establishing dedicated AMS teams, supported by leadership and policy frameworks, ensures consistent implementation.

Conclusion

The study reveals that AMS initiatives in Perak have demonstrated significant progress in promoting the appropriate use of antibiotics and combating antimicrobial resistance. However, implementing and sustaining the AMS program might be challenging especially in resource-limited PHC setting. These interventions, when combined with continuous monitoring and evaluation, lay the foundation for a sustainable AMS program in the PHC setting.

References

1. Institute for Health Metrics and Evaluation. The burden of antimicrobial resistance in Malaysia. 2023. Accessed on 20th February 2025 at <https://www.healthdata.org/sites/default/files/2023-09/Malaysia.pdf>
2. Naeemudeen NM, Mohd Ghazali NAN, Bahari H, et al. Trends in antimicrobial resistance in Malaysia. *Medical Journal of Malaysia*. 2021;**76** (5),698-705.

Association Between Depression and Health Seeking Behaviour Among Women in Malaysia

Sharifah Zawani Syed Ahmad Yunus¹, Mohamad Fuad Mohamad Anuar², Kasturi Manoharan³

¹ Scientific Communication and Dissemination Unit, Office of NIH Manager, National Institutes of Health, Ministry of Health Malaysia

² Sector for Biostatistics and Repository Data, Office of NIH Manager, National Institutes of Health, Ministry of Health Malaysia

³ Research Registry & Data Coordination Unit, Sector for Ethics and Research Surveillance, Office of NIH Manager, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: szawani.nih@moh.gov.my

Summary

Depression is one of the major problems highlighted in burden of disease for mental health, especially among women. Health seeking behaviour is defined as any action made by individuals to find a suitable treatment for themselves. Therefore, this study aimed to highlight the association between women's health-seeking behaviours and their depressive states. Data was received from National Health and Morbidity Survey (NHMS)-Healthcare Demand (HCD) module. 35.1% of depressed women are most likely to seek from non-healthcare workers for health advice. Awareness campaign needs to be done to educate public on the importance of seeking healthcare workers for better medical advice.

Keywords: depression; health seeking behaviour; NHMS; women

Introduction

Throughout the globe, depression is a prevalent mental disorder and one of the primary causes of health impairment¹. Depression has also become more prevalent in Malaysia. According to the National Health and Morbidity Survey (NHMS) 2011, 1.8% of Malaysians experienced depression². Improving people's willingness to seek treatment for both physical and mental health is an urgent public health concern. Recent studies in the United States have reported that depression is associated with increased healthcare use and poorer health behaviours³ and a meta-analysis shows that women are almost twice as likely as men to have depression⁴. Thus, depression and its relationship to such behaviour in women dealing with sickness have become the focus of this study.

Materials and methods

A secondary data analysis was conducted on health seeking behaviour using data from the National Health and Morbidity Survey 2019- Healthcare Demand (HCD) module. The survey utilised cross sectional study design with two stage stratified random sampling. Descriptive analyses were performed using SPSS version 26, with sampling weights applied. Chi square analysis was performed to determine the association between depression and health seeking behaviour, while phi-coefficient or Cramer's V used to evaluate the relationship strength. The study includes all women respondents (n= 8,645; estimate population= 10,339,496). Depression status was assessed using the Patient Health Questionnaire-9 (PHQ-9) measuring how often

they were bothered by depressive symptoms over the past two weeks. Meanwhile, health seeking behaviour for the respondents were assessed based on their actions in the last two weeks for any reported sickness prior to the data collection.

Results and discussion

The prevalence of depression among women in Malaysia was 14.2%. Approximately, half of the population (49.5%) self-rated as poor health condition were perceived as depressed (p-value- <0.001). The result also been support with Cramer's V value with 0.188 (p-value < 0.001), showing strong association findings (Table 1). About half of the women rated their health as poor were in depressed status. The findings give an overview of the severity of the depression towards their self-rated health status.

Table 1: Association between self-rated health with depression status among women.

Self-rated health	Depression Status		Cramer's V	p-value
	No	Yes		
Good	88.7%	11.3%	0.188	<0.001
Moderate	77.1%	22.9%		
Poor	50.5%	49.5%		

Among perceived depressed women, 26.1% of them were seeking for treatment or medication from healthcare practitioner for acute health problems. However, a significant 20.6% did not seek any treatment or medication from healthcare practitioner. This could be due to attitudinal barriers such as attitudes about treatment and perceived need for treatment, structural barriers such as cost and transportation, or concerns with being stigmatised (5). The result also showed 16.8% of them were taking medication without advice from healthcare practitioners. A substantial portion of women (26.1%) may be attempting to manage their sickness independently via over-the-counter medicines.

35.1% of them with acute health problems were seeking advice from other than healthcare practitioner such as family members and friends. The results also show moderate association between depressed women and health seeking behaviour from other than healthcare practitioners. We can assume that depressed women prefer to seek health advice from non-healthcare practitioners due to some factors influencing them such as feeling safe with their circle of friends and family and prefer someone close to them. Among perceived depressed women, 26.0% of them with acute health problems were seeking advice from other resources such as internet, TV, application, radio, and others. In addition, 19.1% of them with acute health problems did nothing.

Table 2: Association between depression status and health seeking behaviour among women.

Health seeking behaviour for acute health problems	Depression Status		Phi Co-efficient	p-value
	No	Yes		
Seeking treatment or medication or advice from healthcare practitioner				
Yes	73.9%	26.1%	0.063	<0.001
No	79.4%	20.6%		
Take medicine without advice from healthcare practitioner				
Yes	83.2%	16.8%	0.093	<0.001
No	73.9%	26.1%		
Someone other than healthcare practitioner				
Yes	64.9%	35.1%	0.112	<0.001
No	78.2%	21.8%		
Other resources such as media				
Yes	74.0%	26.0%	0.021	<0.001
No	76.6%	23.4%		
Did nothing				
Yes	80.9%	19.1%	0.062	<0.001
No	75.6%	24.4%		

Conclusion

Depression significantly influences the health seeking behaviour of women in Malaysia with more likely to rely on informal sources. The underutilisation of formal healthcare raises critical concerns. Hence, future public health initiatives should incorporate effective mental health education, reducing stigma, and improve accessibility to mental healthcare services.

Acknowledgement

We would like to thank the Director General of Health Malaysia for the permission to publish these findings.

References

1. WHO. The global burden of diseases 2004: World Health Organization; 2008.
2. Mohd Tamil A, Ismail NH, Jaafar MH, et al. Depressive symptoms among adults: Baseline findings of PURE Malaysia cohort study. *Heliyon*. 2023.
3. Leung CY, Lee SJ. Depression, healthcare utilization, missed work, and health behaviors among US young workers: Data from the 2015 National Health Interview Survey. *J Occup Environ Med*. 2021.
4. Salk RH, Hyde JS, Abramson LY. Gender difference in depression in representative national samples: meta-analyses of diagnoses and symptoms. *Psychol. Bull*. 2017.
5. Arnaez JM, Krendl AC, McCormick BP, Chen Z, Chomistek AK. The association of depression stigma with barriers to seeking mental health care: a cross-sectional analysis. *J Ment Health*. 2020;29(2):182-90.

Cost-Minimization Analysis of Kramer's Rule Combined with Transcutaneous Bilirubin Screening versus Kramer's Rule Alone for Neonatal Jaundice in Primary Healthcare Clinics

Xin-Jie Lim¹, Subashini Ambigapathy², E-Li Leong¹, Nicholas Yee-Liang Hing³, Nurul Idayu Mior Azmi⁴, Mary Stella⁵, Sheela Mithra⁶, Ling-Yuin Lee⁷, Mohammad Zawawi Abu Bakar⁸, Paream Kaur⁹, Philip Rajan Devesahayam¹, Jeyaseelan P. Nachiappan¹⁰

¹*Clinical Research Centre, Hospital Raja Permaisuri Bainun, Ministry of Health Malaysia*

²*Klinik Kesihatan Buntong, Ministry of Health Malaysia*

³*Institute for Clinical Research (ICR), National Institutes of Health, Ministry of Health Malaysia*

⁴*Klinik Kesihatan Ibu & Anak Pengkalan Pegoh, Ministry of Health Malaysia*

⁵*Klinik Kesihatan Pusing, Ministry of Health Malaysia*

⁶*Klinik Kesihatan Ibu & Anak Batu Gajah, Ministry of Health Malaysia*

⁷*Klinik Kesihatan Tanjung Rambutan, Ministry of Health Malaysia*

⁸*Klinik Kesihatan Gunung Rapat, Ministry of Health Malaysia*

⁹*Klinik Kesihatan Chemor, Ministry of Health Malaysia*

¹⁰*Faculty of Medicine, Royal College of Medicine Perak, Universiti Kuala Lumpur (UniKL-RCMP)*

Summary

This cost-minimisation analysis compared the costs of using the KR-TcB-TSB model versus the KR-TSB model for screening and diagnosing NNJ in primary healthcare clinics. The KR-TcB-TSB model demonstrated 23% lower per-patient costs (RM 18.93 vs. RM 24.57; $p < 0.001$), saving RM 5,640 per 1,000 infants. Threshold analysis showed cost equivalence when TcB-related cost rose by 46%. This identified the procurement threshold for cost-saving, guiding strategic implementation in resource-limited settings. The TRANDLAB study found equivalent clinical outcomes between models, supporting the adoption of the KR-TcB-TSB model in resource-limited settings, particularly clinics with high patient volume, as it lowers costs without compromising care.

Keywords

transcutaneous bilirubinometry (TcB), cost-minimization analysis, Kramer's rule (KR), neonatal jaundice (NNJ), primary healthcare clinics

Introduction

Neonatal jaundice (NNJ) affects 60-80% of infants, making it a leading cause of newborn readmission¹. Effective monitoring is critical to prevent severe hyperbilirubinemia and its complications². While Kramer's rule (KR) serves as the traditional screening method, its subjective nature limits reliability³, whereas transcutaneous bilirubinometry (TcB) provides an objective, non-invasive measurement⁴. Evidence from McClean et al. (2018) demonstrated that TcB reduces total serum bilirubin (TSB) tests by 71.4%, lowering costs and readmissions⁵. Despite its potential, adoption of TcB into Malaysia's healthcare system is yet to be optimised. The cost-effectiveness of KR alone versus KR combined with TcB remains underexplored, particularly in primary care settings. Evaluating from a cost perspective can inform neonatal care policies by promoting efficient resource allocation while upholding clinical efficacy. This study aimed to compare the costs

associated with the **KR-TcB-TSB model** versus the **KR-TSB model** for screening and diagnosing NNJ in primary healthcare clinics.

Materials and Methods

This retrospective cost-minimisation analysis used clinical data from the 10-month TRANDLAB study (completed November 2023)⁶ and cost estimations sourced from relevant procurement records and Malaysian public service references. The cost-minimisation approach was selected because both models (KR-TSB and KR-TcB-TSB) are acceptable for NNJ management and yield equivalent clinical outcomes. The primary outcome was the mean cost per patient for NNJ screening and diagnosis, comparing both models from the perspective of the Malaysian Ministry of Health. Decision-tree models mapped all potential management pathways for both approaches, with branch probabilities derived from TRANDLAB data to calculate mean per-patient costs. The models incorporated costs for: (i) screening using KR (ii) screening with KR and TcB and (iii) diagnostic testing using TSB. Personnel costs applied to all processes, while TSB and TcB test additionally incorporated consumables, equipment and maintenance costs. A sensitivity analysis was conducted using varying TcB-related costs and patient volumes to account for uncertainties in future expenditures and patient volumes. We adopted a 10-day time horizon to match both the standard NNJ risk period and the TRANDLAB study's follow-up duration.

Results and Discussion

The analysis included 765 neonates, comprising 381 in the KR-TSB model and 384 in the KR-TcB-TSB model. Neonates had a median age of 2.0 days (interquartile range [IQR], 1.0-3.0 days) at their first clinic encounter and mean (SD) birth weight of 3.01 (0.39) kg. Baseline characteristics were comparable between models. Decision-tree modelling revealed significantly lower mean (SD) costs per patient (RM 18.93 [10.65]) in the KR-TcB-TSB model versus KR-TSB model (RM 24.57 [12.48]) (Figure 1A & 1B). This translated to a substantial mean difference of RM 5.64 per patient (95% CI, RM 3.99-RM7.29; $p < .001$), translating to RM 5,640 for a hypothetical cohort of 1,000 neonates. In projected analyses of equal cohorts (1,000 neonates/group), the KR-TcB-TSB model retained a per-neonate cost savings of RM5.64, yielding annual savings of RM5,640—2.7 times higher than in the study population. Therefore, clinics with higher patient volume should adopt the KR-TcB-TSB approach, as economies of scale amplify cost savings. Threshold analysis identified cost equivalence of RM24.57 per patient when TcB-related costs increased by 46% (from RM 3.63 to RM 5.3). This finding established a procurement threshold, suggesting that clinics can adopt KR-TcB-TSB model without losing economic advantage unless there is a substantial increase in TcB-related costs, which primarily comprise equipment and maintenance costs. Additionally, safety outcomes from the TRANDLAB study demonstrated clinical equivalence between the KR-TcB-TSB and KR-TSB models, with no significant differences in phototherapy initiation (25.5% vs. 24.4%), severe hyperbilirubinemia (0.0% vs. 0.3%), or rapid bilirubin rise (0.3% vs. 0.8%). These findings support incorporating TcB as a cost-effective first-line screening tool, though local cost monitoring remains essential to sustain savings.

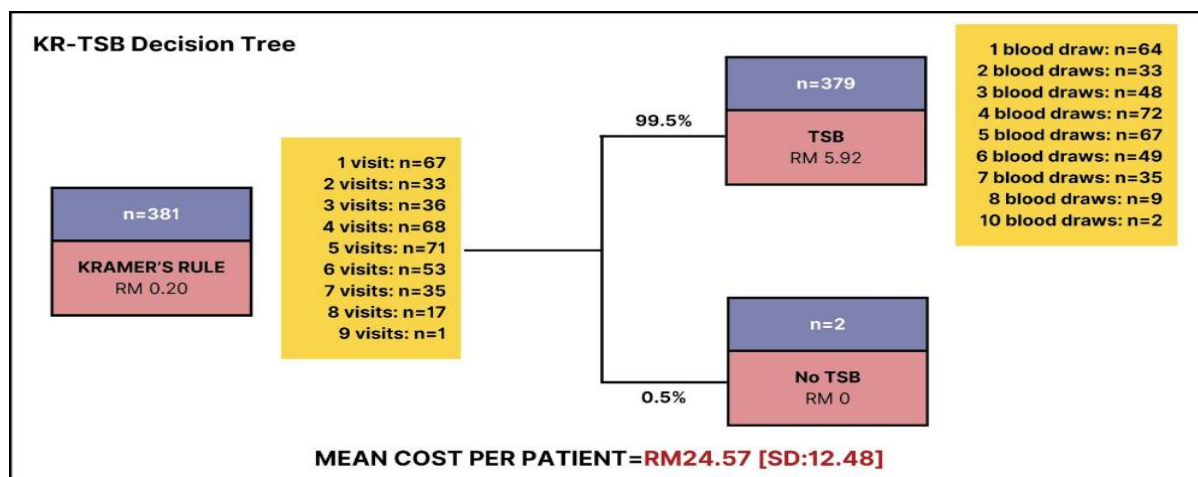


Figure 1A: KR-TSB Decision Tree

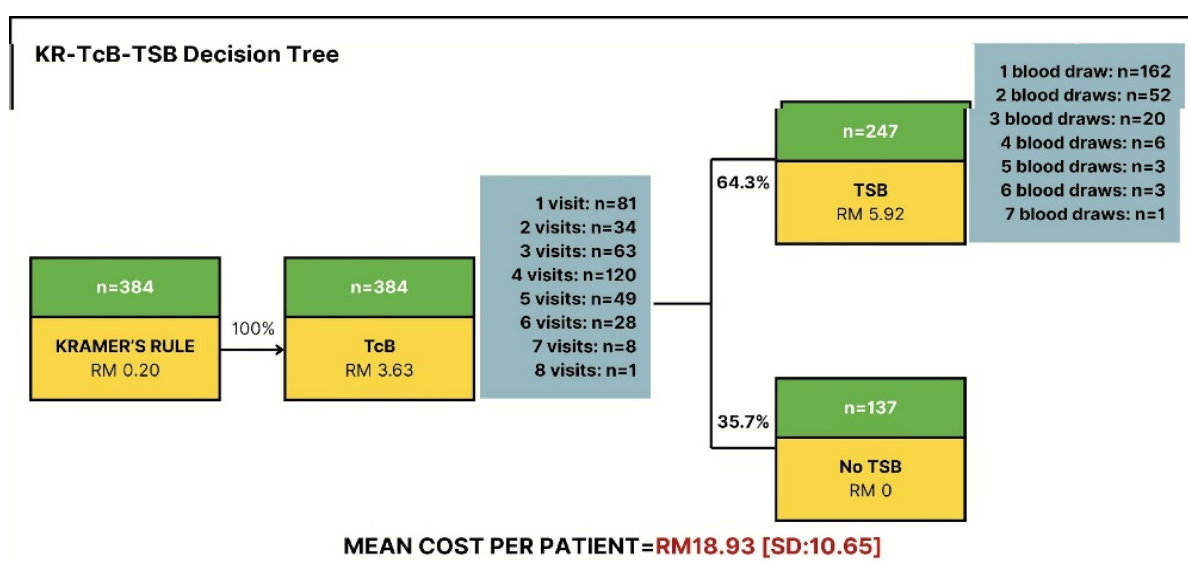


Figure 1B: KR-TcB-TSB Decision Tree

Conclusion

Compared to KR-TSB, the KR-TcB-TSB model achieved 23% lower costs for NNJ screening and diagnosis in primary care settings, without compromising clinical effectiveness. This cost-saving is particularly significant in high-volume clinics due to economies of scale, but may decline if TcB-related costs rise by more than 46%, affecting overall cost-effectiveness.

References

1. Mitra S, Rennie J. Neonatal jaundice: aetiology, diagnosis and treatment. *Br J Hosp Med (Lond)*. 2017;**78**(12):699-704.
2. American Academy of Pediatrics Subcommittee on Hyperbilirubinemia. Management of hyperbilirubinemia in the newborn infant 35 or more weeks of gestation. *Pediatrics*. 2004;**114**(1):297-316.
3. Moyer VA, Ahn C, Sneed S. Accuracy of Clinical Judgment in Neonatal Jaundice. *Archives of Pediatrics & Adolescent Medicine*. 2000;**154**(4):391-4.
4. Okwundu CI, Olowoyeye A, Uthman OA, et al. Transcutaneous bilirubinometry versus total serum bilirubin measurement for newborns. *Cochrane Database of Systematic Reviews*. 2023;(5).
5. McClean S, Baerg K, Smith-Fehr J, et al. Cost savings with transcutaneous screening versus total serum bilirubin measurement for newborn jaundice in hospital and community settings: a cost-minimization analysis. *CMAJ Open*. 2018;**6**(3):E285-91.
6. Lim XJ, Ambigapathy S, Leong EL, Marmuji LZ, Phan AP, Hamdan FA, et al. Comparing Kramer's rule with transcutaneous bilirubin vs. Kramer's rule only in reducing total serum bilirubin sampling among neonates with jaundice. *BMC Pediatr*. 2025 Mar 6;**25**(1):169.

Evaluating the Effect of Equipment Age on Radiographic Service Downtime in Government Primary Healthcare Clinics, Malaysia

Huzaifah Hussin¹, Rajini Sooryanarayana¹, Asnida Anjang Ab Rahman¹, Anisah Sariman¹

¹ Department of Family Health Development, Ministry of Health Malaysia

Corresponding author's email: huzaifah.hussin@moh.gov.my

Summary

Consistent availability of X-ray services is crucial for reliable healthcare delivery. This study explored the relationship between X-ray machine age and service downtime in Malaysian government health clinics from 2023 to 2024. Data from 155 machines were analyzed using descriptive statistics, Chi-square tests, and ordinal logistic regression. Results showed that older machines were significantly linked to increased downtime. Machines aged 6-10 years and over 10 years were 3.81 and 6.09 times more likely, respectively, to face prolonged service interruptions. These findings underscore the importance of timely equipment replacement, preventive maintenance, and data-driven asset management to ensure uninterrupted radiographic services.

Keywords

Service downtime, x-ray machine, maintenance concession, primary healthcare clinics.

Introduction

In Malaysia, government primary healthcare facilities are the backbone of primary care services, where the cost of treatment is heavily subsidised by the government, thus ensuring universal healthcare coverage is achieved¹. Radiographic services are one of the most crucial services provided in primary healthcare facilities. In 2024, a total of 260 clinics out of 1,097 government health clinics provided radiographic services in Malaysia². As the number of machines in primary healthcare facilities is limited throughout Malaysia, it is crucial to ensure the availability of these services is consistently maintained to meet patient needs and avoid disruptions in healthcare services. Extended service downtime can delay diagnoses, affect treatment timelines, and reduce healthcare efficiency^{3,4}. This study aims to examine the relationship between x-ray machine age and service downtime over a two-year period in Malaysian government health clinics under a maintenance concession contract.

Materials and Methods

This cross-sectional study utilised secondary data extracted from the Computerized Asset Management Maintenance System (CAMMs), covering the period from 1 January 2023 to 31 December 2024. Machine age was determined based on the purchase date. Service downtime was defined as the number of days the x-ray machine was non-operational due to breakdowns during regular clinic hours during the study period. All X-ray machines were subject to a standardised maintenance protocol, receiving planned preventive maintenance (PPM) twice annually.

Inclusion criteria were government health clinics under the maintenance concession and static x-ray machines that had been operational for at least two years period. Clinics undergoing major renovations and machines disposed of before 2024 were excluded. Data were analysed using Jamovi version 2.6.26. Descriptive, bivariate (Chi-square test), and multivariate (ordinal logistic regression) analyses were performed. Service downtime was categorised based on the 25th, 50th, and 75th percentiles (0, 2, and 6 days, respectively).

Results and Discussion

A total of 160-units of x-ray machines from 10 states were registered under concession, of which five (5) units were excluded from the study due to age less than 2 years from the study duration. Johor, Selangor and Perak recorded the highest number of x-ray machines (28 each), followed by Negeri Sembilan (16), Sarawak and Malacca (13), Pulau Pinang (11), Sabah (9), Wilayah Persekutuan KL & Putrajaya (8) and Wilayah Persekutuan Labuan with (1). Machine age and downtime were non-normally distributed, confirmed by significant normality tests ($p < 0.05$), skewed histograms, and skewness $> \pm 1.96$ SE. The median machine age was 5 years (IQR 6), ranging from 3 to 29 years. Downtime ranged from 0 to 145 days, with a median of 2 days (IQR 6). A significant association between machine age and downtime was observed ($\chi^2 (6, N = 155) = 28.4, p < 0.001$). Ordinal logistic regression showed a strong relationship between age and service downtime. Compared to machines below 6 years, those aged 6-10 years were 3.81 times more likely to experience higher downtime (95% CI: 1.82-8.14; $p < 0.001$), while machines more than 10 years were 6.09 times more likely (95% CI: 2.91-13.13; $p < 0.001$). The model demonstrated a modest fit (McFadden's $R^2 = 0.067$; AIC = 401), suggesting machine age is an important contributing factor. However, the model did not adjust for potential confounders such as usage frequency, environmental exposure, or maintenance adherence.

These findings reflect established concerns regarding aging medical equipment. Reduced spare part availability, manufacturer discontinuation of obsolete models, and evolving technologies contribute to prolonged service interruptions and higher operational burdens^{3,4}. Although all machines followed a biannual Planned Preventive Maintenance (PPM) schedule, sourcing difficulties and component fatigue may limit its effectiveness⁴. A proactive replacement policy, alongside consideration of confounding factors, is essential to uphold service quality and minimise downtime.

Table 1: Descriptive results

Variables	Median (IQR)	Min -Max	Range	Frequency (n), Percentage(%)
X-ray machine Age (year)	5 (6)	3-29	26	155 (100%)
Below 6 years				84(54.2%)
6 to 10 years				36(23.2%)
More than 10years				35(22.6%)

Variables	Median (IQR)	Min -Max	Range	Frequency (n), Percentage(%)
Service Downtime (days)	2 (6)	0-145	145	155 (100%)
No downtime				54(34.8%)
1-2 days				25(16.1%)
3-6 days				38(24.5%)
More than 6 days				38(24.5%)

Table 2 : Ordinal Logistic Regression

						95% Confidence Interval	
Predictor (x-ray age)	Estimate	SE	Z	P	Odds ratio	Lower	Upper
6-10 years vs. below 6 years	1.34	0.382	3.50	<.001	3.81	1.82	8.14
More than 10 years vs. below 6 years	1.81	0.384	4.71	<.001	6.09	2.91	13.13

Conclusion

Older x-ray machines are significantly associated with increased service downtime. To improve equipment uptime and ensure consistent radiographic services in government health clinics, strategies should prioritise timely replacement of aging devices, enhance preventive maintenance practices, and adopt data-driven asset management approaches.

References

1. Ong SM, Lim MT, Fah Tong S, et al. Comparative performance of public and private primary care service delivery in Malaysia: An analysis of findings from QUALICOPC. *PLoS One*. 2022;**17**(10):e0276480.
2. Ministry of Health Malaysia. Unpublished data on radiographic services in government health clinics. Family Health Development Division; 2024.
3. Zamzam AH, Abdul Wahab AK, Azizan MM, et al. A systematic review of medical equipment reliability assessment in improving the quality of healthcare services. *Front Public Health*. 2021;**9**:753951.
4. Kelvin-Agwu MT, Adelodun MO, Igwama GT, et al. The impact of regular maintenance on the longevity and performance of radiology equipment. *Int J Eng Res Dev*. 2024;**20**(9):171-177. e-ISSN: 2278-067X, p-ISSN: 2278-800X.

Strategies Addressing Early Unscheduled Return Visits to Emergency Departments Among Adults in Asia: A Scoping Review

Diana Yeo Ing Tieng¹, Tg Mohamad Iskandar Tg Mohamad Rosman¹, Nur Khairah Badaruddin¹, Kavita Jetly Jagjit Kumar Jetly², Fairuz Nadiah Nordin¹, Nor Asma Musa¹

¹Institute for Health Management, National Institutes of Health, Ministry of Health Malaysia

²Institute for Medical Research, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: diana.yeo@moh.gov.my

Summary

This scoping review mapped existing strategies addressing early unscheduled return visits (EURVs) to emergency departments (EDs) among adults in Asia using the Input-Throughput-Output (ITO) model. Seven studies were included in this review. No strategies were identified for the input phase, while six studies focused on the throughput phase and one study addressed the output phase. The majority of studies focused on the throughput phase involving clinical decision-making and operational processes within the ED itself. To support sustainable and integrated improvements in emergency care delivery, future efforts should explore and expand the strategies targeting the pre-hospital phase and post-discharge ED care.

Keywords

Early unscheduled return visits, emergency departments, adults, strategy, Asia

Introduction

Early unscheduled return visits (EURVs) to emergency departments (EDs) pose challenges to both patient care quality and overall performance of healthcare systems¹. Despite growing global attention to this issue, Asia remains underrepresented in the existing literature. The Input-Throughput-Output (ITO) model conceptualised patient flow processes within emergency care service by segmenting ED care delivery into three phases which are the input, throughput and output². The input phase involves pre-ED presentation, throughput phase includes the clinical and operational processes within the ED, and output phase relates to patient disposition from the ED². This scoping review, therefore, aimed to identify and map existing strategies addressing EURVs among adults in Asia across the full continuum of ED care, using the ITO model as a guided framework.

Materials and Methods

This scoping review was conducted following the Joanna Briggs Institute (JBI) methodology and adhering to the reporting guidelines outlined in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR)³. A structured search was carried out across three databases (PubMed, Web of Science and Scopus) to identify peer-reviewed research articles published between 2014 and 2024 that reported on strategies addressing EURVs to EDs within nine days among adults aged at least 18 years old in Asia. Two independent reviewers performed study selection and data extraction. Relevant data was charted using a standardised data extraction form adapted from JBI data

extraction instrument³. Findings were synthesised through a thematic and narrative approach.

Results and Discussion

A total of seven studies met the inclusion criteria for this review. Among these, five were observational studies and two were interventional in study design. The majority were single-centre studies, conducted in Taiwan, published in 2021, and reported strategies addressing EURVs to EDs within a 72-hours timeframe. Two studies focused on the general adult population while the other five studies targeted specific group, including elderly, and patients presenting to ED with hypertensive crisis or urinary tract related conditions. Mapping based on the ITO model revealed no strategy addressing the input phase of emergency care service. There were six studies reported strategies addressing the throughput phase including pharmacological interventions given in ED, multidisciplinary geriatric assessment, and quality improvement initiatives consisting of workflow redesign, protocol-driven clinical management, and enhanced team communication. The impact of these strategies on outcome of EURVs to EDs varied. Quality improvement initiatives resulted in reduced EURVs rates while multidisciplinary geriatric assessment showed no significant impact on EURVs. Pharmacological interventions yielded mixed outcomes depending on population characteristics, disease type, and clinical acuity. Only one output-focused strategy involving a high turnover ED utility bed intervention was identified and it did not reduce the EURVs rates. The prevailing focus on throughput focused strategies with limited attention to input and output phase, suggest that the current literature remains narrowly centred within the ED itself. This underscores the need to develop strategies that address the full continuum of emergency care, including the pre-hospital and post-discharge phases.

Conclusion

The existing literature on strategies addressing EURVs to EDs among adults in Asia predominantly focused on the intradepartmental processes within the ED. Future research should prioritise the development and evaluation of strategies targeting the input and output phases to support evidence-based policymaking and strengthen the emergency care systems holistically.

Acknowledgements

The authors would like to thank the Director General of Health, Malaysia for his permission to publish this extended abstract.

References

1. Loi SL, Hj Fauzi MH, Md Noh AY. Unscheduled early revisit to emergency department. *Hong Kong Journal of Emergency Medicine*. 2018;**25**(5):264-71.
2. National Association of Public Hospitals and Health Systems. Perfecting Patient Flow [Internet]. 2005. Available from: <https://med-fom-emerg.sites.olt.ubc.ca/files/2013/10/PerfectingPatientFlow1.pdf>
3. Peters M, Godfrey C, McInerney P, Soares CB, Khalil H, Parker D. Methodology for jbi scoping reviews. In Aromataris E, editor, The Joanna Briggs Institute Reviewers manual 2015. South Australia: Joanna Briggs Institute. 2015. p. 3 - 24

Cost-Effectiveness Analysis of Nirmatrelvir/Ritonavir Versus Usual Care to Prevent COVID-19 Hospitalization Among Elderly Patients in Malaysia

EV Low^{1,2*}, NYL Hing², HS Teh², MD Pathmanathan², SK Chidambaram³, SMZin⁴, F M.Zin⁴, SB M.Amin⁴, MR Appannan⁵, WR Kim⁵, ZW Teh⁵, WJ Lee⁵, MH Ismail⁶, AA Samad⁷, KM Peariasamy²

¹*Institute for Health System Research, NIH, MOH Malaysia*

²*Institute for Clinical Research, NIH, MOH Malaysia*

³*Hospital Sungai Buloh, Malaysia*

⁴*Disease Control Division, MOH Malaysia*

⁵*Medical Development Division, MOH Malaysia*

⁶*Family Health Development Division, MOH Malaysia*

⁷*Klinik Kesihatan Seksyen 7, Shah Alam*

* Corresponding author's email: evlow@moh.gov.my

Summary

This study uses nationally representative data to evaluate the cost-effectiveness of nirmatrelvir/ritonavir in reducing hospitalization among the elderly population in Malaysia. Propensity score matching using a 1:1 ratio was applied to account for observed differences in baseline characteristics between the nirmatrelvir/ritonavir and control groups. Costs (direct medical cost), effectiveness (30-day hospitalization averted) and cost effectiveness were compared between the two groups. From the study, we found a very high incremental cost-effectiveness ratio (~USD \$250,000 per hospitalization averted) for nirmatrelvir/ritonavir compared to the control group. Widespread use of nirmatrelvir/ritonavir among the elderly may have significant cost implications for the healthcare system.

Keywords

Nirmatrelvir/ritonavir, COVID-19, real-world evidence, cost-effectiveness, hospitalization

Introduction

Earlier evidence from clinical trials recommended the use of nirmatrelvir/ritonavir for non-severe COVID-19 patients with higher risk of hospitalisation¹. While transitioning to endemicity, real-world evidence on the effectiveness of this drug is needed to review its subsequent applicability. Therefore, this study aims to evaluate the clinical effectiveness and cost-effectiveness of nirmatrelvir/ritonavir in reducing hospitalization among the elderly population in Malaysia using real-world data.

Materials and Methods

We conducted a retrospective cohort study involving elderly adult COVID-19 patients from July 14, 2022 to December 31, 2022. We used consolidated national administrative data (hospitalization register) and electronic medical records (eCOVID) from 647 health clinics to determine the comparative effectiveness of nirmatrelvir/ritonavir to usual care in preventing COVID-19 related hospitalization within 30 days from diagnosis. Propensity score matching using 1 to 1 ratio was applied to account for the observed differences in the baseline characteristics

among groups. To account for cost-effectiveness evaluations in the local context, attributed direct cost from the Malaysian public healthcare perspectives was used alongside with our real-world treatment data to estimate the incremental cost-effectiveness ratio (ICER) of using nirmatrelvir/ritonavir compared to usual care. Details of the input cost and effectiveness are as Table 1.

Table 1: Input Data for economic evaluation

Cost			
Treatment Cost	Nirmatrelvir/ Ritonavir Group	Control Group	Reference
	Unit Cost (USD)	Unit Cost (USD)	
Outpatient Cost	\$8.83	\$8.83	Fees Act (P.U.(A)363 2014), First Schedule Paragraph 3
Medication Cost	\$250 for 5 days course	\$0.96*	MaHTAS Covid-19 RAPID EVIDENCE UPDATES, Health Clinic Pharmacy
Inpatient Cost	\$446.13 per COVID-19 hospitalization day	\$446.13 per COVID-19 hospitalization day	Medical Development Division. Malaysian DRG 2022. Ministry of Health Malaysia
Effectiveness			
30-day hospitalization after initial visit to the public health clinic (probabilities)	0.9%	1.1%	Low EV et al, Int J Infect Dis. 2023 Aug 9:S1201-9712(23)00688-4. doi: 10.1016/j.ijid.2023.08.003.

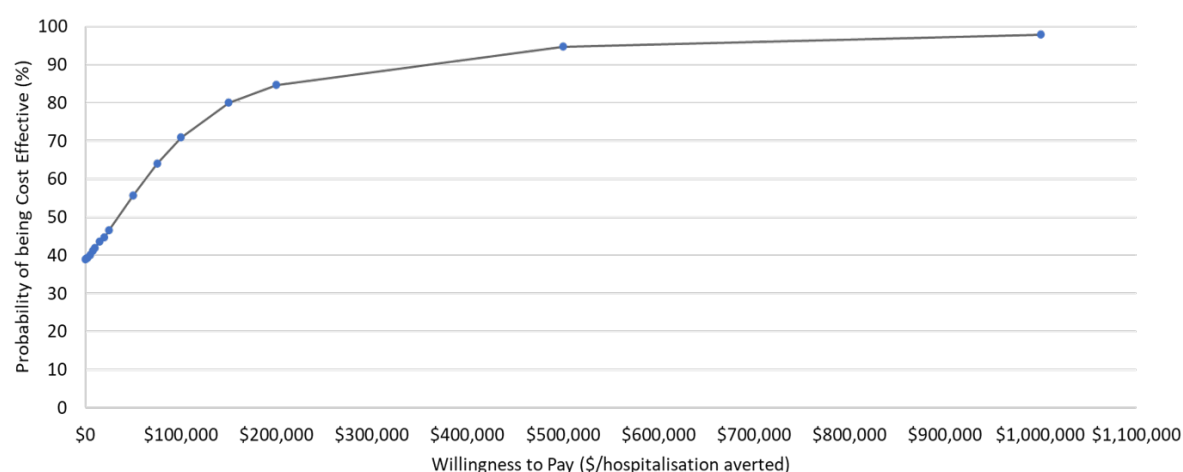


Figure 2: Cost effectiveness Acceptability Curve of nirmatrelvir/ritonavir compared to control group

Results and Discussions

A total of 20,966 COVID-19 high risk outpatients were included, of which 4,080 were elderly aged ≥ 65 years old. Overall, the probability of hospitalization was low in both groups (nirmatrelvir/ritonavir: 0.9%, control group: 1.1%). The total cost per patient for nirmatrelvir/ritonavir (USD\$1427.64) was 8% higher than the standard of care (USD\$1,316.11). The number needed to treat (NNT) and ICER per hospitalization averted for nirmatrelvir/ritonavir vs. usual care was 713 and USD \$257,404, respectively. This high ICER was mainly driven by the high drug cost and low event rate, and it is comparable to other countries²⁻⁴. Subgroup analysis indicated that nirmatrelvir/ritonavir were cost savings amongst patients with hypertension, cardiovascular disease and those treated within first 3 days of illness (Table 2) One-way sensitivity analysis by varying drug price showed that, to be cost effective, the price of the drug would need to be reduced by at least 95% to achieve an ICER equivalent to the cost of 4 days of hospitalization. As Malaysia does not have a defined cost-effectiveness threshold, we constructed a cost effectiveness acceptability curve (CEAC) to assess the cost effectiveness of nirmatrelvir/ritonavir versus usual care across a range of willingness-to-pay (WTP) thresholds. Based on the CEAC at a willingness-to-pay threshold of USD100,000 per hospitalization averted, the probability that nirmatrelvir/ritonavir is cost effective was 70.9% (Figure 2). One of the strengths of this study was the use of real-world data from a nationally representative cohort of 647 clinics. However, the study has limitations. The ICU admission and mortality rate were very low, limiting the ability to meaningfully assess the cost-effectiveness of nirmatrelvir/ritonavir in preventing these outcomes. Also, we assumed that all individuals prescribed with nirmatrelvir/ritonavir adhered to and completed the recommended treatment course.

Conclusions

With the low probabilities of hospitalization and high ICER associated with nirmatrelvir/ritonavir, widespread usage among all elderly could potentially lead to significant cost implications for the healthcare system.

References

1. Hammond J, Leister-Tebbe H, Gardner A, Abreu P, Bao W, Wisemandle W, et al. Oral nirmatrelvir for high-risk, nonhospitalized adults with Covid-19. *N Engl J Med*. 2022;**386**(15):1397-408. doi:10.1056/NEJMoa2118542
2. Wee LE, Tay AT, Chiew C, Young BE, Wong B, Lim R, et al. Real-world effectiveness of nirmatrelvir/ritonavir against COVID-19 hospitalizations and severe COVID-19 in community-dwelling elderly Singaporeans during Omicron BA.2, BA.4/5, and XBB transmission. *Clin Microbiol Infect*. 2023;**29**(10):1328-33. doi:10.1016/j.cmi.2023.06.016
3. Chen C, Li R, Xing S, Cao L, Qu Y, Lv Q, et al. Nirmatrelvir and ritonavir combination against COVID-19 caused by omicron BA.2.2 in the elderly: A single-center large observational study. *Immun Inflamm Dis* . 2024;**12**(4):e1232. Doi: 10.1002/iid3.1232
4. Wang S, Sun J, Zhang X, Li M, Qin B, Liu M, et al. Antiviral effectiveness and survival correlation of azvudine and nirmatrelvir/ritonavir in elderly severe patients with COVID-19: a retrospective real-world study. *EClinicalMedicine*. 2024;**69**(102468):102468. <http://dx.doi.org/10.1016/j.eclinm.2024.102468>

Mapping the Research Landscape on Malnutrition in Older Adults: A Bibliometric Analysis of Trends and Thematic Networks

Sin Wan Tham ¹, Mohd Azmi Bin Suliman ¹

¹ Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: drthamsinwan@moh.gov.my

Summary

Malnutrition among older adults is an escalating global public health issue. This bibliometric analysis highlights a marked increase in scholarly output post-2010, with a focus on assessment tools, prevalence, and clinical implications. The study emphasizes the need for interdisciplinary strategies to guide future research, inform practice, and policy for healthy ageing.

Keywords

Older people, Malnutrition, Bibliometric analysis, Aging Population, Nutritional assessment

Introduction

Malnutrition in older adults represents a significant and growing public health challenge, driven by the global demographic shift toward aging populations. It is closely associated with increased morbidity, mortality, and healthcare expenditures¹. Although scholarly interest in this area has grown over recent decades, a comprehensive synthesis of the research landscape—encompassing publication trends, influential contributions, and thematic trajectories—remains limited. This study employs a bibliometric approach to systematically map the field of malnutrition in older persons, with the objective of delineating publication trends, identifying key scholarly works, and visualizing the co-occurrence network of core research themes within the field.

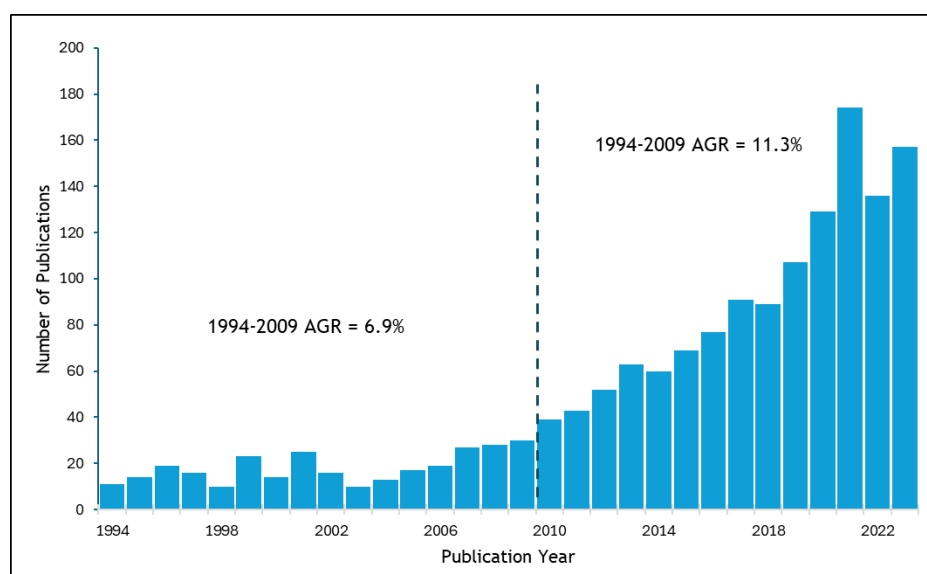
Materials and Methods

Bibliographic records were extracted from the Web of Science database using title-based searches incorporating terms related to malnutrition (e.g., "malnutrition*", "nutrition* status", "deficient*") and older adults (e.g., "older*", "geriatric*", "ageing"). A single database was used to maintain consistency in bibliographic metadata and ensure manageability while minimizing duplication and format incompatibilities². The dataset included all scholarly articles published between 1994 and 2023, excluding proceedings, book chapters, early access publications, retractions, and withdrawn articles. The year 2023 was selected to ensure comprehensive and stable citation data ². The analysis was conducted using the 'bibliometrix' package in R to examine publication trends, identify influential works, and generate co-occurrence network visualizations of key thematic areas.

Results and Discussion

From 1993 to 2023, a total of 1,578 research articles on malnutrition in older adults were published across 508 scholarly sources. The top three contributing journals in this field were the Journal of Nutrition Health & Aging, Nutrients, and Clinical Nutrition. Publication output increased notably from 1994 to 2023, particularly after

2010, where the average annual growth rate increased from 6.9% to 11.3% (Figure 1). This surge likely reflects increasing global awareness of the health and socioeconomic implications of aging populations and the persistent challenge of malnutrition in later life. Moreover, increased research activity post-2010 may be attributed to improvement in detection methods and international initiatives emphasizing healthy aging and nutritional care, exemplified by the United Nations Nutrition Strategy 2022-2030³.



1994-2023 AGR = 9.6%, AGR: Annual growth rate

Figure 1. Number of publications related to malnutrition in older adults (1994-2023)

The most influential publications in this field (Table 1) primarily focus on validated assessment tools, prevalence trends, and clinical implications of malnutrition, highlighting their enduring significance in supporting evidence-based care for older populations. The most cited article, "Screening for undernutrition in geriatric practice: developing the short-form mini-nutritional assessment (MNA-SF)" by Rubenstein et al. (2001), has garnered 1,735 citations, averaging 69.40 citations per year. Furthermore, Lipschitz's (1994) study on nutritional screening in the elderly, despite its early publication date, maintains a sustained average citation rate of 22.22 per year, underscoring its foundational influence in the field.

Table 1: Top 5 most influential publications in malnutrition among older adults (1994-2023)

R	Title, Author (Year)	NC	ACPY
1	Screening for undernutrition in geriatric practice: developing the short-form mini-nutritional assessment (MNA-SF), Rubenstein et al. (2001)	1735	69.40
2	Frequency of malnutrition in older adults: a multinational perspective using the mini nutritional assessment, Kaiser et al. (2010)	664	41.50
3	Prevalence of malnutrition and analysis of related factors in elderly patients with COVID-19 in Wuhan, China, Li et al. (2020)	237	39.50
4	Sarcopenic dysphagia, malnutrition, and oral frailty in elderly: a comprehensive review, De Sire et al. (2022)	109	27.25
5	Screening for nutritional status in the elderly, Lipschitz (1994)	711	22.22

R-rank; NC-Number Cited; ACPY-Average Cited per Year

Keyword plus co-occurrence network analysis (Figure 2) reveals "malnutrition" as the central theme, closely associated with terms such as "prevalence," "risk," and "mortality," indicating a primary research focus on the extent and impact of malnutrition in older adults. Secondary keywords like "nutritional status," "assessment tools," and "depression" suggest a multidimensional encompassing clinical evaluation and related health outcomes. The centrality and interconnectivity of key terms underscore the complexity of addressing malnutrition among older adults and highlights the need for integrated approaches to its assessment, prevention, and management.

Figure 2: Keywords plus co-occurrence network -keywords plus

Conclusion

This bibliometric study maps three decades of research landscape on malnutrition in older adults, highlighting trends, key themes, and influential works. The findings underscore the need for continued interdisciplinary efforts and integrated strategies to address malnutrition, informing future research, clinical practice, and policy aimed at supporting healthy aging.

References

1. Tomaszewicz A, Polański J, Tański W. Advancing the understanding of malnutrition in the elderly population: Current insights and future directions. *Nutrients*. 2024;**16**(15):2502. Available from: <https://www.mdpi.com/2072-6643/16/15/2502>.
2. Donthu N, et.al. How to conduct a bibliometric analysis: An overview and guidelines. *J Bus Res*. 2021;**133**:285-96. Available from: <https://doi.org/10.1016/j.jbusres.2021.04.070>.
3. Li L, et al. Global patterns of change in the burden of malnutrition in older adults from 1990 to 2021 and the forecast for the next 25 years. *Front Nutr*. 2025;**12**:1562536. Available from: <https://www.frontiersin.org/journals/nutrition/articles/10.3389/fnut.2025.1562536/full>.

Analysis of Malaysia's Traditional and Complementary Medicine (T&CM) Policy and Strategies from a Practice Perspective: A Study Protocol

Kavita Jetly a/p Jagjit Kumar Jetly¹, Terence Tan Yew Chin¹, Tay Yea Lu², Siti Hajar binti Muhamad Rosli¹, Teh Li Yin³, Teoh Sheh Ki³, Gong Jia Ying³, Rumana Akhter Saifi⁴, Wong Min Fui @ Esther Wong²

¹ Herbal Medicine Research Centre (HMRC), Institute for Medical Research (IMR), National Institutes of Health (NIH), Ministry of Health Malaysia

² Centre for Health Policy Research, Institute for Health Systems Research, National Institutes of Health (NIH), Ministry of Health Malaysia

³ Traditional and Complementary Medicine Division, Ministry of Health Malaysia

⁴ Faculty of Medicine, Department of Social and Preventive Medicine, University Malaya

Corresponding author's email: drkavitajetly@moh.gov.my

Summary

Despite the increasing popularity of Traditional and Complementary Medicine (T&CM) throughout Malaysia, this field experiences numerous challenges. Recognising the significance of T&CM, the World Health Organisation (WHO) encourages its member states to continuously evaluate and formulate T&CM policies according to their specific healthcare settings. Hence, this study aims to evaluate Malaysia's T&CM policy by identifying gaps in practice, comparing it with international standards, and proposing actionable recommendations. This two-phase study uses document analysis and the nominal group technique (NGT) to evaluate current policy frameworks and engage stakeholders to prioritise necessary reforms. The generated findings will provide a comprehensive and evidence-based strategy to integrate T&CM into Malaysia's healthcare system, with a focus on enhancing safety, effectiveness, and accessibility.

Keywords

T&CM policy, document analysis, stakeholder engagement, nominal group technique, policy triangle framework (PTF)

Introduction

Traditional and Complementary Medicine (T&CM) plays an important role in many healthcare systems, including Malaysia's, where usage is significant across diverse ethnic groups. According to the National Health and Morbidity Survey (NHMS) 2015, 29.25% of Malaysians have used T&CM practices with consultation at some point, while 21.51% reported using T&CM in the past 12 months¹. However, integrating T&CM into mainstream healthcare presents numerous challenges in regulating premises and medicinal products, quality assurance, and practitioner training. Malaysia's current T&CM policy, established in 2001 and revised in 2007, requires re-evaluation to address evolving healthcare needs and international alignment². The policy states that the T&CM system shall be a vital element to be integrated into the healthcare system. Hence, this study aims to evaluate Malaysia's T&CM policy from a practice perspective, identifying policy gaps, benchmarking against international practices, and providing evidence-based recommendations for

improvement. The scope of practice includes relevant aspects or subdomains related to T&CM products, education and training, and research.

Materials and Methods

This qualitative study will be conducted in two phases. Phase 1 will involve a document analysis using the READ approach³ to analyse Malaysia's national T&CM policy and related documents. Primary and secondary data sources will be utilised, including policy documents, reports, and peer-reviewed databases (2014-2025), and screened based on authenticity, credibility, relevance, and meaning. Data extraction will be guided by domains such as policy context, content, actors, and process using the Policy Triangle Framework (PTF). Subsequently, the Logic Model will be utilised to guide the evaluation of the contents and process domains⁴. Phase 2 will employ Nominal Group Technique (NGT) sessions with stakeholders to prioritise findings and provide recommendations for policy improvement. These sessions will involve relevant stakeholders, including practitioners, regulators, and policymakers, who will collaboratively rank the gaps identified in Phase 1. These sessions will yield qualitative and semi-quantitative data to generate a gap analysis and policy recommendations.

Results and Discussion

The document analysis in Phase 1 is anticipated to reveal key gaps in Malaysia's T&CM policy related to the domain of practice. These may include underdeveloped referral systems, limited integration into multidisciplinary care, and inadequate support for T&CM-related research and education⁵. The study expects to identify best practices from international models and practices from other countries. These global benchmarks will serve as reference points for evaluating Malaysia's current policy content, relevance, and alignment with the WHO Traditional Medicine Strategy (2014-2025). The PTF and Logic Model will provide a systematic approach for evaluating the context, content, process, and key actors involved in the policy environment. During Phase 2, stakeholder engagement using the NGT will rank the findings from Phase 1 for policy improvement. By triangulating data from document review and stakeholder input, the study aims to ensure that the final recommendations will be relevant and operationally feasible. The anticipated output is a practical, stakeholder-informed roadmap to update and refine the current T&CM policy.

Conclusion

This study provides valuable insights into the gaps in Malaysia's current T&CM policy and provides stakeholder-informed, evidence-based reform strategies. A revised policy that is realistic, inclusive, and evidence-based is crucial for the sustainable integration of T&CM into national healthcare delivery to ensure the safety, quality, and accessibility of T&CM practices.

References

1. Institute for Public Health. National Health and Morbidity Survey 2015. Ministry of Health Malaysia; 2015.
2. Ministry of Health Malaysia. (2007). National Policy of Traditional and Complementary Medicine.

3. Dalgish SL, et al. Document analysis in health policy research: the READ approach. *Health Policy Plan.* 2020;**35**(10):1424-31. doi: 10.1093/heapol/czaa064.
4. Walt G, Gilson L. Reforming the health sector in developing countries: the central role of policy analysis. *Health Policy Plan.* 1994;**9**(4):353-70. doi:10.1093/heapol/9.4.353.
5. Kim YJ. Current Challenges and Issues for Traditional and Complementary Medicine (T&CM) in Malaysia. In: *Chinese Medicine and Transnational Transition during the Modern Era: Commodification, Hybridity, and Segregation.* 2021.

Improving Maternal Outcomes through Annual Clinical Audit of Pre-pregnancy Care (PPC) in Malaysian Health Clinics

Sarah Awang Dahlan¹, Majdah Mohamed

¹ Family Health Development Division, Ministry of Health Malaysia

Corresponding author's email: sarah.ad@moh.gov.my

Summary

A nationwide annual clinical audit examined the delivery of Pre-pregnancy Care (PPC) services for women with pre-existing medical conditions across all eligible health clinics in Malaysia. In its first cycle in 2024, 28.6% of eligible women were registered into PPC, with 73.7% receiving appropriate interventions and 53.1% achieving disease control. These findings suggest opportunities to strengthen identification and enrolment of high-risk women and condition optimisation, supporting the need for improved integration between disease management and reproductive health needs. As a systematic quality monitoring and evaluation initiative, this annual clinical audit will facilitate the planning of more targeted strategies in improving maternal health outcomes.

Keywords

Pre-pregnancy care, preconception care, clinical audit, quality improvement

Introduction

Pre-pregnancy care (PPC) is a critical pillar in improving maternal and foetal health outcomes by addressing modifiable risks before conceptions, particularly among women with pre-existing medical conditions. In Malaysia, maternal mortality is significantly linked to preventable risks that can be addressed and optimised prior to conception. In view of this, the Ministry of Health (MOH) has taken a targeted approach in PPC interventions.

In addition to other indicators in this program which measure work process such as the proportion of high-risk women registered into the program and the proportion of them practising effective family planning methods, a qualitative measure is essential to assess the quality-of-service delivery. This is addressed through an annual clinical audit, which evaluates care processes and outcomes against established standards to identify areas for improvement. As a continuous quality improvement initiative, this audit enables systematic monitoring and targeted efforts to strengthen service delivery over time.

Materials and Methods

A nationwide clinical audit of PPC services was conducted across all health clinics that provide outpatient or non-communicable (NCD) services alongside antenatal care within the same facility. Designed as an annual initiative, the first cycle was conducted in 2024 following a mock audit in selected clinics in 2023. The audit focused on three (3) main areas: 1) registration of eligible women into the PPC program, 2) appropriateness of PPC interventions provided and 3) control status of medical conditions prior to pregnancy.

Audit samples were identified from antenatal women with documented pre-existing medical conditions who received antenatal care in the preceding year. Women who have no NCD follow-up at the clinic, whose NCD records were unavailable, and non-citizen mothers were excluded. Non-citizens were excluded to minimize bias related to service non-utilization due to fee-based care. The audit involved a retrospective review of medical records during the pre-conception period for each eligible woman.

Results and Discussion

The performances of all indicators varied between all states throughout Malaysia. Overall, only 28.6% of the mothers who have pre-existing medical conditions have been registered into the PPC program. Among all registered mothers, 73.7% of them received appropriate PPC interventions. Among women who have the selected medical conditions (i.e.; diabetes mellitus, hypertension and asthma), 53.1% achieved an optimum control of their conditions prior to their conception (Table 1).

Table 1: Pre-pregnancy Care Audit Indicator Performance by State

States	Indicator 1 - proportion of mothers with pre- existing medical conditions have been registered in the PPC program (%)	Indicator 2 - proportion of women received appropriate PPC interventions (%)	Indicator 3 - proportions of women with selected medical conditions were optimised prior to pregnancy (%)
Perlis	25.5	73.2	60.0
Kedah	30.0	74.2	52.3
Pulau Pinang	18.7	52.3	47.6
Perak	43.5	66.9	39.6
Wilayah Persekutuan Kuala Lumpur	20.3	64.3	41.7
Wilayah Persekutuan Putrajaya	50.0	76.9	77.8
Selangor	26.3	78.7	53.2
Negeri Sembilan	33.1	67.2	42.6
Melaka	29.3	75.9	43.5
Johor	21.3	61.3	55.6
Pahang	27.0	80.7	44.6
Terengganu	24.1	77.8	54.5
Kelantan	28.5	82.0	46.3
Sabah	21.4	33.3	66.7
Sarawak	31.9	71.0	51.0
Wilayah Persekutuan Labuan	34.9	76.6	68.7
MALAYSIA	28.6	73.7	53.1

As this is the first cycle of the audit, the target for each indicator has not yet been established. Appropriate targets will be set based on performance trends over

subsequent audit cycles. Findings from this audit highlight significant gaps in the identification and enrolment of high-risk women into the PPC program, which is a critical first step in ensuring timely intervention. However, the relatively high proportion of appropriate interventions received among registered women indicates that the quality of care is generally satisfactory once they were enrolled. Only half of the women with the selected medical conditions achieved optimal disease control prior to conception reflects the need for a greater emphasis on NCD management and reproductive health planning.

We acknowledge the key limitation of this clinical audit is the reliance on medical records, where incomplete documentations may not accurately reflect actual service provision. The absence of documentation may not always reflect non-performance, leading to possible underestimation of gaps in care. However, as the audit becomes more routine and integrated into clinical practice, healthcare personnel will be increasingly attentive to documentation practices, recognising its role as a proxy indicator of care quality. Another limitation of this audit is that we only include women who received antenatal care within the same facilities, where we could not assess the service quality for women who did not conceive or received antenatal and NCD care in separate facilities.

Conclusion

This audit revealed gaps in PPC enrolment and disease control among high-risk women, despite satisfactory care within the program. Systematic audit-feedback cycles are essential to reduce preventable maternal morbidity and mortality in Malaysia. Monitoring of more outcome-based indicators in the future may provide a more comprehensive evaluation of care quality.

References

1. Family Health Development Division, Ministry of Health, Malaysia. *Garis panduan Perkhidmatan Prakehamilan (PPC) di Penjagaan Kesihatan Primer*. 2023.

Mapping Patient and Provider Perspectives on Diabetes Control to the Chronic Care Model: Insights from a Review of Qualitative Studies in Malaysia

Lee Pei Jia¹, Norshahiratul Atiqah Mohd Zaidi¹, Mohamad Zulfikrie Abas¹, Tan Jie Nee¹, Wan Kim Sui², Azah Abdul Samad³, Chan Huan Keat⁴, Sheamini Sivasampu⁵, Ang Swee Hung¹

¹ Institute for Clinical Research, National Institutes of Health, Ministry of Health Malaysia,

² Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

³ Primer Health Branch, Family Health Development Division, Ministry of Health Malaysia

⁴ Clinical Research Centre, Alor Setar Hospital, Ministry of Health Malaysia

⁵ National Public Health Laboratory, Ministry of Health Malaysia

Corresponding author's email: peijia@moh.gov.my

Summary

Diabetes remains a significant health burden globally and in Malaysia, particularly within primary health care (PHC) settings. We conducted a scoping review and mapped the evidence from 21 qualitative studies on diabetes control from patients' and healthcare providers' (HCP) perspectives in Malaysia using the Chronic Care Model (CCM) framework. Self-management support emerged as the most frequently discussed domain. Community resources, such as community pharmacists and non-government organizations (NGOs), were also identified as important sources of support. These findings highlighted the significance of self-care strategies and emphasized the need to integrate community resources into a structured, patient-centred care model.

Keywords

Diabetes, primary health care, scoping review, chronic care model, qualitative studies

Introduction

The burden of diabetes remains substantial both globally and in Malaysia¹. The CCM framework provides a structured guide for enhancing chronic disease management, including diabetes, especially within the PHC setting where most patients receive care². While existing qualitative studies offer valuable insights into relevant factors, the findings are fragmented. This review aims to map the available qualitative evidence on factors associated with glucose control to the CCM domains from the perspectives of patients and HCPs in Malaysia.

Materials and Methods

This study was a part of a larger scoping review and focused on qualitative studies in type 2 diabetes. A comprehensive literature search was conducted across Embase, Scopus, MyMedR, and PubMed databases. The search strategy of the main scoping review focused on key terms including "diabetes mellitus," "hypertension", "dyslipidemia", "primary health care," and "Malaysia." Studies were included in the current analysis if they employed qualitative methodologies and explored the perspectives of patients or healthcare providers on diabetes control. Themes and subthemes from the selected studies were independently extracted and reorganized

into CCM domains by two researchers. Through iterative discussions among the research team, emerging themes and subthemes were developed and refined³.

Results and Discussion

Twenty-one qualitative studies focused on diabetes control were included for analysis. Each article may contribute to more than one CCM domain. The most frequently addressed domain was Self-Management Support (n=20), followed by Health System Organization (n=8), Delivery System Design (n=8), Decision Support (n=7), and Community Resources and Policies (n=8). Notably, the Clinical Information System domain was not identified in the included studies.

Table 1: Studied themes by CCM domain

CCM Domain	Studied Themes
Healthcare System Organization (n=8)	Cost of diabetes care
	Government support for the private sector
	Human resources and capacity building
	Lack of resources (educational material and facilities)
	Policy and governance
	Coordination of care
Decision Support (n=7)	Access to evidence-based guidelines and information
	Clinical knowledge and practice gaps
Delivery System Design (n=8)	Consultation efficiency
	Provider perspectives on insulin therapy initiation
	Provider-patient communication
	Patient-centred care
	Information provision by HCP
	Special clinic
Self-management Support (n=20)	Diabetes management adherence and attitudes
	Diet and exercise management
	Emotional and psychological responses
	Health beliefs and attitudes
	Knowledge and awareness
	Motivation and behaviour change
	Practical and lifestyle barriers
	Self-management and empowerment
Clinical Information Systems (n=0)	No study reporting this domain was identified
Community Resource and Policies (n=8)	Access to reliable and consistent information
	Engagement with other organizations
	Role of community pharmacists
	Role of family, social, and cultural dynamics

*n: number of studies reporting the domain

In the Self-Management Support domain, 'diabetes management adherence and attitudes' was a key theme. This theme identified misconception as one of the

components affecting diabetes management adherence, such as “taking too much medication leads to ill health”⁴. Another theme under this domain was ‘self-management and empowerment’, which emphasized proactive behaviour and self-management capabilities. Next, in the Community Resources and Policies domain, ‘engagement with non-government organisations (NGOs), media, and the pharmaceutical industry’ was highlighted as essential for expanding diabetes education and support. The ‘role of community pharmacists’ was also recognised as accessible healthcare providers who could provide medication counselling and reinforce self-care messages. Within the Delivery System Design domain, ‘provider-patient communication’ was identified as a key concern. Ineffective communication practices were reported, including the use of scare tactics, restricted opportunities for patient expression, and limited interaction with nurses during screenings. Under the Health System Organization domain, ‘coordination of care’ emerged as a key theme, highlighting a disconnect during transitions between the public and private healthcare sectors. This discontinuity contributed to challenges in maintaining consistent diabetes control.

Our study provides a structured understanding of various components of care that are perceived and experienced in Malaysia. This approach allows the identification of specific areas for improvement in diabetes management within PHC settings. While thematic analysis in this study may allow for varying interpretations, consistency was strengthened through independent reviews and consensus discussions.

Conclusion

This study highlights that both patients and providers in Malaysia prioritize self-management support. Community resource engagement was also perceived as a valuable aspect of improving diabetes care. Understanding the factors driving self-management and community needs offers a foundation for developing targeted strategies for enhancing diabetes care in Malaysia’s local context.

References

1. Institute for Public Health. National Health and Morbidity Survey (NHMS) 2023: Non-Communicable Diseases and Healthcare Demand: Technical Report. 2024.
2. Goh LH, Siah CJR, Tam WWS, et al. Effectiveness of the chronic care model for adults with type 2 diabetes in primary care: a systematic review and meta-analysis. *Syst Rev* 2022;11(1):273.
3. Sibounheuang P, Olson PS, Kittiboonyakun P. Patients’ and healthcare providers’ perspectives on diabetes management: a systematic review of qualitative studies. *Res Social Adm Pharm* 2020;16(7):854-74
4. Swarna Nantha Y, Chelliah AA, Haque S, Yen GK, Md. Zain AZ. The external realities of people with type 2 diabetes—understanding disease perspective and self-management behaviour via grounded theory approach. *PloS one*. 2021 Jan 14;16(1):e0245041.

Patient Safety and Medication Errors in Telemedicine: Protocol for a Scoping Review

Nor Asma Musa ¹, Mohd Amirul Hariz Aminuddin ², Fairuz Nadiah Nordin ¹, Syarifah Nortasya Sayed Muhammad Kamarudin ¹, Zawaniah Brukan Ali ³

¹ Institute for Health Management, National Institutes of Health, Ministry of Health Malaysia

² Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

³ Medical Development Division, Ministry of Health Malaysia

Corresponding author's email: dr.norasma@moh.gov.my

Summary

This present scoping review protocol outlines a procedure for mapping and bringing together literature on patient safety and medication errors in telemedicine. The zonation aims to categorize types and causes of medical errors in telehealth, outlining particular hazards to patient safety in virtual healthcare and assessing their associated risks for outcomes. The gaps in the literature should also be identified for better informing future research. A systematic search strategy will be applied across databases, and analysis and data extraction will be used to describe improvements of safety in telemedicine. In the end, it is believed that the review will guide policy and clinical practice in the enhancement of remote healthcare delivery.

Keywords

Telehealth, virtual care, video consultations, Patient safety, Patient harm

Introduction

Modern healthcare has fashioned telehealth as a cornerstone of remote access to medical consultation and care¹. The rapid diffusion of telehealth into health systems is raising concerns about possible patient safety and medication errors not identical with those in traditional health settings². This may be in relation to technological limitations, issues of communication, and clinical decision-making processes in virtual environments. Such errors will have an impact on patient safety. Despite the growing literature addressing telemedicine, an overarching synthesis of evidence in terms of patient safety risks and medication errors is still lacking³. Hence, this scoping review is meant to systematically map this specific category of medical error—how they happen and why—in order to highlight particular safety risks and their effects on patient outcomes. The review will outline gaps in the literature that require further research and will help in the development of evidence-based policies and practice to support safe and effective telemedicine delivery⁴.

Materials and Methods

Trial registration obtained from Malaysian National Medical Research Register (NMRR) : ID-25-01468-M59. Ethical Clearance was waived by NMRR because it solely entails reviewing and collecting data from existing literature, without involving human participants.

We will carry out a scoping review of a systematic methodological approach following the framework set out by Arksey and O'Malley in 2005 and aligned with

PRISMA-ScR guidelines from 2021. Through the discussion, this review will look to map the available published literature on patient safety and medication errors in telemedicine. A comprehensive search strategy will be prepared and implemented across varied electronic databases like PubMed, Cochrane Library, Embase, with searches covering studies from their origin to date. Inclusion criteria should directly relate to empirical studies, review works, grey literature discussing medication errors as an element of harm to patient safety risks, and telemedicine outcomes. Relevance for studies will be accepted based on the predefined eligibility criteria, and data extraction will underline types, causes, and outcomes of errors in the telehealth setup. Thematic analysis will be applied to detect themes, risks, gaps, and patterns in the literature. Findings from this scoping review shall be mapped to provide an overview of current evidence and hence guide future research, policy development, and clinical practice.

Table 1: Population, Concept and context (PCC) framework

Population	Patients and healthcare providers involved in telemedicine or virtual consultations
Concept	Patient safety issues and medical errors (e.g. misdiagnosis, medication errors, communication failures)
Context	Telemedicine or virtual consultation settings (video, phone, messaging), in any level of care

Table 2: Eligibility Criteria

Criteria	Inclusion	Exclusion
Population	Patients and providers using telemedicine platforms for clinical care	Studies not involving telehealth users
Concept	Studies discussing medical errors or patient safety issues in telehealth	Studies focusing only on telemedicine satisfaction or usability without discussing safety
Context	Virtual consultations across all healthcare levels (primary to tertiary)	Non-clinical telehealth (e.g. wellness coaching, administrative use)
Study Design	Qualitative, cross-sectional, mixed-methods, case reports, implementation studies	Editorials, protocols without data, commentaries, reviews, conference proceedings, short communications
Language	All languages with at least an English abstract	Non-English abstracts
Publication Years	Last 10 years	Studies older than 10 years

Table 3: Keyword search

Keyword	Synonyms
Telemedicine	• telemedicine • eHealth • Remote consultation • Remote healthcare • Digital health • Virtual healthcare • Remote patient care • mHealth • mobile health • telehealth • video consultation • online consultation • teleconsultation • eConsultation • Virtual visit • Remote visit • virtual medicine • Synchronous consultation • Asynchronous consultation • Tele-Referral* • Tele Referral* • telecare • tele-care
Patient safety	• safety incident* • adverse event* • safety risk* • Harm prevention • Healthcare safety • Risk management • Patient harm • Quality and safety
Medical errors	• diagnostic error* • treatment error* • prescribing error* • clinical error* • adverse drug event* • misdiagnosis* • healthcare error* • adverse event* • delayed diagnosis • preventable adverse event*

Results

The scoping review results are expected to comprehensively map the types, causes, and outcomes of medical errors in telemedicine. Also, it would determine those risks

that may threaten a patient's safety in a virtual health care setting and influence them on their health outcome. The review will seek to reveal gaps in the existing literature and thus provide thorough insight for further research direction. The evidence will be used to develop guidelines and policies that are informed by best practices to improve patient safety and reduce medication errors in telehealth practices, ultimately leading to safer and more effective remote healthcare delivery.

Discussion

Telemedicine has grown fast through time, which has exposed various opportunities for the provision of healthcare. It has also provided some challenges to the safety of patients, such as issues related to technological failures in communication, remote clinical decision-making, and similar elements that are unique within virtual healthcare settings and could eventually cause medication errors⁵.

Although existing literature points to all of these problems, there seems to be a striking absence of a comprehensive synthesis of what the types, causes, and effects of medical errors in telehealth could be. Therefore, the objective of this scoping review is to try and close this gap by mapping the evidence presently existing on risks to patient safety that are specific to telemedicine.

In telehealth, a few elements may even add to that risk with inadequacy in infrastructure, unfamiliarity of users, and lack of regulatory frameworks. Therefore, identifying critical gaps in the literature will provide insights into further research and assist in the development of evidence-informed policies that guide practice to enhance safety and effectiveness in telemedicine.

Conclusion

This scoping review protocol is aimed at mapping out the patient safety risks and medication errors in telemedicine. In doing so, it will identify gaps in the literature and point out future directions for research to inform policy and practice in improving telehealth safety and reducing risks in remote healthcare delivery.

References

1. Stewart D, Paudyal V. Prevalence, contributing factors, and interventions to reduce medication errors in outpatient and ambulatory settings: a systematic review. *Int J Clin Pharm* 2023; **45**(5):1235-46.
2. Ryan R, Hill S. Connected healthcare system technology interventions to improve patient safety by reducing medical errors: a systematic review. *J Glob Qual Saf Healthc* 2024; **8**(1):43-56.
3. Bates DW, Singh H. Two decades since *To Err Is Human*: an assessment of progress and emerging priorities in patient safety. *Health Aff (Millwood)* 2023; **42**(3):1736-43.
4. World Health Organization (WHO). *Global patient safety action plan 2021-2030: towards eliminating avoidable harm in health care*. Geneva: World Health Organization; 2021.
5. Greenhalgh T, Wherton J, Papoutsi C, et al. Virtual online consultations: advantages and limitations (VOCAL) study. *BMJ Innov* 2018; **4**(4):124-30.

Designing a Sustainable Premium Economy Health Service Model in Malaysia Public Hospitals : Insight from Healthcare User

Wafaak.E¹, Natrah.M.S², J.H.W.Wong³, W.A.Yap²

¹Ministry of Health, Malaysia

²Health Transformation Office, Ministry of Health

³Putrajaya Health Office

Corresponding author's email: drwafaak@moh.gov.com

Summary

This cross-sectional online survey (n=628) explored public priorities and views on proposed premium economy health services in Malaysian public hospitals. Key service preferences included shorter waiting times, improved customer service, and flexible clinic hours. Most supported evening and weekend operating hours. Thematic analysis showed interest driven by speed, affordability, and comfort, while disinterest stemmed from equity concerns and distrust in public premium care. Findings suggest public support exists, but implementation must balance service upgrades with universal access. A sustainable business model should include clear service tiers, extended hours, and reinvestment in core public healthcare.

Keywords

Health services, premium economy, public perception, motivational determinants

Introduction

Malaysia's healthcare system is a two-tiered system, with a public sector funded by government revenue and a private sector driven by the market. The public healthcare sector is heavily subsidized by the government, ensuring that all Malaysians have access to healthcare services. However, the system faces challenges such as limited fiscal space, high medical inflation and an aging population with a rising burden of chronic diseases¹. To address these challenges, the Ministry of Health will introduce "premium economy" services in public hospitals and clinics². These services aim to provide options to purchase value-added services. Understanding the demand for these premium economy services from the perspective of healthcare users is crucial for the successful implementation of the initiative. This study aims to inform the development of a business model by examining three critical components: (1) consumer priorities, (2) preferred operational hours, and (3) underlying motivational determinants.

Methodology

A cross-sectional study was conducted using a self-administered online survey distributed via the open-access platforms websites of the Life Insurance Association of Malaysia (LIAM) and Rakan KKM between December 2024 and March 2025. Convenience sampling was applied. The survey targeted the general public, with a focus on individuals likely to be private health insurance policyholders. The survey comprised two sections: health services (service priorities, operating hours, willingness to pay, and interest in services) and sociodemographic data (gender, age, education, and postcode). Ethical approval was obtained from the National Medical Research Register (NMRR ID-24-04025-YYA).

For service priorities, respondents rated the importance of proposed service features using a 5-point scale (1 = highest priority, 5 = lowest priority). Responses to proposed operating hours and interest in the new premium economy health services were recorded as “Yes” or “No.” Open-ended responses captured reasons for interest or disinterest. Descriptive analysis was conducted on service priorities, operating hours and interest in services, in accordance with the study objectives, using JASP software. Reasons for interest and disinterest were analyzed using thematic analysis.

Results

There were 628 respondents with response rate was 2.67%. For inpatient services, the most highly prioritised features were shorter waiting times (mean score 1.564), customer service (1.937), and ambience of waiting areas and parking (2.275). In outpatient services, respondents prioritised near-future clinic slot availability (1.709) and shorter clinic waiting times (1.745). A substantial proportion of respondents expressed interest in extended operating hours: 85.2% supported evening sessions, 87.9% endorsed Saturday services, and 76.3% favoured Sunday services. Thematic analysis identified six motivations for interest: faster and priority services, affordability and financial protection, trust in government expertise, improved comfort and facilities, administrative convenience, and health coverage security for the future. Reasons for disinterest included preference for private sector services among insured patients, concerns about long waiting times in public hospitals, prioritisation for non-insured patients, affordability concerns, belief in maintaining publicly funded healthcare, and distrust in public sector premium care standards.

Discussion

The prioritisation of shorter waiting times, improved customer service, appointment availability, and physical amenities aligns with broader trends in healthcare where patient experience is increasingly recognised as a key determinant of service quality and satisfaction^{3,4}. The strong interest in extended operating hours reflects the demands of a modern, time-constrained population seeking greater flexibility in accessing healthcare.

The identified motivations for interest highlight the potential market for premium economy services. However, the reasons for disinterest also underscore critical challenges that must be addressed to ensure the success and acceptance of these services. Concerns about affordability, equity, and the potential for compromising core public healthcare values require careful management and communication strategies.

Further research could explore specific pricing models, service packages, and communication strategies to optimise the appeal and uptake of premium economy services. It is also important to investigate the impact of these services on the overall efficiency and equity of the public healthcare system.

Conclusion

A balanced, sustainable premium economy model in public hospitals must enhance service quality while preserving universal access. Key actions include queue management, extended hours, clear pricing, pilot testing, and public engagement—to ensure equitable, socially responsible care without compromising the integrity of Malaysia's public healthcare system.

References

1. Lim MY, Kamaruzaman HF, Wu O, Geue C. Health financing challenges in Southeast Asian countries for universal health coverage: a systematic review. *Arch Public Health* 2023; **81**(1):148.
2. Ministry of Health Malaysia. *Rakan KKM* [Internet]. Available from: <https://rakankkm.moh.gov.my/en/> [cited 2025 May 7].
3. Yi FR, Shamsuddin SN, Abdul Rashid M, et al. Identification of factors leading to excessive waiting time at the pharmacy unit of health clinics in Temerloh district, Pahang, Malaysia. *Malays J Pharm Sci* 2021; **19**(1):97-111.
4. Basit KSA, Hussain S. Exploring the influence of service quality on patient satisfaction: a case study of Universiti Malaysia Pahang Health Centre (UMPHC). *Int J Ind Manag* 2022; **15**:26-37.

Determinants of Period Poverty Among Women in a Malaysian Low-Income Housing Community

S A Zafirah¹, Nor Faiza binti Mohd Tohit¹, Wan Farizatul Shima binti Wan Ahmad Fakurazi¹, Badrul Hisham bin Abdul Samad¹, Nur Adnin binti Ahmad Zaidi¹

¹Community Health Department, Faculty of Medicine and Defence Health, National Defence University of Malaysia

Corresponding author's email: athirah@upnm.edu.my

Summary

This study investigates the prevalence and determinants of period poverty among adult women residing in a low-income housing community in Malaysia. Conducted in Projek Perumahan Rakyat (PPR) Raya Permai, the cross-sectional study surveyed 117 women aged 18-49. The results show that 18.8% experienced period poverty. Statistically significant associations were found between period poverty and lower education ($p = 0.045$), household income $\leq$ RM3400 ($p = 0.02$), and household size >4 members ($p = 0.014$). These findings highlight the socioeconomic challenges contributing to menstrual inequity and emphasise the need for targeted interventions addressing education, affordability, and family burden in low-income urban communities.

Keywords

Period poverty, socioeconomic factors, low-income housing, menstrual health, women's health

Introduction

Period poverty is a global health issue encompassing limited access to menstrual products, safe sanitation, and menstrual health education¹. It reflects deeper gender, social, and economic disparities. In Malaysia, discussions around period poverty remain nascent, particularly within urban poor populations residing in government-subsidised housing projects². However, scientific research on this topic remains limited. To address this gap, the present study explores key determinants of period poverty among women residing in PPR Raya Permai, Kuala Lumpur. Identifying these determinants will help advance menstrual equity and inform policies tailored to urban low-income communities.

Materials and Methods

A cross-sectional study was conducted between August and September 2024 involving 117 women aged 18-49 in PPR Raya Permai. A bilingual validated questionnaire adapted from previous studies was distributed via both Google Forms and printed versions. The survey captured menstrual material affordability, education level, monthly household income, and household size. Period poverty was operationally defined as the inability to afford menstrual products in the past year. Data were analysed using SPSS v25, applying descriptive statistics and chi-square tests to explore associations between period poverty and socioeconomic variables. A p -value <0.05 was considered statistically significant. Ethical clearance was obtained from the Ethical Committee National Defence University of Malaysia and PPR Raya Permai's Community Committee.

Results and Discussion

Out of 117 respondents, 22 women (18.8%) experienced period poverty. Socioeconomic characteristics revealed that 63.2% had below-tertiary education, 59.8% had household income $\leq$ RM3400, and 69.2% lived in households with more than four members. Statistical analysis showed a significant association between period poverty and: - Education level: 24.3% of women with below-tertiary education experienced period poverty, compared to 9.3% of those with tertiary education ($X^2 = 4.02$, $p = 0.045$). - Household income: 25.7% of women earning $\leq$ RM3400 experienced period poverty, compared to 8.5% of those above that threshold ($X^2 = 5.45$, $p = 0.02$). - Household size: 24.7% of women in larger households (>4 members) experienced period poverty, compared to 5.6% in smaller households ($X^2 = 5.98$, $p = 0.014$).

Table 1: Distributions of Period Poverty and Findings of Chi Square Test

Variables	Period Poverty				Chi Square Test	
	Yes		no		x^2 value	p value
	n	%	no	%		
Educational Level						
Below Tertiary Education	18	24.3	56	75.7	4.02	0.045
Tertiary Education	4	9.3	39	90.7		
Household Income						
MYR 3400 and below	18	25.7	52	74.3	5.45	0.02
above MYR3400	4	8.5%	43	91.5		
Number of Household						
4 and below	2	5.6	34	94.4	5.98	0.014
Above 4	20	24.7	61	75.3		

These findings mirror global evidence showing that economic and educational disparities are central to menstrual inequity. In low-income households, menstrual products often fall behind other basic necessities such as food or rent³. Additionally, limited education may hinder awareness about menstrual health or reduce access to better-paying employment, compounding economic vulnerability⁴. Larger households, particularly with multiple menstruators, may experience compounded costs, amplifying financial stress. This study underscores the urgency of integrating menstrual equity into public health programming. Provision of subsidised menstrual products, comprehensive reproductive education, and income-based support mechanisms is essential to reduce period poverty. While prevalence was lower than in some international studies, the socioeconomic patterns observed affirm the need for community-targeted interventions in Malaysia's urban poor sectors.

Conclusion

Period poverty affects nearly one in five women in PPR Raya Permai and is significantly associated with lower income, lower education, and larger household size. Tackling these social determinants is critical to improving menstrual equity and public health outcomes in Malaysian low-income communities.

References

1. Cardoso LF, Scolese AM, Hamidaddin A, Gupta J. Period poverty and mental health among US college women. *BMC Womens Health* 2021; **21**(1):14.
2. Jaafar H, Ismail SY, Azzeri A. Period poverty: a neglected public health issue. *Korean J Fam Med* 2023; **44**(4):183-8.

3. Singh S, Kunwar R, Sengar M, Gupta A. Period poverty in reproductive-age women in Lucknow. *J Family Med Prim Care* 2023; **12**(11):2602-7.
4. Muhaidat S, Awwad N, Karasneh R, Obeidat N. Period poverty and depressive symptoms in Jordanian refugee camps. *BMC Public Health* 2024; **24**(1):1-10.

Primary Healthcare Utilization and Cost Among Older Adults with Diabetes Mellitus: Insights from TPC-OHCIS 2022

Hazwa Harith¹, Weng Hong Fun¹, Zen Yang Ang¹, Shakirah Md.Sharif¹, Su Fen Chia¹, Wern Han Lim², Alif Haikal Md Razman¹, Kar Foong Tang¹, Noraliza Noordin Merican³, Sheleaswani Inche Zainal Abidin³, Siti Raidah Mohamad Azman⁴, Muhammad Amiruldin Bin Harun⁴

¹ Institute for Health Systems Research, National Institutes of Health, Ministry of Health Malaysia

² School of Information Technology, Monash University Malaysia, Selangor, Malaysia

³ Elderly Health Sector, Family Health Development Division, Ministry of Health Malaysia

⁴ Clinical Informatics Unit, Digital Health Division, Ministry of Health Malaysia

Corresponding author's email: hazwa.h@moh.gov.my

Summary

This study examines the healthcare utilization and cost of diabetes mellitus (DM) care among older adults in primary care clinics using 2022 Teleprimary Care and Oral Health Clinical Information System (TPC-OHCIS) data. A total of 55,228 patients accounted for 213,902 visits, with an estimated annual average cost of RM 482.19 per patient. Medication was the main driver of healthcare costs, with patients on both oral glucose-lowering drugs and insulin incurring the highest median expenses. The findings highlight the substantial resource use and the need for integrated chronic care for Malaysia's ageing population.

Keywords

Non-communicable diseases, costs, primary care, older adults, diabetes mellitus

Introduction

Non-communicable diseases (NCDs) such as diabetes mellitus (DM) continue to challenge healthcare systems, particularly among older adult populations who often present with multiple chronic conditions. In Malaysia, the burden of DM is increasing, especially among those aged 60 and above¹. This demographic frequently experiences multimorbidity, including cardiovascular diseases (CVD) and respiratory conditions, leading to complex healthcare needs and rising service costs. Primary care clinics serve as the initial contact point for managing these conditions, yet data on associated cost implications remain limited. Utilizing electronic health records from the Teleprimary Care-Oral Health Clinical Information System (TPC-OHCIS), this study describes the utilization of healthcare resources and costs among older adults with DM in Klang Valley public clinics.

Materials and Methods

A retrospective cross-sectional study was conducted using 2022 TPC-OHCIS data involving patients aged 60 years and above with diabetes mellitus (DM; ICD-10 E10-E14) attending public primary care clinics in Klang Valley. A hybrid costing approach was applied to estimate DM management costs from the provider's perspective, using patient-level visit data. Costing sources included inflation-adjusted service costs based on the COMPHEC Study, Pharmaceutical Services Programme, Ministry of Health (2023 medication price lists), and expert opinion. Cost components

covered medications, laboratory tests, procedures, radiological examinations, and administrative fees. Descriptive statistics were used to summarize visit frequencies, costs, patient age, and stratifications by type of DM medications. Data processing and visualization were conducted using Python and Excel.

Results and Discussion

Table 1 shows the distribution of 55,228 patients included in the study across 17 primary care clinics in Klang Valley, with an average of four visits per patient annually, in line with the average visit frequencies reported in China². The estimated total healthcare cost was RM 26,630,424.92, equating to an average expenditure of RM 482.19 per patient per year. This cost was higher compared to the average RM 459.00 per year for general outpatient diabetes care in 2017³. Medication was the cost driver (Figure 1), with patients on combined therapy of both oral glucose lowering drugs (OGLDs) and insulin accounts for 47.7% price increment from the base median cost of single OGLD treatment regime (Table 2), consistent with findings by Bonafede et. al of lower cost among non-insulin users⁴. The rising expenditure among patients requiring combination therapies highlights the urgent need for earlier, more intensive disease management to prevent progression and mitigate long-term financial burden. These findings emphasize the importance of strengthening chronic disease management strategies tailored to the older population. This study offers comprehensive and specific insights into the service utilization of diabetic patients in public primary care clinics. However, a limitation of the cost estimation is that it did not account for varying follow-up durations or potential differences in drug brands across facilities, which may affect the accuracy of annual cost estimates.

Conclusion

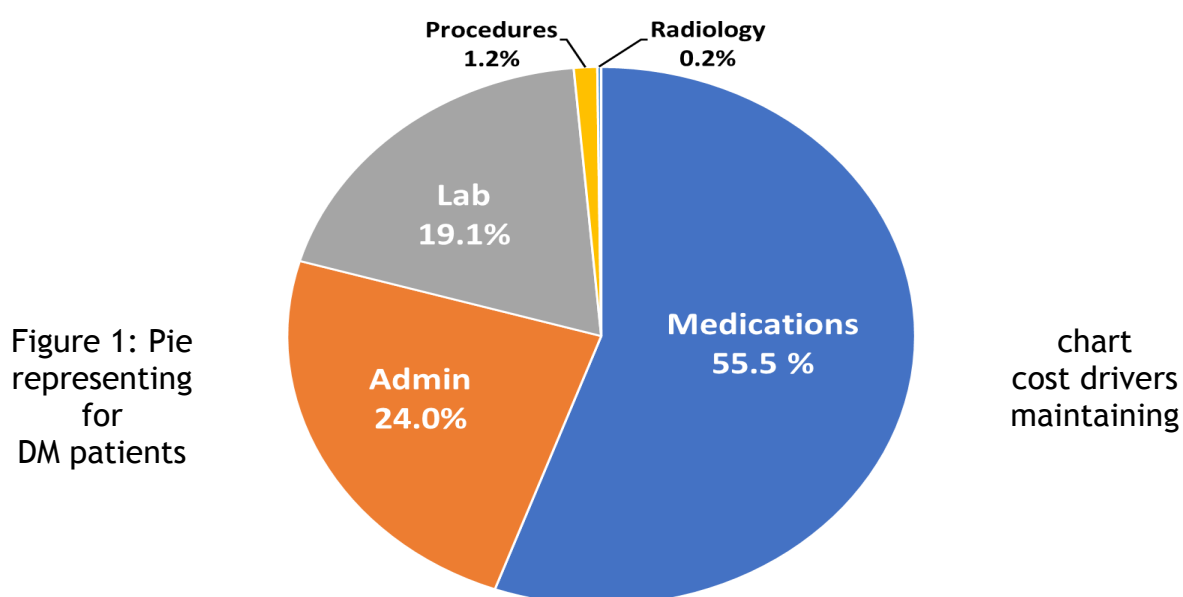
Managing older adults with diabetes in Klang Valley primary clinics costs an average of RM 482.19 per year, mainly driven by medication. The increasing complexity of diabetes management demands greater resources, highlighting the need for integrated chronic care for Malaysia's ageing population.

Table 1: Summary of patient distribution by age group

Total, n (patients)	55,228		
Mean age (years) ± SD	69.23 ± 6.73		
Total, n (visits)	213,902		
Age category	Number of visits	Average number of visits ± SD	Median visit
60-69	126,096	3.99 ± 2.92	4
70-79	71,050	3.77 ± 2.33	3
80 and above	16,756	3.45 ± 2.47	3

Table 2: Cost distribution according to medication regime

Medication regime	Number of patients	Total cost (RM)	Mean cost (RM) ± SD	Median cost (RM)
Single OGLDs	17,539	7,170,439.97	408.82 ± 217.27	378.11
Multiple OGLDs	17,433	9,645,264.49	553.28 ± 247.91	526.65
Insulin only	5,251	1,113,283.69	441.78 ± 321.68	382.09
Both OGLD and Insulin	11,764	7,052,964.97	599.54 ± 303.63	558.36



References

1. Shariff Ghazali S, Seman Z, Zainuddin NH, et al. Prevalence and factors associated with multimorbidity among older adults in Malaysia: a population-based cross-sectional study. *BMJ Open* 2021; 11(10):e052126. doi:10.1136/bmjopen-2021-052126
2. Wang J, Zuo H, Chen X, et al. Analysis of factors influencing the frequency of primary care visits among diabetic patients in two provinces in China. *BMC Public Health* 2019; 19:1267. doi:10.1186/s12889-019-7591-6
3. Mustapha FI, Azmi S, Manaf MRA, et al. What are the direct medical costs of managing type 2 diabetes mellitus in Malaysia? *Med J Malaysia* 2017; 72(5):271-7.
4. Bonafede M, Chandran A, DiMario S, et al. Medication usage, treatment intensification, and medical cost in patients with type 2 diabetes: a retrospective database study. *BMJ Open Diabetes Res Care* 2016; 4(1). doi:10.1136/bmjdr-2016-000201

Knowledge and Attitudes on Contraception Among an Underprivileged Community in Sungai Besi.

Nur Adnin Ahmad Zaidi¹, Siti Athirah Zafirah Abdul Rashid¹, Nor Faiza Mohd Tohit¹, Wan Farizatul Shima Wan Ahmad Fakuradzi¹, Badrul Hisham Abd Samad¹

¹ Department of Community Health, Faculty of Medicine and Health Defence, Universiti Pertahanan Nasional Malaysia

Corresponding author's email: adnin@upnm.edu.my

Summary

Contraception plays a crucial role in public health as it enabling individuals to plan family size, space births, and prevent unintended pregnancies as well as reduced maternal and infant mortality. The purpose of this study is to assess the level of knowledge and attitude score on contraception among an underprivileged community in Sungai Besi, Kuala Lumpur. A cross-sectional study was conducted on 292 residents of Program Perumahan Rakyat (PPR) in Sungai Besi through convenient sampling to answer a validated self-administered questionnaire. Despite living in urban communities facing economic hardship, the majority have moderate knowledge with a good attitude towards contraception.

Keywords

Contraception, Family Planning, Knowledge, Attitude, reproductive control

Introduction

Effective contraceptive use is strongly associated with reduced maternal and infant mortality, decreased rates of unsafe abortions, and improved overall reproductive health. Furthermore, contraception contributes to the prevention of sexually transmitted infections and promotes socioeconomic development by empowering women and expanding educational and economic opportunities. Poor knowledge on contraception may result in premarital unplanned pregnancy among suburban communities¹. Addressing barriers to contraception access is essential for improving health outcomes and achieving global development goals. This study aimed to assess the level of knowledge and attitude score on contraception among an underprivileged community in Sungai Besi, Kuala Lumpur.

Materials and Methods

A cross-sectional study using convenient sampling techniques was conducted among 292 residents of PPR in Sungai Besi. The data was collected from August to September 2025. The respondents were approached to answer a self-administered questionnaire during the community awareness program on reproductive health. This study was ethically granted from Jawatankuasa Etika Penyelidikan UPNM (No. kawalan JKEP: 15/2024). The bilanguage questionnaire (in Malay and English language) consists of 3 sections which covers sociodemographic, contraceptive knowledge and contraceptive attitude. Descriptive analysis was used to summarise socioeconomic characteristics. All data were analysed using SPSS version 26.0.

Results and Discussion

The response rate was 84.88% whereby 292 respondents from 344 calculated sample sizes participated in this study. Study reveals 42 respondents (14.4%) scored moderate knowledge while 152 respondents (52.1%) scored good attitude on contraception practices. Majority of respondents were female (58.2%), age group 40-49 years old (41.8%), Malay (86.3%), received secondary education (59.2%), employed (60.6%), from low-income family (76%) and have ≤ 4 number of children (85.6%). From the results, most of the respondents were Malay as it represents the largest ethnic group in Malaysia ¹.

Table 1: Demographic descriptive of respondents (n=292)

Characteristic	N (%)
Age	
18 - 29 years old	52 (17.8%)
30 - 39 years old	118 (40.4%)
40 - 49 years old	122 (41.8%)
Gender	
Male	122 (41.8%)
Female	170 (58.2%)
Ethnicity	
Malay	252 (86.3%)
Chinese	22 (7.5%)
Indian	13 (4.5%)
Other	5 (1.7%)
Number of Children	
≤ 4 children	250 (85.6%)
> 4 children	42 (14.4%)
Education status	
Non-formal education	4 (1.4%)
Primary education	15 (5.1%)
Secondary education	173 (59.2%)
Tertiary education	100 (34.2%)
Household income	
$\leq$ RM3400	222 (76.0%)
$>$ RM3400	70 (24.0%)
Knowledge score level	
Poor	55 (18.8%)
Medium	195 (66.8%)
Good	42 (14.4%)
Attitude score level	
Poor	24 (8.2%)
Medium	116 (38.7%)
Good	152 (52.1%)

Conclusion

Most respondents have moderate knowledge with a good attitude towards contraception.

References

1. Wong, L.P., Atefi, N., Majid, H.A. *et al.* Prevalence of pregnancy experiences and contraceptive knowledge among single adults in a low socio-economic suburban community in Kuala Lumpur, Malaysia. *BMC Public Health* 14 (Suppl 3), S1 (2014). <https://doi.org/10.1186/1471-2458-14-S3-S1>
2. Khan, R. N. J., Hashim, S. M., Nawli, A. M., & Siraj, H. H. (2018). Factors associated with ever used of modern contraception among married men attending a primary healthcare clinic. *Med. J. Malays*, 73, 301-306

Evolution Of HPV Vaccination Strategies Over 15 Years In Malaysia

Mardiana Omar¹, Radziah Mohamad ¹, Saidatul Norbaya B.¹, Noorhaire Sumarlie Nordin¹, Don Ismail Mohamed ¹

¹ Family Health Development Division, Ministry of Health Malaysia

Corresponding author's email: mardiana.omar@moh.gov.my

Summary

Malaysia's HPV vaccination program has developed into an adaptive and gender-responsive healthcare model since the program's introduction in 2010. The first HPV vaccines targeted 13-year-old girls on a three-dose vaccine schedule. Over time, Malaysian HPV vaccine policies were amended to include younger adolescents, to optimize the dosage to a one-dose schedule and to rely on adapted delivery methods. In response to a global HPV vaccine shortage occurring worldwide from 2021 to 2024, the 2024 Catch-up Immunisation Program was introduced and has significantly improved coverage. Malaysia's approach offers valuable lessons for nations working toward the WHO's 2030 cervical cancer elimination targets.

Keywords

HPV vaccination, cervical cancer, Malaysia, immunisation policy, public health model

Introduction

HPV infection is the leading cause of cervical cancer in Malaysia and is of the great public health concerns around the world. In 2010, Malaysia launched its national HPV immunisation programme targeting female students aged 13 years. The strategy was to deliver vaccines in school settings to ensure large coverage and equitable vaccination access. The HPV immunisation programme evolved and changed over time to adapt to the latest recommendations from the World Health Organization (WHO), and to reflect a variety of different contextual realities, such as shortages of vaccine and changing public health priorities. Between 2021 and 2024, the global HPV vaccine shortage affected 800,000 female students. In response, the Ministry of Health (MOH) revised the program's strategy to mitigate the impacts of this disruption and also to ensure the viability and sustainability of cervical cancer prevention initiatives.

Materials and Methods

Malaysia's HPV vaccination program evolved through several key adaptations:

- **Earlier Vaccination Age:** The program was expanded to also cover standard 6 students to provide protection earlier.
- **Schedule Adjustments:** In 2023, the dosing protocol was amended to a single-dose regimen (based on emerging research^{1,2} and recommendations from WHO³ and Jawatankuasa Dasar dan Amalan Imunisasi Kebangsaan Imunisasi Kebangsaan (JDAIK) in order to guarantee optimal vaccine delivery and more efficient execution.
- **Diversified Delivery Models:** While school-based delivery remains the predominant approach, clinic-based models have been added to ensure greater

flexibility and better access for adolescent girls outside the formal education system.

- **Catch-up Initiative:** The Catch-up HPV Immunisation Programme was launched in 2024 as an important initiative to address the huge number of missed vaccinations by female students between 2021 and 2024.
- **Collaborative Outreach:** To reach marginalized and out-of-school populations the program was initiated, thereby expanding outreach and inclusivity.

These enhancements were anchored by the Family Health Development Division of the MOH, which integrated policy information, staff training and coordinated communication among stakeholders.

Results and discussion

From 2010 to 2020, Malaysia had an average of 90% vaccination coverage rate of targeted female students for HPV vaccination. This was achieved by the strong infrastructure provided by the school health service, good community trust and stable government support. For 2021 until 2024 cohort female students, coordination of the 2024 Catch-up HPV Immunisation Programme through implementation by school health teams, usage of an accurate digital tracking system and effective community outreach initiatives were significant pillars in restoring high immunization coverage in these cohorts. Consequently, the program achieved extraordinary results which were: 95.11% for the 2021 cohort; 92.69% for the 2022 cohort; 91.50% for the 2023 cohort; and 92.42% for the 2024 cohort. These results demonstrate the success of the adaptation strategies undertaken in Malaysia, the strength of the public health infrastructure as well as the strong commitment to cervical cancer prevention in Malaysia. Several enabling factors contributed to these outcomes:

- **Government Leadership:** Strong governmental support enabled swift policy shifts, resource allocations and mobilisation of cross sectoral partnerships.
- **Stakeholder engagement:** Effective cooperation with the Ministry of Education ensured smooth implementation of vaccination schedules into the school calendar as well as enabled effective parent engagement strategies to be executed.
- **Data driven strategy:** Using digital health records, the MOH was able to keep track of unvaccinated individuals, identify real-time progress and conduct targeted follow-ups.

Conclusion

Malaysia's HPV vaccination program has evolved into a resilient, inclusive model that demonstrates an effective national public health initiative. Its ability to adapt to global disruptions while sustaining high coverage levels underscores the program's resilience. As other countries scale up HPV vaccination to meet WHO's 2030 goals, Malaysia's strategy offers valuable insights in formulating an effective policy design and implementation.

References

1. Barnabas RV, et al. Efficacy of single-dose HPV vaccination among young African women. *NEJM Evid.* **2023**;1(7).
2. Whitworth HS, et al. Efficacy and immunogenicity of a single dose of human papillomavirus vaccine compared to no vaccination or standard three and two-

- dose vaccination regimens: a systematic review of evidence from clinical trials. *Vaccine*. **2020**;38(6):1302-14.
3. World Health Organization. Human papillomavirus vaccines: WHO position paper (2022 update). *Wkly Epidemiol Rec*. **2022**;97(50):645-72.

Client Dissatisfaction At Public Health Facilities In Perak : A Cross Sectional Descriptive Study From *Sistem Pengurusan Aduan Awam*, Ministry Of Health Malaysia, 2019-2024

Lau Kin Mun¹, Husna Maizura Ahmad Mahir ¹

¹Perak State Health Department, Ministry of Health Malaysia

Corresponding author's email: dr.laukinmun@moh.gov.my

Summary

Sistem Pengurusan Aduan Awam (SisPAA), Ministry of Health (MOH) Malaysia was officially launched in 2014 as a platform for public feedback. With the system well over 10 years, there is a need to analyse health service provision from data system information in SisPAA. This descriptive study was to identify the magnitude and characteristics of the clients' feedback from SisPAA Perak from 2019 till 2024. In Perak, the complaint rate has increased to 6.4.3 per 100,000 attendances in 2024 with majority valid complaints targeted at five main personnel that focused on client dissatisfaction and unmet expectations of health service delivery in public health facilities.

Keywords

SisPAA, Perak, Health Care Worker, public health services, client satisfaction.

Introduction

SisPAA MOH Malaysia was officially launched in 2014 as a platform for public appreciation of the health services and complaints on the dissatisfaction towards unjust administrative action, misuse of power, and maladministration by the health care workers in government hospitals and clinics. Over the past 10 years, the second edition of the Guidelines for The Management of Public Health Complaints MOH Malaysia was updated and published in 2020¹ with additional definition fine-tuned in the year 2025. A study at Lembah Pantai Health Office, Jabatan Kesihatan Wilayah Persekutuan Kuala Lumpur dan Putrajaya in 2019 identified that half of the complaints lodged were related to health clinic services and 38% due to health care worker (HCW)'s poor attitude. In addition, the complaint rates were reported as still low at 4.6 per 100,000 attendances with more than half of the complaints concluded as valid². This particular study was done to identify the trend and characteristics of the clients' feedback from SisPAA MOH Malaysia in Perak from January 2019 till December 2024.

Materials and Methods

This study was a cross-sectional study utilizing data from SisPAA MOH Malaysia from 2019-2024. Seven categories from SisPAA MOH Malaysia were analysed which included Feedback Classification, Public Complaints Bureau Classification, Health Care Worker, District Health Office, Results Outcome, Resolution Factor, and the Key Performance Index (KPI). A total of 3,082 SisPAA MOH feedbacks were included in the study with 106 (3.3%) feedbacks excluded due to missing data. Final secondary data from SisPAA MOH Malaysia³ were analysed descriptively using Microsoft Excel 2013 and presented by frequency (n) and percentage (%).

Results and Discussion

A total of 3,082 complete SisPAA MOH feedbacks were recorded for the past 6 years. The SisPAA feedback rates have doubled over the past 6 years from 4.9 per 100,000 attendance in 2019 to 11.1 per 100,000 attendances in 2024. The complaint rates have increased and plateaued at 6.4 per 100 000 attendance (Figure 1).

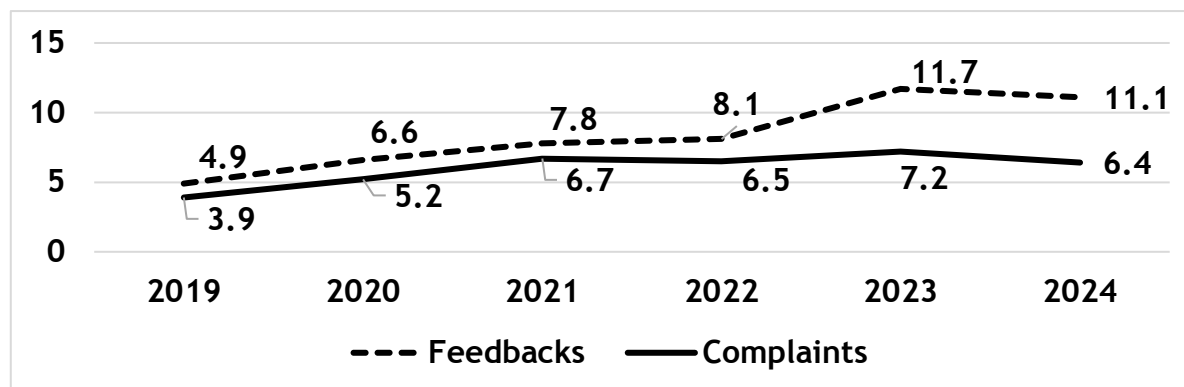


Figure 1 : Trend of SisPAA MOH Feedback and Complaint Rates In Public Health Facilities, Perak 2019-2024 (per 100,000 health clinic attendances)

The types of feedbacks received comprised of complaints 69.9% (2153) and non-complaints 30.1% (929). The non-complaints consists of appreciations 21.8% (672), inquiries 3.4% (106), requests 2.3% (70), suggestions 2.0% (62) and reportings 0.6% (19). The category of complaints against health care workers were the highest among Medical Officers 37.8%, followed by Staff Nurses 14.4%, Community Nurses 11.3%, Assistant Medical Officers 8.7% and Front Desk Clerks 5.7%. The distribution of feedbacks were the highest in the districts Kinta 35.5%, Manjung 13.0%, and Larut, Matang and Selama 9.8% which parallels to the district population density respectively.

The results of the complaints are accounted for as valid 62.6%, and non-valid 37.4%. The resolution factor of the complaints concluded is highest among non-MOH factor 31.4%, followed by HCW factor 18.0%, MOH managerial and organizational factor 11.0%, physical and structural factors of MOH 4.5%, and MOH systems and procedural factors 2.4%. Further positive measures are made for the respective listed factors above such as notification of issue to the respective non-MOH department, skill upgrading and effective communication training for HCW, supervision of the administrative management in a health facility, short term and long term health facility development planning, and revision of systems and procedure to facilitate both HCW and clients.

The targets of Key Performance Index (KPI) SisPAA MOH Malaysia i.e. more than 85% complaints investigated and solved within 15 days is very well achieved. This ranges from 87.8% in 2020 to 97.7% in 2024. The percentages of completed feedback within 5 working days are 30.0%, within 10 working days - 20.1%, within 15 working days - 44.7%, and required more than 15 working days - 5.2%.

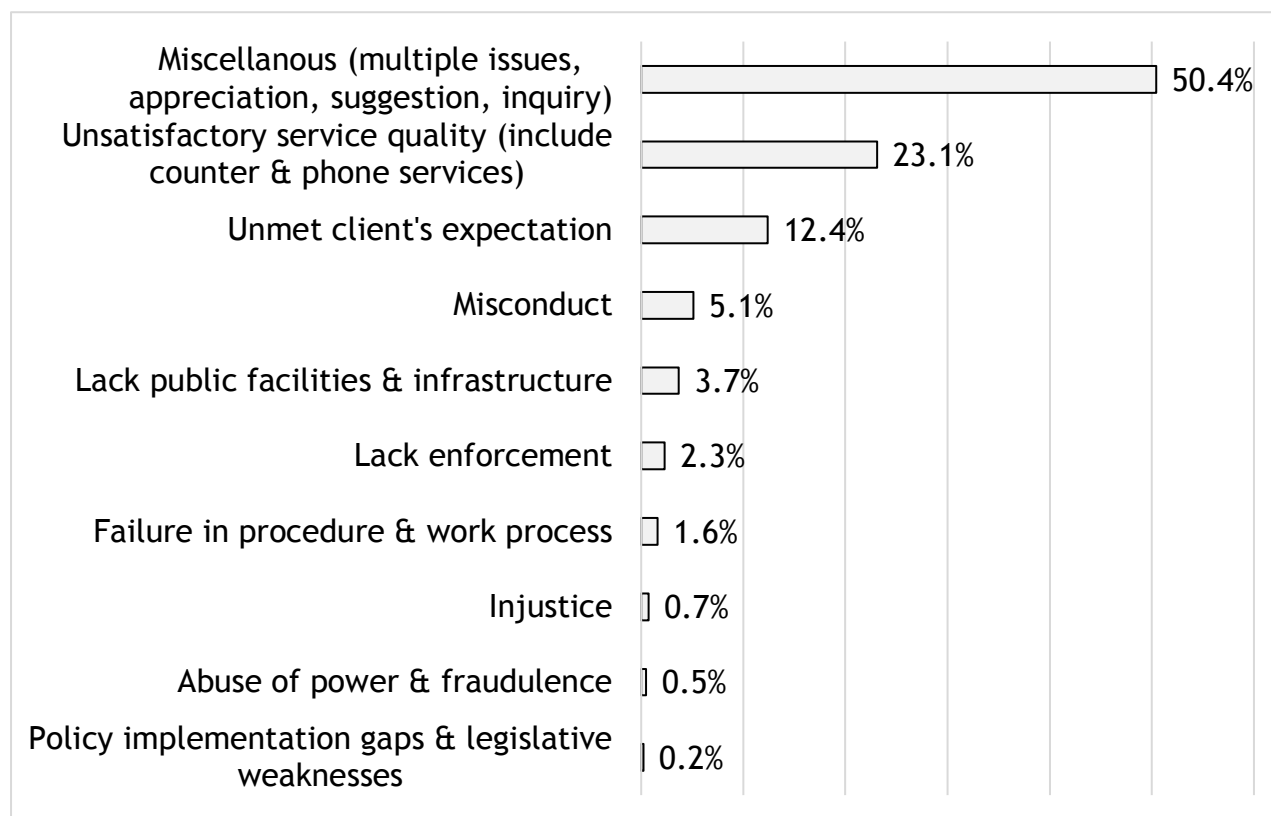


Figure 2 : Percentage of Feedbacks SisPAA MOH Malaysia, Perak 2019-2024 (Public Complaints Bureau Categorization)

The top 3 categories identified under Public Complaints Bureau for SisPAA MOH Malaysia are the miscellaneous group (includes multiple complaint issues and non-complaints) 50.4%, unsatisfactory service quality including counter and telephone services 23.1%, and unmet client's expectation 12.4%.

Conclusion

SisPAA complaints for Public Health Division in Perak remain the majority at an alarming 69.9% of which is valid 62.6%. Client dissatisfaction is centred on the medical fraternity factor. Effective and intensive professional skill training is required. This covers communication sensitivities and stress management for the top five identified HCW with the aim to provide good service quality that meets up to the expectations of the new generation client. Though SisPAA is user-friendly and well accepted, there is still room for improvement especially in fields of legitimate clientele biodata for adequate investigations.

References

1. Kementerian Kesihatan Malaysia. *Garis Panduan Pengurusan Aduan Awam Kementerian Kesihatan Malaysia*. Edisi 2020.
2. Mahat D, Kamarudin R. SisPAA: what is clients' complaint in Lembah Pantai health facilities? *Med J Malaysia*. 2019;74(Suppl 2):66. Presented at: 6th Asia-Pacific Conference on Public Health.
3. Kementerian Kesihatan Malaysia. Sistem Pengurusan Aduan Awam (SisPAA) [Internet]. Available from: <https://moh.spab.gov.my/eApps/system/index.do>

From Paper Trails to Digital Tales: A Mixed-Methods Implementation Study of CCMS Rollout in Rural Primary Care

Karen Christelle¹, Tong Yung Hung², Abby Chan Kai Ern¹, Mohd. Azzahi Mohamed Kamel², Mohd. Farid Abd. Hamid³

¹Klinik Kesihatan Felda Bersia, ²Klinik Kesihatan Lenggong, ³Klinik Kesihatan Pengkalan Hulu

Corresponding author's email: karenchristelle@moh.gov.my

Summary

This study evaluated the implementation of the Ministry of Health's Cloud-Based Clinic Management System at Felda Bersia Health Clinic, a rural primary care clinic in Hulu Perak. A mixed-methods approach was used: the implementation process was documented through field observations and staff feedback, while user experience (UX) was quantitatively assessed using the validated Malay User Experience Questionnaire. Challenges such as digital unfamiliarity and fragmented workflows were addressed through adaptive strategies. Significant UX improvements were recorded across all six domains. These findings demonstrate that structured rollout and context-responsive adaptation can enable effective digital transformation in underserved primary care settings.

Keywords

Health Information Systems, Electronic Health Records, Primary Health Care, Rural Health Services, User Experience

Introduction

Digitalisation of healthcare remains uneven across Malaysia, with rural clinics often facing infrastructure and readiness gaps. To address these disparities, the Ministry of Health introduced the Cloud-Based Clinic Management System (CCMS) to improve continuity of care, data management, and service delivery. However, little is known about its real-world implementation in rural settings.

Prior to its transition to the CCMS, Felda Bersia Health Clinic (FBHC), a rural primary care clinic in Hulu Perak, relied entirely on paper-based documentation, resulting in fragmented workflows and inefficiencies across outpatient, maternal-child, and pharmacy services.

This study aimed to evaluate the implementation process and user experience (UX) of CCMS at FBHC. Using a mixed-methods approach, we examined operational challenges, staff acceptance, and system usability to assess the feasibility of digital transformation in rural primary care. The findings offer lessons for scaling digital health systems in underserved areas, aligned with national and global health priorities.

Materials and Methods

This study employed a convergent parallel mixed-methods design to evaluate the implementation of CCMS at FBHC from August 2023 to April 2024.

The implementation was carried out in a structured manner across outpatient, maternal-child, and pharmacy services. Qualitative data were collected prospectively throughout the rollout using weekly implementation logs, field

observations, and informal staff feedback. These were systematically categorized into implementation challenges, corrective actions, and focus areas to document operational adaptation in real time.

In March 2024, a cross-sectional evaluation of UX was conducted using the validated Malay version of the User Experience Questionnaire (UEQ). All eligible healthcare workers (≥ 1 month of CCMS use) were included via census sampling. The UEQ assessed six usability domains on a 7-point Likert scale (-3 to $+3$).

Descriptive statistics and paired sample t-tests were used to compare CCMS with prior manual record systems. All analyses were conducted using SPSS v28. Qualitative and quantitative findings were integrated during interpretation to contextualize UX outcomes within the observed implementation process.

This study was registered with the National Medical Research Register (NMRR ID-24-01285-XU7) and conducted under the Ministry of Health research governance.

Results and Discussion

A total of 28 healthcare workers (HCWs) participated in the user experience evaluation. The majority were nurses (32.1%), followed by medical officers and specialists (17.9%), pharmacists (14.3%), and medical assistants (14.3%). Other participants included health attendants, occupational therapists, lab technicians, and counsellors, reflecting the multidisciplinary use of CCMS across service points at FBHC.

The introduction of CCMS marked a major shift from handwritten documentation to integrated digital workflows. Staff reported clearer communication, reduced duplication, and faster data access. Implementation milestones over the nine-month period are illustrated in Figure 1.

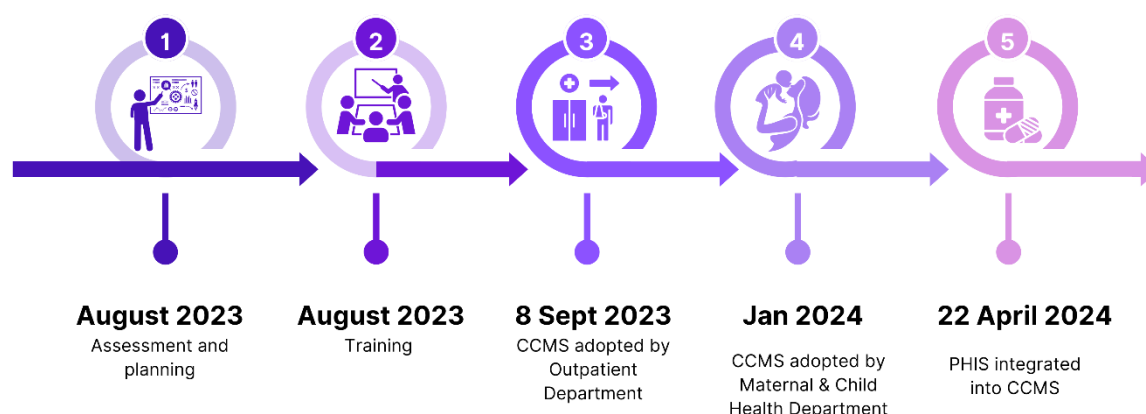


Figure 1: Timeline of CCMS Implementation Milestones at FBHC

UX scores improved significantly across all six domains of the UEQ when comparing CCMS to prior manual records. The largest mean differences were observed in stimulation ($+1.80$), efficiency ($+1.74$), and dependability ($+1.57$). Notably, even domains such as novelty ($+1.54$) and perspicuity ($+0.68$) showed marked gains (Table 1). All improvements were statistically significant ($p < 0.001$), indicating strong user-perceived benefits of CCMS over the manual system.

Table 1: Comparison of UEQ Scores Between Manual Records (MMR) and CCMS (n = 28)

Domain	MMR Mean $\pm$ SD	CCMS Mean $\pm$ SD	Mean Difference	P value
Efficiency	-0.46 $\pm$ 0.34	1.28 $\pm$ 1.02	1.74	<0.001
Attractiveness	0.09 $\pm$ 0.37	1.26 $\pm$ 1.11	1.17	<0.001
Dependability	-0.42 $\pm$ 0.39	1.15 $\pm$ 0.98	1.57	<0.001
Perspicuity	0.34 $\pm$ 0.83	1.02 $\pm$ 1.10	0.68	<0.001
Stimulation	-0.68 $\pm$ 0.43	1.12 $\pm$ 0.96	1.80	<0.001
Novelty	-0.69 $\pm$ 0.53	0.85 $\pm$ 0.92	1.54	<0.001

Implementation challenges included digital unfamiliarity, resistance to change, hardware limitations, unstable connectivity, and prescription workflow fragmentation. These were addressed through peer mentoring, onboarding, infrastructure upgrades, and integration of the Pharmacy Information System (PhIS). Strategic responses were mapped across workforce development, infrastructure, and sustainability (Table 2).

Table 2: Implementation Challenges, Strategic Actions, and Focus Areas in CCMS Rollout at FBHC

Challenge Identified	Action Taken / Implementation Step	Focus Area
Digital unfamiliarity	Onboarding, hands-on training, peer mentoring	Workforce development
Resistance to change	Assigned digital champions, mentoring	Change management
Inadequate hardware	Shared access, procurement planning	Infrastructure optimization
Connectivity instability	Network upgrades	Digital infrastructure
Staff turnover	Structured onboarding	Human resource stability
Prescription workflow fragmentation	Integrated PhIS with CCMS	Service integration
Post-rollout fatigue	Feedback loop, staggered rollout	Sustainability measures

Conclusion

The implementation of CCMS at FBHC led to significant improvements in system efficiency, user satisfaction, and digital confidence. UX scores improved across all domains, while operational challenges were addressed through adaptive strategies. This demonstrates that rural clinics can achieve impactful digital transformation with structured support and context-responsive rollout.

References

1. Samuels-Kalow ME, Jaffe T, Zachrisson KS. Digital health implementation across settings: a review of barriers and facilitators. *NPJ Digit Med*. 2022;5(1):21. doi:10.1038/s41746-022-00561-w
2. Greenhalgh T, Papoutsi C. Spreading and scaling up innovation and improvement. *BMJ*. 2019;365:l2068. doi:10.1136/bmj.l2068

Silent Burden: Insights into α -Thalassaemia Carrier Status from a Nationwide Adolescent Screening in Malaysia

Don Ismail Mohamed¹, Alisahkhairun Rahmat¹, Mohd Shahriel Mat Daud¹, Nurul Kausar Izzati binti Mohd Ghazali¹, Radziah Mohamad¹, Saidatul Norbaya Buang¹

¹ Family Health Development Division, Ministry of Health

Corresponding author's email: drdonismail@moh.gov.my

Summary

Silent carriage of α -Thalassaemia often remains unrecognized, despite its significant reproductive implications. This study aimed to determine the prevalence and characterize the genotypic spectrum of α -Thalassaemia carriers in Malaysia. Between 2017 and 2023, a total of 988,449 Form 4 students underwent Thalassaemia carrier screening and the findings demonstrated that α -Thalassaemia carriers represented the second most prevalent carrier group. Identified genotypes were further stratified into deletional and non-deletional subgroups. These results provide critical insights into the genotype distribution of α -Thalassaemia carriers in Malaysia and highlight the imperative for targeted genetic counselling and intervention strategies to mitigate potential reproductive risks.

Keywords

α -Thalassaemia, Thalassaemia carrier screening, genotype distribution

Introduction

α -Thalassaemia is the most common inherited disorder in Malaysia. Its clinical severity is determined by the number of affected α -globin genes¹. The condition arises from either deletional or non-deletional mutations in the α -globin gene, with deletional mutations being more prevalent. However, non-deletional forms are generally associated with more severe clinical outcomes compared to deletional forms². Malaysia's meta-population is highly heterogeneous, reflecting a rich diversity of ethnic, genetic, and cultural backgrounds³. Silent carriers of α -Thalassaemia ($-\alpha/\alpha\alpha$), involving single gene deletions, usually exhibit no clinical symptoms and maintain normal haematological profiles⁴. The relatively high frequency of non-deletional α -Thalassaemia mutations observed highlights the potential for severe phenotypic manifestations in offspring, particularly through compound heterozygosity involving different α -globin gene mutations in asymptomatic carrier parents.

Materials and Methods

This study employed a retrospective quantitative design using secondary data from the Form 4 Thalassaemia National Screening database. A total of 988,449 Form 4 students from various schools across Malaysia were screened between 2017 and 2023. The screening process involved the use of a combination of hematological and molecular diagnostic techniques. Data were analyzed by district and ethnic group. The specific prevalence of α -Thalassaemia carriers was calculated and further examined. The Malaysia Thalassaemia Diagnosis Code (MTDC) was used to classify the spectrum of α -Thalassaemia based on genotype. Upon confirmation of α -

Thalassaemia carriage, genotypes were categorized into two main subgroups: deletional and non-deletional. The deletional forms were primarily characterized by the presence of single or double gene deletions, including the --SEA deletion, which is prevalent in certain ethnic groups. Non-deletional mutations, including point mutations such as Hb Constant Spring, were also identified, with their frequencies recorded across different ethnic populations.

Results and Discussion

Over a five-year period, a nationwide screening program identified a Thalassaemia carrier rate of 59.1 per 1,000 students, with 58,428 confirmed carriers out of 988,449 students screened. α -Thalassaemia carriers were the second most prevalent group, with a carrier rate of 17.2 per 1,000 students. The state of Kedah reported the highest α -Thalassaemia carrier rate, at 43.9 per 1,000 students.

Genotypic analysis showed a varied distribution of α -Thalassaemia variations. Single-gene deletions were the most prevalent, comprising 52.59% of cases, followed by double-gene deletions at 22.60%, and heterozygous hemoglobin variants at 20.75%. Among individuals with single-gene deletions, 88.0% carried the $\alpha^{3\cdot7}$ deletion (MTDC code AP1). The --SEA deletion (MTDC code AZSE) was the most common double-gene deletion, accounting for 93.24% of such cases. For heterozygous hemoglobin variants, 86.42% were identified as Hb Constant Spring (MTDC code HVCS), a mutation linked to more severe clinical outcomes.

Table 1 : Distribution of α -Thalassaemia carrier according to group of genotypes among form 4 students screened 2017-2021

Genotype of α -Thalassaemia carrier	n	%
Compound Heterozygous - Deletional with others	650	3.8
CH12	200	30.8
CH1CS	426	65.5
CH2CS	22	3.4
CH2QS	1	0.2
HC1SE	1	0.2
Deletional - Double gene	3,832	22.6
AZ20	1	0.0
AZFI	199	5.2
AZME	7	0.2
AZSE	3,573	93.2
AZTH	52	1.4
Deletional - Single Gene	8,917	52.6
AP1	7,847	88.0
AP11	533	6.0
AP2	478	5.4
AP22	8	0.1
AP3	45	0.5
AP33	6	0.1
Non-deletional Heterozygous Hb Variant	3,519	20.8
HV30	8	0.2
HVAD	354	10.1

HVCS	3,041	86.4
HVCS with BV	1	0.0
HVEV	2	0.1
HVJM	3	0.1
HVOI	6	0.2
HVQS	96	2.7
HVQT	8	0.2
Rare Mutation	39	0.2
Grand Total	16,957	

The frequency of α -Thalassaemia carriers varied notably among ethnic groups, with higher prevalence observed in Malay and Chinese students. Among Malay carriers, 52.9% had single-gene deletions, most commonly the $\alpha^{3.7}$ deletion (MTDC code AP1), present in 89.2% of cases. In contrast, 73.5% of Chinese carriers had double-gene deletions, predominantly the --SEA deletion (MTDC code AZSE), found in 98.2% of cases.

Counselling individuals with α -Thalassaemia is particularly challenging due to the wide spectrum of genotypes and clinical presentations. Unlike β -Thalassaemia, which can often be explained using the Mendelian pattern of inheritance involving two genes, α -Thalassaemia involves multiple genes located in tandem on the same chromosome. This complexity, along with the varied severity ranging from silent carriers to fatal hydrops fetalis, makes genetic counselling for α -Thalassaemia more intricate and individualized compared to β -Thalassaemia.

Conclusion

A five-year screening program revealed a high prevalence of α -Thalassaemia carriers among Malaysian secondary school students, with significant ethnic differences in α -Thalassaemia genotypes. Malays primarily exhibited single-gene deletions, while Chinese students more often carried severe double-gene deletions, particularly the --SEA type. The presence of serious mutations like Hb Constant Spring and Hb Adana highlights the risk of severe Thalassaemia in future generations. These findings emphasize the need for continued screening, public education, and access to specialized genetic counselling, despite the challenges posed by the disorder's complex genetic and clinical diversity.

References

1. Raja Zahratul Azma, et al. Molecular characteristics of alpha thalassaemia among patients diagnosed in UKM Medical Centre. *Malays J Pathol.* 2014;36(1):27-32.
2. Harteveld CL, Higgs DR. Alpha-thalassaemia. *Orphanet J Rare Dis.* 2010;5(1):13.
3. Department of Statistics Malaysia. *Population distribution and basic demographic characteristics—2011* [Internet]. Putrajaya: Department of Statistics Malaysia; [cited 2025 Apr 29]. Available from: http://www.statistics.gov.my/portal/index.php?option=com_content&id=1215
4. Goh LPW, et al. Prevalence of alpha (α)-thalassaemia in Southeast Asia (2010-2020): a meta-analysis involving 83,674 subjects. *Int J Environ Res Public Health.* 2020;17(20):7354. doi:10.3390/ijerph17207354

Expanding the Role of Community Nurses in Rural Clinics for Elderly Care : Malaysia's Community-Based Ageing Initiative

Sheleaswani Inche Zainal Abidin¹, Noraliza Nordin Merican¹, Nurhayati Mardiah Manut¹, Nor Hasimawati Shaari¹, Shamsol Lot¹, Saidatul Norbaya Buang¹

¹Family Health Development Division, Ministry of Health Malaysia

Corresponding author: dr.sheleaswani@moh.gov.my

Summary

Malaysia's declining fertility rates have resulted in decreased utilisation of maternal and child health services at rural clinics. In response, a 2019 initiative aimed to broaden the role of Community Nurses by involving them in healthcare delivery for older adults. Their responsibilities include registering elderly individuals, conducting health risk screenings, providing health education, and making necessary referrals. The programme has since expanded to 434 designated rural clinics across all states. Evidence shows increased service utilisation among older adults, particularly in Perak, Kedah, and Pahang. This community-based strategy demonstrates the effective use of existing infrastructure to promote healthy ageing in rural areas.

Keywords

elderly health, rural clinics, community nurses, primary care, ageing population

Introduction

Malaysia is undergoing a demographic transition towards an ageing population, accompanied by a decline in fertility rates¹. This shift has contributed to the underutilisation of healthcare services in rural clinics (Klinik Desa, KD), presenting opportunities to optimise existing healthcare resources. In 2019, the Ministry of Health Malaysia launched a programme to expand the role of Community Nurses (Jururawat Masyarakat, JM) in delivering elderly-focused healthcare services. These expanded roles are aligned with the national framework on healthy ageing and aim to provide community-based care that supports the health and functional ability of older adults. The programme includes the registration of older persons and health screenings to identify risks early, enabling timely intervention and promoting overall wellbeing. Initially piloted in Perak and Pahang, the programme has since expanded nationwide. This study aims to describe the implementation process and analyse trends in healthcare utilisation and screening among older persons in selected rural settings from 2020 to early 2025, with a focus on state-level variations and implications for future planning.

Materials and Methods

The initiative was rolled out in phases between 2019 and 2025. Rural clinics were selected based on two main criteria: an average of fewer than 15 clients per day and the presence of at least two permanent Community Nurses. The programme targeted older adults aged 60 and above who lived within the operational areas of these clinics. Key activities included registering older persons and conducting health risk screenings using a standardised form. Individuals identified as at risk received early interventions, such as health education, advice on physical activity, and referrals to health clinics when necessary. Data from the Family Health Development

Division, covering the period from 2020 to March 2025, were used to develop Tables 1 and 2. These tables present trends in the number of older persons accessing healthcare services and undergoing screenings in selected rural clinics across various states, highlighting service uptake and geographical differences in implementation.

Results and Discussion

Tables 1 and 2 show an overall upward trend in the number of older persons receiving healthcare services and undergoing screenings at selected rural clinics. The highest figures were recorded in Perak, Kelantan, and Johor, indicating strong uptake of the programme in these states. Notably, there was a significant increase in service utilisation in 2024, which may be attributed to post-pandemic recovery², increased programme emphasis, or enhanced mobilisation of community health teams.

By early 2025, data in Tables 1 and 2 indicated sustained service momentum, with several states already approaching the figures recorded in 2024. The notable gains observed across various regions suggest a positive response to the programme and increased awareness among older adults. These findings also support Malaysia's ongoing efforts to prepare for its transition to aged nation status by 2030³.

However, disparities persist. States such as Pulau Pinang and Perlis showed only modest increases, highlighting variations in programme implementation or underlying population demographics. This uneven distribution may reflect differences in human resource capacity, infrastructure, or the reach of awareness campaigns.

The initiative demonstrates that, when empowered, Community Nurses can effectively extend primary care outreach to older persons in underserved areas. Integrated models like GeCares, along with national action plans on dementia and ageing, have likely contributed to the observed progress⁴. Community-based approaches are especially crucial for managing non-communicable diseases and preserving functional independence among the rural elderly population⁵.

Going forward, targeted capacity-building in underperforming states is essential. Sustained investment in community health teams, equitable allocation of resources, and ongoing monitoring will be key to closing service gaps and ensuring consistent progress nationwide.

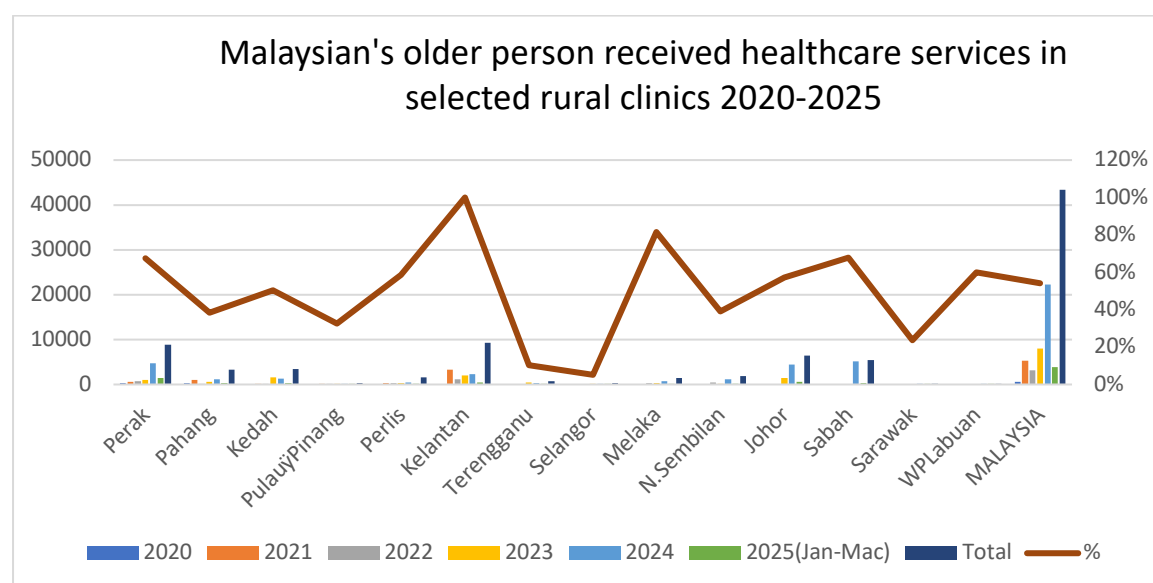


Figure 1: Trend of Older Persons Receiving Healthcare Services in Selected Rural Clinics in Malaysia (by State from 2020-2025)

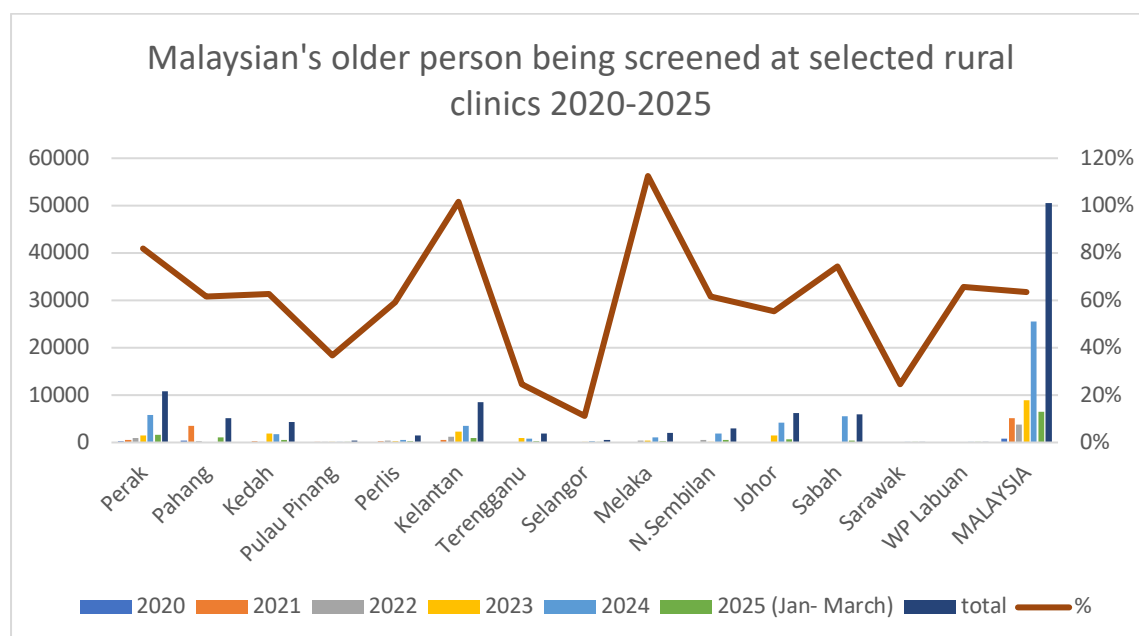


Table 2: Trend of Older Persons Screened by Community Nurses in selected rural clinics across various states in Malaysia from 2020-2025

Conclusion

Malaysia's rural elderly health programme shows promising trends, particularly in service expansion and human resources optimisation. However, addressing interstate disparities is critical. Future strategies should strengthen workforce capacity, equitable access, and data monitoring, ensuring readiness to meet the healthcare needs of an ageing nation by 2030.

References

1. World Health Organization. Ageing and health: key facts. Geneva: WHO; 2023 [cited 2025 May 27]. Available from: <https://www.who.int/news-room/fact-sheets/detail/ageing-and-health>
2. Ujang IRM, Hamidi N, Ab Hamid J, Sooryanarayana R. Impact of COVID-19 on primary care use in Malaysia: a focus on older adults. *BMJ Glob Health*. 2023;8(11):e011827.
3. Ministry of Health Malaysia. *Pelan Tindakan Perkhidmatan Kesihatan Warga Emas 2023-2030*. Putrajaya: Ministry of Health Malaysia; 2023.
4. Sooryanarayana R, Choo WY, Hairi NN. Healthy ageing in Malaysia by 2030. *Malays J Med Sci*. 2024;31(4):1-12.
5. Hamid TA, Yusof FA, Ibrahim R. Community health services for older persons in rural Malaysia: challenges and strategies. *Int J Public Health*. 2022;67:1604321.

Psychological Distress among Malaysian Infertile Individuals: A Comparison Between First Visit and Recurrent Fertility Clinic Visits

Noor Izni Mohamed Shapie ¹, Nik Daliana Nik Farid ², Rafdzah Ahmad Zaki ²

¹ Miri Divisional Health Office, Ministry of Health Malaysia

² *Department of Social and Preventive Medicine, Faculty of Medicine, Universiti Malaya, Malaysia*

Corresponding author's email: drnoorizni@gmail.com

Summary

Infertility is a distressing condition that significantly affect the psychological well-being of both men and women. In Malaysia, the cultural expectations and social pressures may amplify this distress. Nevertheless, the psychological distress may vary based on many factors including the type of visit to fertility clinic, particularly between first visit and recurrent fertility clinic visits. The results proved that infertile individuals attending first and recurrent visits experienced psychological distress with regards to infertility. However, those with recurrent visits had a significantly higher level of anxiety as compared to the first-time visitors. Thus, it is crucial to provide an early psychological intervention to prevent further detrimental mental health problems.

Keywords

Psychological distress, infertility, number of clinic visit, depression, anxiety, stress

Introduction

Psychological distress refers to a complex state of emotional and mental suffering which can impair an individual's cognitive, behavioural, and social functioning. Infertility is a deeply personal and often distressing experience that affects millions of individuals and couples worldwide¹. In Malaysia, infertility has become an increasingly prominent public health concern, with studies estimating that approximately 10-15% of Malaysian couples of reproductive age face difficulties in conceiving². While medical interventions and assisted reproductive technologies offer potential solutions, the emotional and psychological burden of infertility remains significant. This study aimed to examine the differences in perceived psychological distress between infertile individuals attending their initial and subsequent visits to fertility clinics.

Materials and Methods

This was a cross-sectional study using universal sampling. All eligible participants that came to the fertility clinic of the National Population and Family Development Board (LPPKN), Kuala Lumpur, Malaysia between February and April 2016 were included in the study. A total of 502 participants not known to have psychiatric disorder or organic brain disease were recruited. Data were collected using the self-administered Malay version of the Depression, Anxiety and Stress Scale (BM DASS-21). Descriptive and logistic regression analyses were conducted using SPSS Version 20.0.

Results and Discussion

Majority of participants were recurrent visitors to the fertility center (50.8%) at the time of participation, compared to first-time visitors (49.2%). The study found that recurrent visitors had a significantly higher prevalence of anxiety (62.7%) compared to first-time visitors (53.4%), p-value of 0.035 (95% CI: 1.03-2.10). This indicates that individuals with recurrent visit were 1.47 times more likely to experience anxiety than those visiting the clinic for the first time. No significant association were observed between the type of visits and the outcome of depression and stress in the study. The higher prevalence of anxiety among participants with recurrent clinic visits is attributed by the challenges encountered during the early stages of fertility treatment and management^{3,4}. Most infertility interventions require physically invasive and complex procedures, such as intrauterine insemination (IUI) and in vitro fertilisation (IVF), which are time-consuming, require multiple clinic visits, costly, mentally challenging, painful, with uncertain outcomes^{4,5}. Furthermore, the participants were anxious to know the outcomes of their involvement in the complex series of fertility procedures and interventions⁵.

Table 1: The differences in psychological distress (Depression) among infertile individuals who attend the first visit and recurrent visits to fertility clinic

Variables, Types of visits	Frequency, N %	Depression status, N (%)		OR (95% CI)	P-value
		Normal	Depression		
First time visit	247 (49.2)	172 (69.6)	75 (30.4)	1	0.535
Recurrent visit	255 (50.8)	171 (67.1)	84 (32.9)	1.16 (0.77,1.64)	

Table 2: The differences in psychological distress (Anxiety) among infertile individuals who attend the first visit and recurrent visits to fertility clinic

Variables, Types of visits	Frequency, N %	Anxiety status, N (%)		OR (95% CI)	P-value
		Normal	Anxiety		
First time visit	247 (49.2)	115 (24.6)	132 (53.4)	1	0.035
Recurrent visit	255 (50.8)	95 (37.3)	160 (62.7)	1.47 (1.03,2.10)	

Table 3: The differences in psychological distress (Stress) among infertile individuals who attend the first visit and recurrent visits to fertility clinic

Variables, Types of visits	Frequency, N %	Stress status, N (%)	OR (95% CI)	P-value
-------------------------------	-------------------	----------------------	-------------	---------

		Normal	Stress		
First time visit	247 (49.2)	170 (68.8)	77 (31.2)	1	0.887
Recurrent visit	255 (50.8)	177 (69.4)	78 (30.6)	0.97 (0.67,1.42)	

Conclusion

The study highlighted that fertility clinic visit-related differences are significantly associated with elevated level of anxiety among infertile individuals in Malaysia. These results underscore the importance of integrating the psychological screening, intervention and support in the fertility treatment protocols.

Acknowledgement

I would like to thank the Director General of Health of Malaysia, University Malaya Ethics Committee, and National Population and Family Development Board (LPPKN), Ministry of Women, Family and Community Development, Malaysia for granting me the permission to undertake this study. This study was partially funded by Post Graduate Research Grant, University of Malaya (Grant Number PG220-2015B).

References

1. Vayena E, Rowe PJ, Griffin PD. Current practices and controversies in assisted reproduction: report of a WHO meeting on medical, ethical and social aspects of assisted reproduction [Internet]. Geneva: World Health Organization; 2002 [cited 2025 May 27]. Available from: <http://whqlibdoc.who.int/hq/2002/9241590300.pdf?ua=1>
2. Vander Borgh M, Wyns C. Fertility and infertility: definition and epidemiology. Clin Biochem. 2018;**62**:2-10.
3. Musa R, Ramli R, Yazmie AWA, Khadijah MBS, Hayati MY, Midin M, et al. A preliminary study of the psychological differences in infertile couples and their relation to the coping styles. Compr Psychiatry. 2014;**55** Suppl 1:S65-S69. doi:10.1016/j.comppsy.2013.01.001
4. Stevenson EL, Sloane R. Certain less invasive infertility treatments associated with different levels of pregnancy-related anxiety in pregnancies conceived via in vitro fertilization. J Reprod Infertil. 2017;**18**(1):190-196. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5359857/>
5. Awtani M, Kapoor GK, Kaur P, Saha J, Crasta D, Banker M. Anxiety and stress at different stages of treatment in women undergoing in vitro fertilization-intracytoplasmic sperm injection. J Hum Reprod Sci. 2019;**12**(1):47-52. doi:10.4103/jhrs.JHRS_23_18

Maternal Mortality: A Situational Analysis from 2020 to 2024 in an East Coast State of Peninsular Malaysia

Nur Akmal Ismail¹, Nurnajayati Omar¹, Yazreen Najihah Mohd Nor¹, Siti Nor Shuhada Mustfar¹

¹ Family Health Sector, Terengganu State Health Department, Ministry of Health Malaysia

Corresponding author's email: dr.nurakmalismail@moh.gov.my

Summary

This five-year situational analysis (2020-2024) of maternal deaths in Terengganu recorded 51 cases, with the maternal mortality ratio fluctuating significantly, peaking in 2022. Indirect causes accounted for most deaths (60.8%), followed by fortuitous and direct causes. Notably, 68.6% of the cases were preventable, mainly due to medical and non-medical delays. The trend reflects a shift similar to high-income countries such as the United States, contrasting with global patterns where direct causes dominate. Strengthening healthcare access, emergency care systems, and addressing modifiable risk factors remain crucial for reducing maternal mortality in the state.

Keywords

Maternal death, maternal mortality, preventable death, direct causes, indirect causes

Introduction

Maternal mortality is defined as the death of a woman during pregnancy or within 42 days of its termination, due to causes related to or aggravated by the pregnancy or its management, excluding accidental or incidental causes. These deaths are categorized into direct, indirect, or fortuitous causes. In Malaysia, maternal deaths are reviewed through a structured system at district, state, and national levels to identify contributing factors and improve care. At the district level, hospitals and health clinics conduct investigations, followed by discussions in the District Maternal Death Committee. Reports are then forwarded to the State Maternal Mortality Review Committee and subsequently reviewed by the National Technical Committee through the Confidential Enquiry into Maternal Deaths (CEMD). This study aims to describe the sociodemographic profile, classify causes, assess preventability, and identify key medical and non-medical remediable or contributory factors in maternal deaths in Terengganu from 2020 to 2024.

Materials and Methods

This was a descriptive cross-sectional study based on maternal death reporting and review data from all eight districts in the state of Terengganu. No sample size calculation was required, as all reported maternal death cases during the study period were included. Data were manually extracted from maternal death reports covering a five-year period, from 2020 to 2024. The study included all cases involving women who died during pregnancy, childbirth, or within 42 days of delivery, excluding deaths due to accidental or incidental causes. Data compilation and analysis were performed using Microsoft Excel.

Result and Discussion

A total of 51 maternal deaths were recorded in Terengganu over the past five years. The trend of the maternal mortality ratio (MMR) per 100,000 live births in Terengganu over the five-year period showed notable fluctuations. From 2020 to 2022, there was a consistent increase, with the MMR rising from 24.8 per 100,000 live births in 2020 to 44.4 in 2021, and reaching a peak of 69.9 in 2022. This upward trend was followed by a significant decline to 11.4 per 100,000 live births in 2023. However, the ratio rose again to 39.5 per 100,000 live births in 2024. In terms of classification, indirect causes were the most common (60.8%), followed by fortuitous causes (21.6%) and direct causes (17.6%). Regarding preventability, 68.6% of the cases were considered preventable, 27.5% non-preventable, and 3.9% were undetermined. Among the preventable contributory factors, medical-related issues such as failure to diagnose, underestimation of severity, and delays or failures in referral were the most frequent. Non-medical factors included delays or failure in seeking treatment, non-compliance with therapy, and non-adherence to medical advice significantly contributed to preventable maternal deaths. The predominance of indirect causes, which accounted for 60.8% of maternal deaths in Terengganu, reflected a pattern similar to that observed in the United States, where indirect causes, particularly pre-existing medical conditions exacerbated by pregnancy had become the leading contributors to maternal mortality¹. This shift was associated with increased access to institutional deliveries and improved management of obstetric emergencies, reducing deaths from direct causes². However, this pattern contrasts sharply with global trends, where direct causes such as postpartum hemorrhage, eclampsia, sepsis, and obstructed labor still dominate, contributing to approximately 86% of maternal deaths worldwide³. The discrepancy suggested potential epidemiological transitions in maternal health, influenced by demographic shifts, access to healthcare, and the burden of non-communicable diseases.

Table 1: Preventability of maternal death in Terengganu 2020-2024 (n=51)

Variables	n	%
Preventable	35	68.6
Non-Preventable	14	27.5
Undetermined	2	3.9

Table 2: Classification of maternal death in Terengganu 2020-2024 (n=51)

Variables	n	%
Direct	9	60.8
Indirect	31	21.6
Fortuituous	11	17.6

Table 3: Sociodemographic of maternal deaths in Terengganu 2020-2024 (n=51)

Variables	Mean (SD)	n (%)
Maternal age	32.18 (5.110)	
Marital status		
Married		50 (98)
Unmarried		1 (2)
Ethnicity		
Malay		44(86.3)
Bumiputera		1(2)

Others		6(11.8)
Educational level		
Unschooling		6(11.8)
Primary		3 (5.9)
Secondary		30 (58.8)
Tertiary		12 (23.5)
Occupation		
Employed		16 (31.4)
Unemployed		35 (68.6)

Conclusion

This situational analysis highlights ongoing challenges in maternal health across Terengganu, with a substantial proportion of maternal deaths deemed preventable. Enhancing timely access to high-quality obstetric services, strengthening emergency care systems, and addressing socio-demographic disparities are essential steps towards lowering maternal mortality and improving maternal health outcomes in the state.

References

1. Joseph KS, Lisonkova S, Boutin A, et al. Maternal mortality in the United States: are the high and rising rates due to changes in obstetrical factors, maternal medical conditions, or maternal mortality surveillance? *Am J Obstet Gynecol*. **230**:440.e1-13; 2024.
2. Hossain N, Shaikh ZF. Maternal deaths due to indirect causes: report from a tertiary care center of a developing country. *Obstet Med*. **15**(3):176-179; 2022. doi:10.1177/1753495X211037916.
3. Filippi V, Chou D, Ronsmans C, et al. Levels and causes of maternal mortality and morbidity. In: Black RE, Laxminarayan R, Temmerman M, et al., editors. *Reproductive, Maternal, Newborn, and Child Health: Disease Control Priorities, Third Edition (Volume 2)*. Washington (DC): The International Bank for Reconstruction and Development / The World Bank; 2016 Apr 5. Chapter 3. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK361917/>

Evaluating the Effectiveness of an Antimicrobial Stewardship Program in Malaysian Primary Health Care

Noraini M Yusof¹, Hazirah M Noor², Bee Kiau³, Mardhiyah Kamal⁴, Marziaty Shazreena Mohd Shah⁵, Durga Murugia⁶, Wan Noor Azlin Wan Idris⁷, AF Azam Abd Rahman⁸, Izwan Effendy⁹

^{1,2} *Family Health Development Division, Ministry of Health, Malaysia*

³ *Klinik Kesihatan Bandar Botanik, Klang, Selangor*

^{4,5} *Pharmaceutical Services Programme, Ministry of Health, Malaysia*

⁶ *Klinik Kesihatan Taman Ehsan, Gombak, Selangor*

⁷ *Klinik Kesihatan Putrajaya Presint 9, WPKL & Putrajaya*

⁸ *Klinik Kesihatan Ayer Keroh, Melaka Tengah, Melaka*

⁹ *Klinik Kesihatan Puchong Batu 14, Petaling Selangor*

Corresponding author's email: drnorainimy@moh.gov.my

Summary

Antimicrobial Stewardship (AMS) in Primary Health Care is essential to address antimicrobial over-prescription which may lead to the development of antimicrobial resistance. This study aimed to evaluate the effectiveness of the AMS implementation in public Primary Health Care. Various strategies and activities were implemented with the aim of promoting appropriate antimicrobial prescription practices. Point Prevalence Survey and Antimicrobial Clinical Audit have been conducted annually to evaluate the effectiveness of AMS implementation. This study showed that AMS has effectively improved the appropriateness of antimicrobial prescribing rate. Continuous strengthening of AMS in public Primary Health Care is crucial to ensure sustainability.

Keywords

Antimicrobial Stewardship, Primary Health Care, antimicrobial resistance, Point Prevalence Survey, Antimicrobial Clinical Audit

Introduction

Antimicrobial resistance is a growing global concern, and the burden is estimated to increase (1,2,3). Although primary healthcare is known as the setting with high rate of antimicrobial prescription (4), little is known about the appropriateness of antimicrobial prescribing practices in Malaysia primary healthcare. Antimicrobial Stewardship (AMS) (5) in Primary Health Care has been introduced since 2019. Various AMS strategies and activities were planned and implemented with the aim of promoting appropriate antimicrobial prescription practices. This program comprises of continuous monitoring of the compliance to evidence-based practices, establishing the formulary restrictions, reporting antimicrobial surveillance (Defined Daily Dose), conducting process audit (clinical, structure and Point Prevalence Survey) and educating prescribers, pharmacists and paramedics in good antimicrobial prescribing practices. This study aimed to evaluate the effectiveness of the AMS implementation in Primary Health Care in Malaysia.

Materials and Methods

In 2015, PPS was first conducted one off across public Primary Health Care clinics. Since 2019, AMCA and PPS have been conducted annually as cross sectional audit-

based surveys in all public Primary Health Care clinics with Family Medicine Specialists (FMS) or Medical Officers (MO) and pharmacists.

PPS involves reviewing all patient medical records (manual/electronic) on a designated day to determine antimicrobial prescribing rates and FMS assessing URTI prescription appropriateness based on existing clinical guidelines.

For AMCA, 30 cards with antimicrobial prescription for URTI and non URTI cases were selected randomly in each public Primary Health Care clinic and audited by FMS and given audit scores based on existing guidelines to determine the antimicrobial prescribing practice. Descriptive analysis was performed using Microsoft Excel.

Effectiveness was assessed based on year-on-year trends in overall and URTI antimicrobial prescribing rate, URTI antimicrobial appropriateness and AMCA score.

Results and Discussion

The overall antimicrobial prescribing rate in Primary Health Care has declined from 8.9% in 2015 (pre-AMS implementation) to 4.3% in 2024, representing a 51.7% reduction. The percentage of antimicrobial use among URTI has also reduced by 44.2% from 12.9% in 2019 to 7.2% in 2024. The appropriateness of antimicrobial use among URTI patients showed an increasing trend, improving by 60.9% from 48.4% in 2019 to 77.9% in 2024. After five years of AMS implementation, the AMCA score increased by 64.6% from 55.3% in 2019 to 91.0% in 2024, reflecting overall prescribing practice has improved across all audited cases.

These improvements suggest that comprehensive AMS programs in public Primary Health Care can effectively improve prescribing practice. While the program has been highly effective, challenges such as initial prescriber's resistance, knowledge gap, patients' expectation and the impact of the COVID-19 pandemic on service delivery were observed.

This AMS program has potential for further scale up especially to private Primary Health Care Clinics through public private partnership.

A few limitations identified in this study included lack of a control group, as the program was implemented nationwide and incomplete documentation across all facilities.

Table 1: Prescription Received and Antimicrobial Prescribing Rate

Year	Total Prescription Received, n	Overall Antimicrobial Prescribing Rate, n (%)	Total URTI Prescription, n	Antimicrobial Prescribing Rate in URTI, n (%)
2015	69182	6172 (8.9)	3015	-
2019	91185	3762 (4.1)	11780	1516 (12.9)
2020	76802	3532 (4.6)	6406	589 (9.2)
2021	54228	1837 (3.4)	4076	172 (4.2)
2022	90635	4402 (4.9)	18527	1506 (8.1)
2023	110609	5812 (5.3)	21550	1842 (8.6)
2024	113866	4951 (4.3)	23820	1718 (7.2)

Table 2: Appropriateness of Antimicrobial Prescribed Among URTI Patients

Year	Appropriate	Inappropriate	Unable to Conclude
2019	734 (48.4)	356 (23.7)	426 (28.1)
2020	353 (59.9)	120 (20.4)	116(19.7)
2021	119 (69.2)	21 (12.2)	32 (18.6)
2022	1011 (67.1)	242 (16.1)	253 (16.8)
2023	1312 (71.2)	300 (16.3)	230 (12.5)
2024	1338 (77.9)	229 (13.3)	151.8)

Table 3: Antimicrobial Clinical Audit (AMCA) score

Year	AMCA Score >80% (%)	AMCA Score <80% (%)
2019	55.3	44.7
2020	66.7	33.3
2021	75.6	24.4
2022	80.0	20.0
2023	89.0	11.0
2024	91.0	9.0

Conclusion

Implementation of AMS has effectively reduced overall and URTI antimicrobial prescribing rates while improving prescribing practice and appropriateness in Primary Health Care. To ensure sustainability and greater impact, continuous monitoring, strategy strengthening, and expanding AMS to private practitioners are essential. Enhancing community awareness is also crucial in combating antimicrobial resistance.

References

1. WHO. World Antimicrobial Resistance Awareness Week 2024. <https://www.paho.org/en/campaigns/world-antimicrobial-resistance-awareness-week-2024> (accessed on 28 April 2025)
2. WHO. People-centred approach to addressing antimicrobial resistance in human health:WHO core package of interventions to support national action plan (2003)
3. Malaysian Action Plan on Antimicrobial Resistance (MyAP-AMR) 2022-2026
4. Teng CL, Tong SF, Khoo EM, Lee V, Zailinawati AH, Mimi O, Chen WS, Nordin S. Antimicrobials for URTI and UTI -- prescribing in Malaysian primary care settings. *Aust Fam Physician*. 2011 May;40(5):325-9
5. Dyar OJ, Huttner B, Schouten J, Pulcini C; ESGAP (ESCMID Study Group for Antimicrobial stewardshiP). What is antimicrobial stewardship? *Clin Microbiol Infect*. 2017 Nov;23(11):793-798

Integrating Primary Care and Public Health in Malaysia: A Path Forward for Primary Healthcare Reform

Rima Marhayu Abdul Rashid¹, Noor Haslinda Ismail², Saidatul Nurbaya Buang¹, Mohd Safiee Ismail¹.

¹ *Primary Medical Care Sector, Family Health Development Division, Ministry of Health Malaysia*

² *Jelevu District Health Office, Ministry of Health Malaysia*

Corresponding author's email: drmarhayu@moh.gov.my

Summary

Malaysia's healthcare system is at a pivotal stage of reform, particularly in primary healthcare (PHC), where fragmented service delivery between individual-level primary care and population-level public health remains a core challenge. This write-up proposes a dual-leadership model integrating Family Medicine Physicians (FMPs) and Public Health Medicine Specialists (PHMSs) to unify clinical care and population-health initiatives. Through enhanced governance, interoperable data systems, and community engagement, the model seeks to transform PHC into a more cohesive, equitable, and people-centered system aligned with the *Health White Paper* vision¹.

Keywords

Primary healthcare reform, Health White Paper, integrated leadership, primary care, public health, Malaysia

Introduction

As Malaysia transitions toward a resilient and equitable healthcare system, existing fragmentation and silos between primary-care services and public-health strategies pose barriers to continuity and efficiency². For example, the 2022 MOH review of district health services found that only 27 % of government primary-care clinics had interoperable electronic health records linked to district public-health units, leading to duplicated patient risk-factor screening in 41 % of cases¹. Likewise, tuberculosis contact-tracing data in 2023 showed that fewer than 60 % of symptomatic household contacts identified by public-health teams were successfully referred to FMP-led clinics for follow-up within 30 days⁴. These gaps illustrate how parallel data systems and uncoordinated workflows undermine seamless patient journeys and inefficient use of scarce health resources.

At the organisational level, budgeting and governance pathways remain split: primary-care allocations flow through the Family Health Development Division, whereas population-health funds are channeled via the Disease Control Division. Without structural reform, PHC is ill-equipped to meet the demands of evolving demographic, epidemiological, and social landscapes³.

Objectives

This paper presents a proposal for primary healthcare reform through the realignment of the leadership and operational scopes of primary care and public health at district level. The goal is to establish a more coherent and collaborative framework in which FMPs and PHMSs are clearly empowered to lead their respective domains—clinical care and population health—within an integrated governance structure^{2,4}. Furthermore, the initiative seeks to enhance overall service delivery by promoting stronger coordination between clinical and public-health functions, investing in improved infrastructure, and leveraging interoperable data systems to support more responsive, efficient, and people-centered services¹.

Methods

This conceptual analysis employed the WHO Primary Health Care Measurement and Improvement (PHCMI) Framework⁶ as the organising model. The PHCMI framework examines service-delivery reforms across five domains—governance, inputs, population health management, service delivery, and outcomes—providing a structured lens to map gaps and proposed interventions.

To identify international comparators, we conducted a purposive review of peer-reviewed literature, WHO country profiles, and OECD health-system reports published between 2015 and 2024. Four health systems with recognised success in integrating primary care and public-health functions were selected:

- United Kingdom (England): National Health Service Primary Care Networks and Integrated Care Boards¹⁰.
- Australia: Primary Health Networks with joint public-health planning mandates¹¹.
- Thailand: District Health System model under Universal Coverage Scheme¹².
- Canada (Ontario): Family Health Teams linked with Public Health Units¹³.

Key design features, implementation enablers, and outcome metrics from these jurisdictions informed the recommended dual-leadership configuration for Malaysia as proposed in Figure 1.

Results and Discussion

Malaysia's earlier 1Care for 1Malaysia⁵ proposal (2010 - 2012) envisioned a universal, integrated primary-care gatekeeping network financed through a national health-insurance mechanism. Although the initiative stalled, its core principles—comprehensive first-contact care, coordinated referral pathways, and population-level accountability—remain highly relevant. The dual-leadership model revives these principles by (i) assigning Family Medicine Physicians as clinical gatekeepers, (ii) embedding Public Health Medicine Specialists to steward population outcomes, and (iii) utilising interoperable digital platforms to provide the longitudinal patient records that 1Care originally envisaged⁶. In doing so, the proposal operationalises 1Care's conceptual framework without requiring wholesale financing reform, providing an incremental yet concrete pathway toward the same integrated PHC vision.

The dual-leadership structure positions FMPs to lead clinical care and PHMSs to spearhead population health at district level, aligning with the *Enhanced Primary Healthcare (EnPHC)* model highlighted in the 2024 Malaysian Health System Reform Report⁹. Integration ensures seamless transitions between individual and community

health services, improved resource allocation, and shared accountability⁷. Strategic priorities include workforce development, interoperable digital systems, and localised interventions^{2,3}. Pilot projects and stakeholder engagement are key to successful implementation⁸.

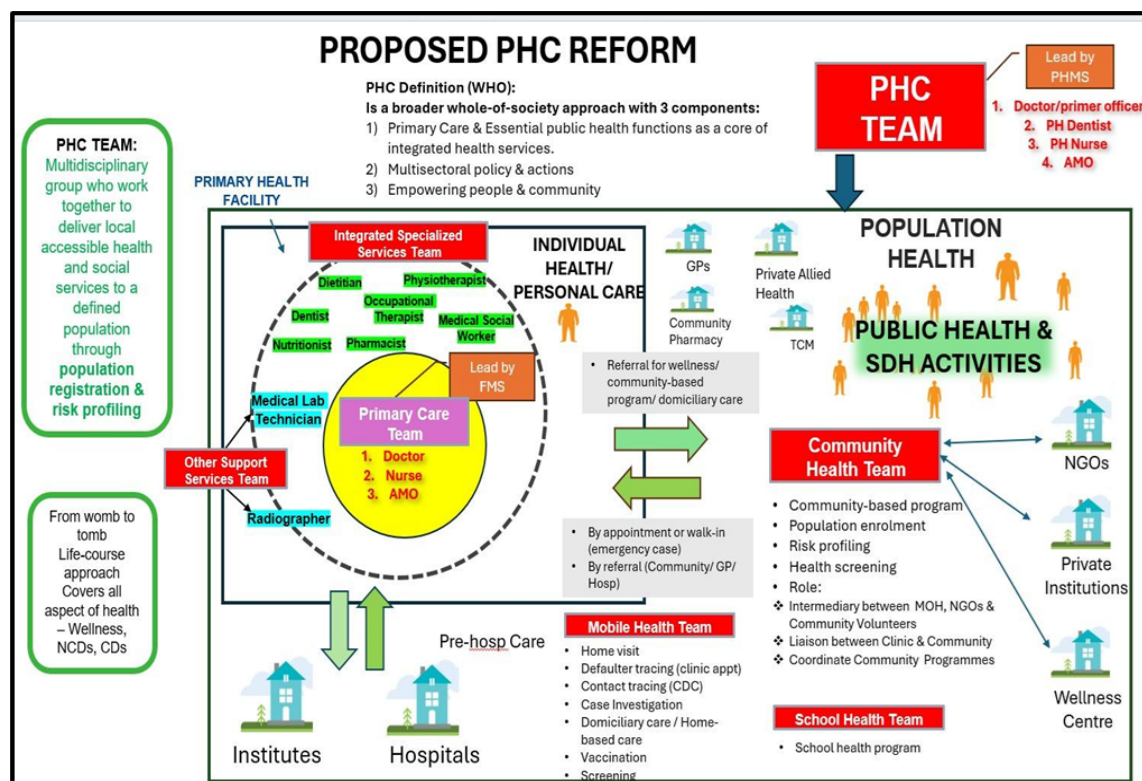


Figure 1. Proposed Future PHC Reform.

Conclusion

Integrating primary-care and public-health leadership under a unified PHC framework is central to Malaysia's health reform agenda¹. This model is designed to promote equity, efficiency, and responsiveness to both individual and community needs. However, a well-planned pilot, expansion in phases and stakeholder engagements are crucial to ensure successful implementation. With sustained investment and policy support, Malaysia is poised to deliver a stronger, more integrated healthcare system for the future.

References

1. Ministry of Health Malaysia. *Transformasi penjagaan kesihatan primer*. Putrajaya; 2024.
2. World Health Organization. *Operational framework for primary health care*. Geneva: WHO; 2022.
3. Starfield B. *Primary care: balancing health needs, services, and technology*. Oxford: Oxford University Press; 1998.
4. World Health Organization, UNICEF. *A vision for primary health care in the 21st century*. Geneva: WHO; 2018.
5. Ministry of Health Malaysia. *1Care for 1Malaysia: conceptual framework and strategy paper*. Kuala Lumpur: MOH Malaysia; 2012.
6. World Health Organization. *Primary Health Care Measurement and Improvement (PHCMI) Framework: technical report*. Geneva: WHO; 2023.

7. NHS England. *Evaluating the impact of Primary Care Networks on integrated service delivery: Year-2 report*. London: NHS England; 2023.
8. OECD. *Engaging stakeholders in health service innovation: lessons from primary care pilot projects*. Paris: OECD Publishing; 2022.
9. Ministry of Health Malaysia. *Malaysian health system reform report: Enhanced Primary Healthcare (EnPHC) recommendations*. Putrajaya: MOH Malaysia; 2024.
10. NHS England. *Primary Care Networks and Integrated Care Boards: progress report 2023*. London: NHS England; 2023.
11. Australian Government Department of Health and Aged Care. *Primary Health Networks Program: performance & evaluation report 2022*. Canberra: AGDHAC; 2023.
12. World Health Organization. *Thailand's district health system: integrating primary care and public health under universal coverage*. Geneva: WHO; 2021.
13. Ontario Ministry of Health. *Family Health Teams and Public Health Units: collaborative models for integrated primary care*. Toronto: Government of Ontario; 2022.

Seamless Healthcare, Digitally Delivered: Malaysia's Patient Summary Initiative

Chin Yangxin¹, Vivek Jason Jayaraj¹, Maheshwara Rao Appannan¹

¹ *Digital Health Division, Ministry of Health Malaysia*

Corresponding author's email: yang.xin@moh.gov.my

Summary

The Digital Health Division, Ministry of Health Malaysia, is establishing the Malaysia Digital Health Certification Network (MDHCN), aligned with WHO's Global Digital Health Certification Network (GDHCN). A key component is the Malaysia Patient Summary (MPS), adapted from WHO's International Patient Summary (IPS). Through two strategic workshops, six private healthcare groups successfully onboarded to a sandbox and essential MPS data elements were identified collaboratively. This approach ensures a standardised, interoperable patient summary, strengthening Malaysia's digital health landscape. Initial pilot implementation will target primary care clinics to improve care continuity, with uptake measured through system integration and patient summary exchange volume.

Keywords

Digital Health, Interoperability, Patient-Centred Health Information Exchange, Malaysia Digital Health Certification Network (MDHCN), Malaysia Patient Summary (MPS)

Introduction

The increasing complexity of healthcare delivery in Malaysia underscores the need for seamless health information exchange to support continuity of care and improve patient outcomes¹. Fragmented data systems and inconsistent documentation practices pose challenges to interoperability across healthcare settings². In response, the Digital Health Division, Ministry of Health Malaysia, is developing the Malaysia Digital Health Certification Network (MDHCN), aligned with the World Health Organization's Global Digital Health Certification Network (GDHCN)³. A key component of this initiative is the Malaysia Patient Summary (MPS), a standardised clinical document adapted from the WHO's International Patient Summary (IPS) specification⁴. The MPS aims to enable secure, efficient sharing of essential patient information nationwide. To ensure relevance and usability within the Malaysian context, a series of stakeholder engagement workshops were conducted to define the core data elements for the MPS, incorporating perspectives from healthcare providers, academia, and patient representatives.

Materials and Methods

The development of Malaysia Digital Health Certification Network (MDHCN) involved a multi-stage consultative process. Initially, a technical workshop on September 24th, 2024, successfully onboarded and tested the MDHCN system with six leading private healthcare groups within a sandbox environment. Subsequently, a two-day workshop was held on April 14th and 15th, 2025 to define a standardized Malaysia Patient Summary (MPS) as a critical element of the MDHCN. The first day convened

healthcare professionals from diverse specialisations across the Ministry of Health Malaysia, private healthcare, and academia. The second day engaged health advocacy groups. Participants were prompted with key questions to identify crucial information for the MPS from both provider and patient perspectives. Breakout sessions then focused on discussing and adapting the core data elements of the WHO IPS to the Malaysian context, facilitating a collaborative consensus-building process.

Results and Discussion

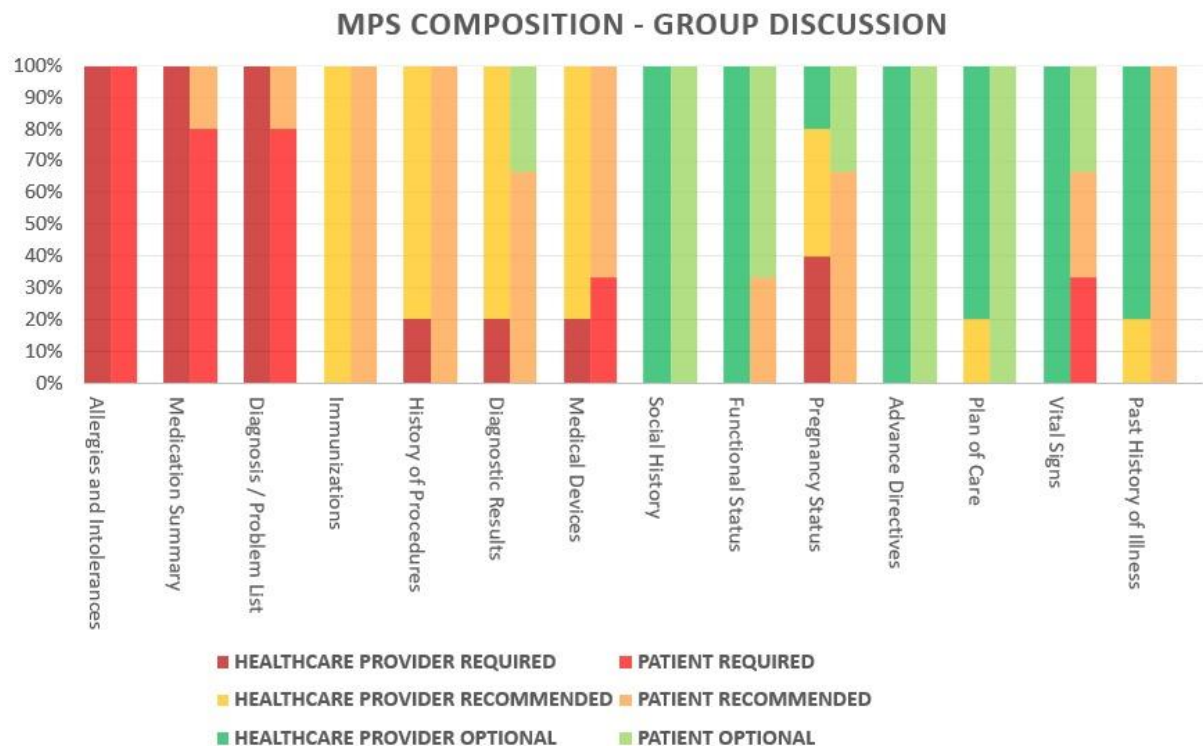
Stakeholder workshops yielded a significant consensus on the foundational data elements for the Malaysia Patient Summary (MPS), a crucial component of the MDHCN. *Allergies*, *Medications*, and *Diagnosis* were consistently identified as required fields across all stakeholder groups, underscoring their paramount importance for immediate clinical decision-making, patient safety, and effective communication amongst healthcare providers. This unanimous agreement highlights the recognised need for these core elements to ensure a baseline level of critical patient information is consistently available.

Furthermore, *Immunisations*, *History of Procedures*, *Diagnostic Results* and *Medical Devices* were strongly included as recommended fields. Stakeholders acknowledged the substantial value of these data points in providing a more comprehensive understanding of a patient's medical history and supporting holistic care. While not mandated, their strong endorsement suggests a broad recognition of their contribution to a richer and more informative patient summary.

Social History, *Functional Status*, *Advance Directives*, *Plan of Care* and *Vital Signs*, in contrast, were agreed upon as optional fields. This decision reflects a pragmatic approach, allowing for flexibility in the MPS to suit specific clinical contexts, data availability, and the intended use case of the summary, thereby acknowledging the diverse needs within the healthcare ecosystem. While *Pregnancy status* and *Past History of Illness* elicited mixed opinions, stakeholder feedback suggested a preference for classifying them as recommended fields over required or optional ones.

The strong stakeholder consensus achieved in these workshops underscores the feasibility of establishing a relevant and clinically meaningful MPS for Malaysia. Building upon this foundation, future efforts will focus on developing clear implementation guidelines, addressing data integration challenges across various systems, and piloting the MPS within diverse healthcare settings to ensure its practical utility and contribution to improved patient care and empowerment.

Graph 1: MPS Composition (Healthcare Provider and Patient Perspectives)



Conclusion

The collaborative workshops successfully defined the foundational framework for Malaysia Patient Summary (MPS), adapting the WHO IPS for Malaysian context. The identified core data elements represent a crucial step towards achieving seamless healthcare through the MDHCN, promising enhanced information sharing and improved patient care across the nation's healthcare ecosystem.

References

1. World Health Organization (WHO). Global strategy on digital health 2020-2025 [Internet]. Geneva: WHO; 2021 [cited 2025 May 11]. Available from: <https://www.who.int/publications/i/item/9789240020924>
2. Benson T, Grieve G. *Principles of health interoperability: SNOMED CT, HL7 and FHIR*. 3rd ed. Cham: Springer; 2016.
3. World Health Organization (WHO). Global Digital Health Certification Network (GDHCN) [Internet]. Geneva: WHO; 2023 [cited 2025 May 11]. Available from: <https://www.who.int/initiatives/global-digital-health-certification-network>
4. World Health Organization (WHO), HL7 International. *International Patient Summary (IPS) Implementation Guide* [Internet]. 2022 [cited 2025 May 11]. Available from: <https://www.hl7.org/fhir/uv/ips/>

Reaching the Unreachable: A Review of Malaysia's Mobile Clinic Services in Advancing Primary Health Care and Universal Health Coverage

Hidayatul Fariha Sulaiman¹, Mohamad Hafizan Abd Hadi², Mastura Mohamad Tahir¹, Juriati Ismail¹, Azah Abdul Samad¹, Christina Baun Lian¹, Abdul Shukor Salha¹, Azlie Ismail¹, Wan Mohd Izuadi Wan Mahmud¹

¹Family Health Development Division, Ministry of Health Malaysia

²Public Health Development Division, Ministry of Health Malaysia

Corresponding author's email: dr.hidayatul@moh.gov.my

Summary

Mobile Clinic Services (MCS) initiative aims to bridge the health care access gap for populations in remote areas of Malaysia, where static health facilities are inaccessible. This paper examines the historical development, implementation, challenges, and impact of MCS in enhancing health equity and supporting Malaysia's journey towards achieving Universal Health Coverage (UHC).

Keywords

Mobile Clinic Services, Primary Health Care, Universal Health Coverage, Malaysia.

Introduction

Since its inception in the 1940s, Mobile Clinic Services (MCS) has been one of Malaysia's efforts in delivering primary health care (PHC) to marginalized communities, particularly in remote regions¹. Strategically deployed to address geographical and socioeconomic barriers, MCS is delivered via land, water, and air transport².

Dedicated multidisciplinary mobile health teams, comprising a medical officer, an assistant medical officer, a nurse, and a driver or pilot, conduct scheduled monthly visits. At times, family medicine specialists, nutrition science officers and pharmacists are mobilized to ensure comprehensive health care management. Services encompassing health promotion, disease prevention, and curative care within the primary health care framework is given³.

As of 2024, MCS is served at 11 states namely Johor, Melaka, Negeri Sembilan, Selangor, Perak, Pahang, Kedah, Kelantan, Terengganu, Sabah and Sarawak⁴.

Materials and Methods

Data were primarily collected from internal Ministry of Health (MOH) documents which includes the monthly Mobile Clinic Services Census from 2014 to 2024 and the Annual Mobile Clinic Services Mapping Reports for year 2024. This report detailed client attendance, service types provided, and resource utilization.

Data compilation involved data submissions from MCS teams via Google Spreadsheet. It is then reviewed and verified by supervisors at the district, state and MOH Headquarters levels to ensure accuracy and completeness. Annual mapping reports underwent rigorous validation processes, through the same process at each level as mentioned above.

Descriptive statistical analysis utilized Microsoft Excel 360, calculating specific indicators such as total client visits per year, client distribution by service type, resource deployment patterns, and geographical coverage. Graphs were generated to visually represent data trends over the analyzed decade.

Results and Discussion

A) Service Distribution and Reach

Mobile Clinic Services (MCS) plays a pivotal role in delivering primary health care (PHC) to remote populations in Malaysia. Image 1 illustrates the highest number of service locations concentrated in Sarawak (1,089) and Sabah (424), reflecting the geographical challenges in East Malaysia. Significant service coverage is also seen in Pahang (278), Kedah (138), and Perak (121), serving Orang Asli settlements in forested, hilly terrains.

The sustained provision of MCS ensures that the population of interest receives essential health services and health education tailored to their needs and cultural context.

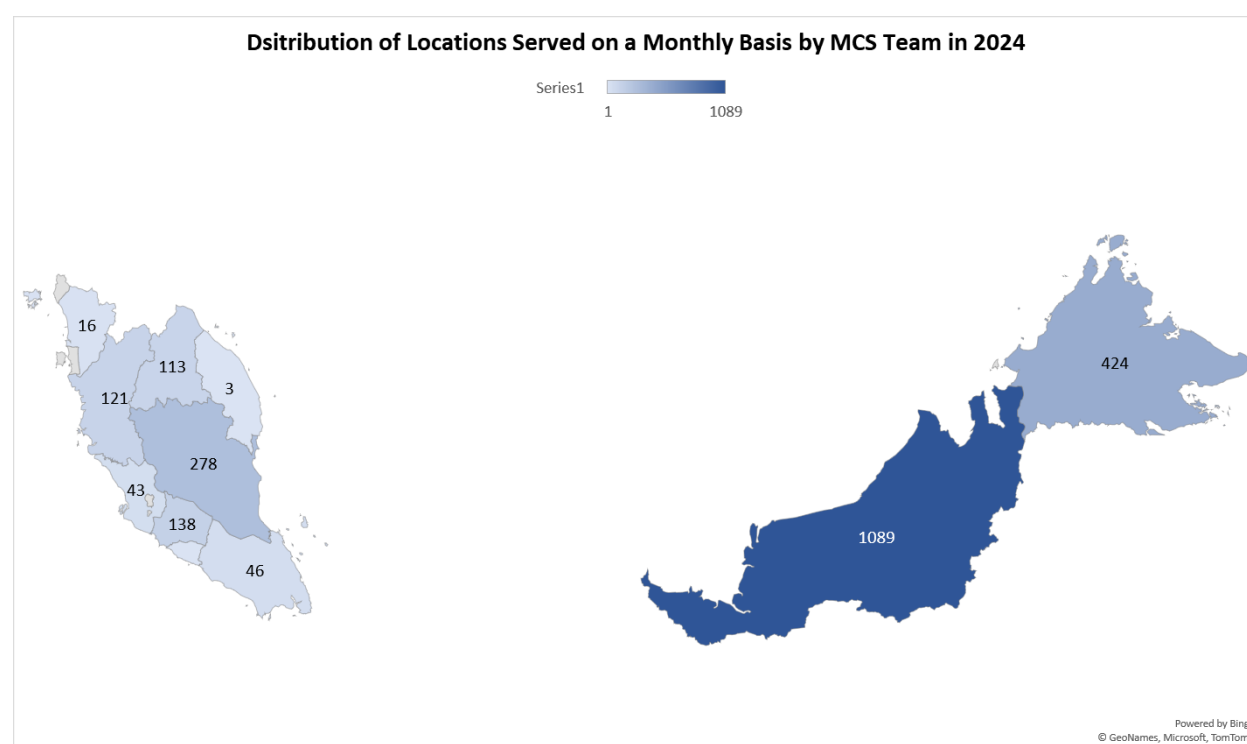
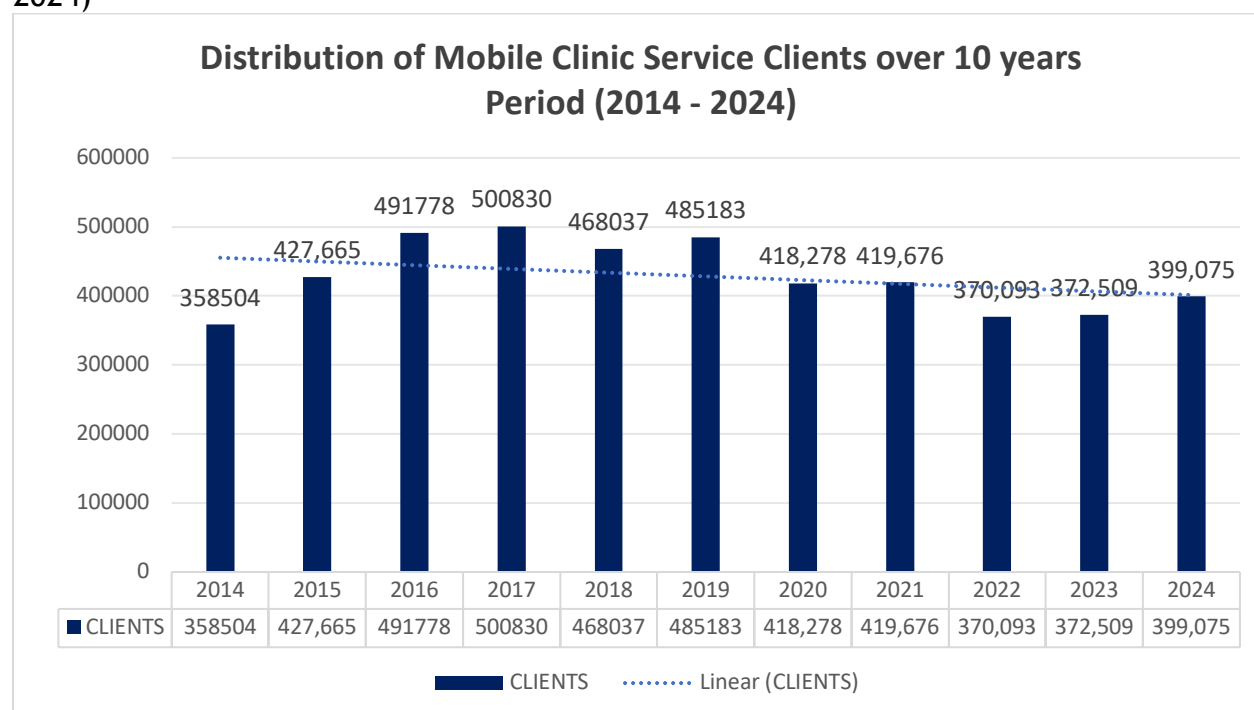


Figure 1: Distribution of location served on monthly basis by MCS team in 2024

B. Trends and Utilization Patterns

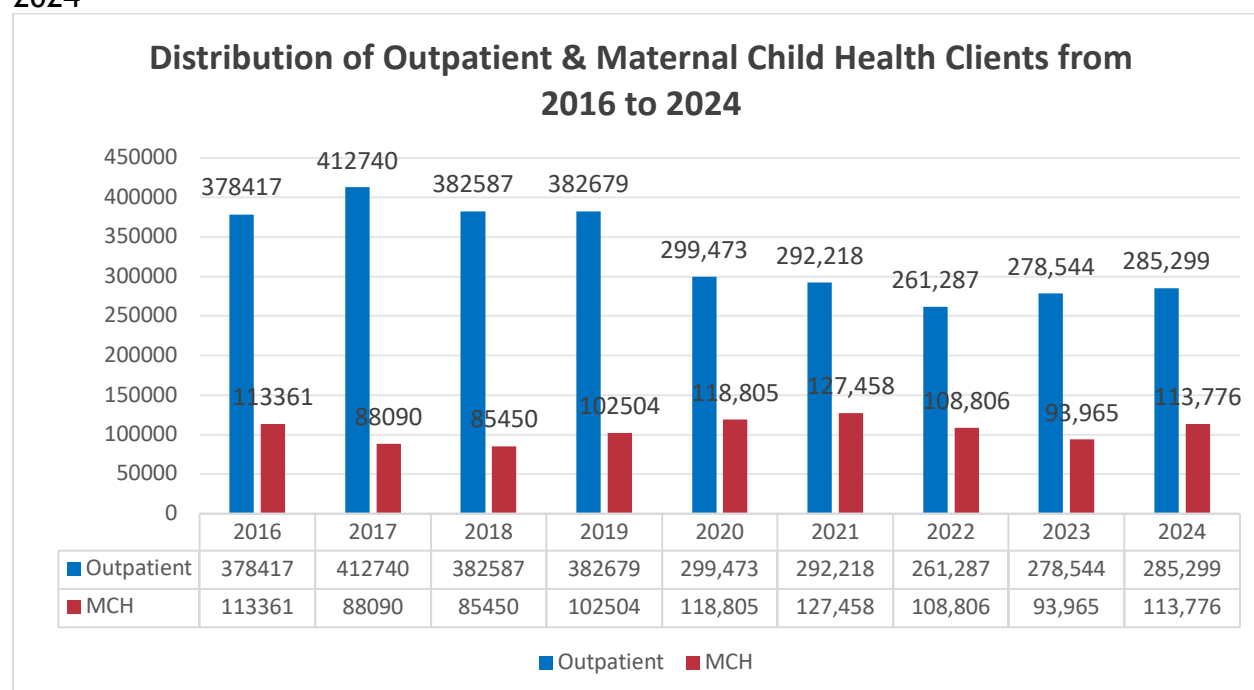
Over the past decade, client attendance has shown a gradual decline. **Graph 1** demonstrates a steady downward trend in total clients served from a peak of 500,830 in 2017 to 399,075 in 2024. This decline may be attributed to factors such as modernization efforts as well as urbanization to enhance access to static healthcare facilities particularly in rural areas where transportation connectivity and infrastructure have improved. Further analysis should be conducted including community feedback and local services expansion of data is necessary to confirm this trend. However, isolated communities living in remote areas still depend on MCS as the primary point of health care contact ensuring health equity.

Graph 1: Distribution of Mobile Clinic Service Clients over 10 years Period (2014-2024)



Graph 2 describes outpatient services as the most utilized component, although the numbers have decreased throughout the years. In contrast, Maternal and Child Health (MCH) care shows a steady increase from 93,965 in 2023 to 113,776 in 2024. This reflects targeted efforts by the Ministry of Health to prioritize vulnerable groups through MCS.

Graph 2: Distribution of Outpatient & Maternal Child Health Clients from 2016 to 2024



C) Challenge and Opportunities

One of the key challenges in delivering MCS is the need for understanding cultural context and sensitivity. Several studies and field reports support the importance of culturally sensitive health education and community engagement when working with indigenous population in Malaysia^{7,8,9}. Health-seeking behaviours influenced by traditional beliefs require community engagement and culturally appropriate health education. Understanding and integrating cultural beliefs into health education and health promotion have been shown to significantly enhance positive health-seeking behaviour as well as health literacy and acceptance within this community of interest.

Conclusion

Mobile Clinic Services (MCS) continue to play a pivotal role in delivering primary health care to Malaysia's remote population. Their commitment to overcoming barriers contributes significantly to health equity and supports the nation's progress towards Universal Health Coverage (UHC)⁵. Enhancing service delivery through multidisciplinary teams, inter-agency collaboration, and digital health innovations is needed to ensure that no one is left behind.

References

1. Kementerian Kesihatan Malaysia. (2014). *Garis Panduan Klinik Bergerak*. Putrajaya: KKM.
2. Kementerian Kesihatan Malaysia. (2015). *Garis Panduan Perkhidmatan Doktor Udara di Sabah dan Sarawak*. Putrajaya: KKM.
3. Ministry of Health Malaysia. (2023). *Monthly Mobile Clinic Services Reports*. Internal Documents.
4. Ministry of Health Malaysia. (2023). *Annual Mobile Clinic Services Mapping Reports*. Internal Documents.
5. World Health Organization. (2020). *Primary Health Care on the Road to Universal Health Coverage: 2019 Monitoring Report*. Geneva: WHO.
6. Institute for Public Health. (2020). *National Health and Morbidity Survey (NHMS) 2019: Volume I - NCDs & Health Care Demand*. Putrajaya: NIH, KKM.
7. Husin NA, Bakar AA. Healthcare professionals' experiences in managing growth of Orang Asli children in Malaysia: a qualitative study. 2022.
8. Sarmila MS, Mohd SAS, Mohd FA, Wong LP. Cultural beliefs, mental health literacy, and help-seeking behaviours among young Sarawak Indigenous adults. 2023.
9. Ismail NR, Raduan SR. Community participation and volunteering among Orang Asli during the measles outbreaks in Kelantan: an ethnographic perspective. *ResearchGate*. 2023.

Alcohol Consumption Patterns among Urban Residents in Malaysia

Fazila Haryati Ahmad¹, Mohd Hatta Abd Mutalip¹, Halizah Mat Rifin¹

¹Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: fazila.haryati@moh.gov.my

Summary

Geographical location is an important contributing factor to alcohol consumption patterns due to physical environment and individual socioeconomic impact. Studies have shown that urban alcohol drinkers are higher compared to rural with harmful alcohol drinking patterns. Harmful alcohol consumption impacts the public health scene significantly in the short and long term disease burden. This study will show the patterns of urban alcohol consumers, its associated factors, as well as their consumption patterns. It was found that the proportion of alcohol drinkers in urban areas was higher among males, younger adults, Chinese ethnicity and those with higher income. In an increasingly urbanised Malaysia, understanding these factors and circumstances can help align public health strategies to reduce the burden of alcohol-related diseases, both now and in the future.

Keywords

Alcohol, urban, current drinkers, Malaysia.

Introduction

Geographical location is an important contributing factor to alcohol consumption patterns due to availability, income, economic impact and socioenvironmental impact¹. Some studies have shown that urban drinkers are higher compared to rural drinkers^{2,3}. This study will show the differences between urban current alcohol consumers, their consumption patterns, as well as factors that influence them. Understanding these factors can align the public health strategy in reducing the burden of alcohol-related diseases in Malaysia, and better understand and focus on treatment and management of specific groups of drinkers.

Materials and Methods

This was a cross-sectional study using a randomised sampling method. Enumeration blocks and houses were selected using Department of Statistics Malaysia data. Alcohol consumption data were obtained from eligible respondents aged 13 and above using a self-administered questionnaire, which included the validated 10-item Alcohol Use Disorder Identification Test (AUDIT)⁴. Screening questions identified “current drinkers” as any alcohol consumption in the past 12 months, who were required to complete the full AUDIT questionnaire. Harmful drinking pattern categories were underage drinkers (≤ 21 yo), binge drinkers (consumed ≥ 6 standard drinks in one sitting), heavy episodic drinkers (binged at least weekly) and risky drinkers (AUDIT scores ≥ 8)⁴. Analysis focused on the relationship between current drinkers in urban areas with different sociodemographic factors, and harmful drinking patterns. Descriptive statistics and chi-square tests ($p < 0.05$) were used, with data analysed using IBM SPSS version 29.0.

Results and Discussion

The total eligible respondents aged 13yo and above were 11,713. 11,607 answered the questionnaire with a response rate of 99.1%. The prevalence of current drinkers in Malaysia were 9.6% (n=833). The prevalence of urban drinkers was 9.9% (n= 650). Mean age of urban drinkers was 38.5yo. Among urban drinkers, it was found that there were more male drinkers compared to females (67.8%), higher in those aged less than 40yo (61.2%), Chinese ethnicity (58.8%), those with secondary or tertiary education (87.1%), employed (79.1%) and those with higher income (51.9%). The proportion of underage drinkers in the urban locality were 6.0%, binge drinkers 42.90%, heavy episodic drinkers 9.9% and high risk drinkers 18.4%. Age and marital status were not significant associated factors ($p>0.05$).

Alcohol consumption patterns vary across populations and are influenced by urbanisation, which can increase accessibility and normalisation of drinking culture, as well as associated stressors that may drive individuals to use alcohol for relief or social bonding⁵. In Malaysia, current urban alcohol drinkers are more commonly male, of Chinese ethnicity and younger adults which may be due to their certain cultural and social norms. Alcohol consumption is also higher among those who are employed and with a higher income that correlates with increased drinking given the relatively high cost of alcohol in the country.

Table 1: Proportion of urban current alcohol drinkers according to sociodemographic factors

Factors		n	Proportion (%)	p value
Gender	Males	427	67.8	0.041
	Females	223	32.2	
Age	≤40yo	327	61.2	0.785
	>40yo	323	38.8	
Ethnicity	Malay	32	3.5	<0.001
	Chinese	337	58.8	
	Indian	104	12.5	
	Bumiputera Sabah	65	5.6	
	Bumiputera Sarawak	76	11.3	
	Others	36	8.3	
Marital status	Never married or separated	247	43.5	0.860
	Married/Living with partner	401	56.5	
Education	Primary or below	97	9.7	0.002
	Secondary or above	550	82.9	
Employment	Employed	479	79.1	0.012
	Unemployed	170	20.9	
Monthly income	<RM2000	114	10.5	0.008
	RM2000-RM6000	234	28.4	
	≥RM6000	300	58.5	

Table 2: Proportion of urban current alcohol drinkers according to harmful alcohol consumption patterns

Drinking patterns	n	Proportion (%)	95% CI (lower)	95% CI (upper)	p value
Underage drinkers	41	6.0	3.90	9.10	0.046
Binge drinkers	340	42.90	36.50	49.60	0.079
Heavy episodic drinkers	92	9.9	7.00	13.80	0.143
Risky drinkers (AUDIT score ≥8)	138	18.4	13.90	23.90	0.005

Conclusion

A targeted urban public health strategy to promote safer drinking behaviours is needed. Early screening, youth-focused counselling, and stronger regulation of alcohol sales and advertising can help reduce alcohol-related disease burden, particularly in urban settings where these behaviours appear to be more pronounced.

References

1. Sun Y, Li J, Jin X, *et al.* Intra-urban excessive alcohol drinking: geographic disparities, neighborhood characteristics and planning implications. *Sustain Cities Soc.* 2019;**46**:101414. doi:10.1016/j.scs.2018.12.042
2. Villalbí JR, Espelt A, Sureda X, *et al.* The urban environment of alcohol: availability, promotion and visibility in Barcelona neighborhoods. *Adicciones.* 2018;**950**. doi:10.20882/adicciones.950
3. Dixon MA, Chartier KG. Alcohol use patterns among urban and rural residents: demographic and social influences. *Alcohol Res.* 2016;**38**(1):69-77. PMID: 27159813; PMCID: PMC4872615
4. World Health Organization. *AUDIT: the Alcohol Use Disorders Identification Test - Guidelines for Use in Primary Care.* 2nd ed. Geneva: World Health Organization; 2001. Available from: <https://apps.who.int/iris/handle/10665/67205>
5. Yu J, Sumerlin TS, Goggins WB, *et al.* First- and second-hand alcohol-related harms among urban Chinese: a population-based study from Hong Kong. *Drug Alcohol.* 2022;**41**(1):208-20

A Simulation-Based Cost-Effectiveness Analysis of Reflex DNA Versus Multi-Sample Adolescent Screening for Thalassaemia in East Malaysian Schools

Azrin Syahida Abd Rahim¹, Don Ismail Mohamed², Nour El Huda Abd Rahim³

¹ *School of Medicine, Business Healthcare Management, International Medical University, 126, Jalan Jalil Perkasa 19, Bukit Jalil, 57000 Kuala Lumpur, Malaysia*

² *Family Health Development Division, Ministry of Health, Precinct 1, Federal Government Administrative Centre, 62590 Putrajaya, Malaysia*

³ *Department of Basic Medical Sciences, Kulliyyah of Medicine, International Islamic University Malaysia, Jalan Sultan Ahmad Shah, 25200 Kuantan, Pahang, Malaysia*

Corresponding author's email: ajeansyahida09@gmail.com

Summary

This study compares the cost-effectiveness of two school-based thalassemia screening protocols—multi-sample (P1) and Single-sample Reflex DNA (P2)—in Sabah and Sarawak using 2018 National Thalassaemia Screening (NTSP) data. Although P2 was 9-11% costlier upfront, it eliminated dropouts and improved carrier detection. Sabah, a high-prevalence state, demonstrated superior cost-effectiveness with P2 (RM379.95 per carrier detected) compared to Sarawak (RM821.85). Lifetime treatment cost savings for avoided births with thalassemia major were substantial. The findings support the phased implementation of P2, starting with high-prevalence states, to reduce the economic burden on Malaysia's healthcare system.

Keywords

Thalassemia, school-based screening, simulation-based analysis, Reflex DNA, dropout rates

Introduction

Thalassemia remains a significant public health concern in Malaysia, with an estimated lifetime treatment cost of RM2.66 million per transfusion-dependent patient¹. Since 2016, the Ministry of Health Malaysia has implemented the National Thalassaemia Screening Programme (NTSP), targeting Form Four students through a school-based multi-sample approach (P1)². However, the multi-stage workflow contributes to significant dropout rates. In 2018 alone, 2,950 students in Sabah and 2,836 in Sarawak discontinued the screening, resulting in missed carrier detection and a preventable disease burden. To address this, an alternative strategy Single-sample Reflex DNA approach (P2) was retrospectively modelled using 2018 data. This study aims to compare the cost-effectiveness of P1 and P2 in Sabah and Sarawak and evaluate the potential national impact of adopting P2.

Materials and Methods

A retrospective, simulation-based cost-effectiveness analysis used 2018 NTSP data involving 36,860 students from Sabah and 35,161 from Sarawak. Two protocols were compared as shown in Table 1.

Table 1: Comparing P1 and P2 steps involved

Step	Conventional Multi-Sample (P1)	Single-Sample Reflex DNA (P2)
Enrolment	Form 4 students enrolled	Form 4 students enrolled
Consent	Consent obtained	Consent obtained
Sample Collection	3 separate samples (Full Blood Count (FBC), Haemoglobin Analysis (HbA), DNA testing)	Single blood sample collected
Suspected Carrier	Identified after HbA	Identified after same sample tested
DNA Confirmation	Requires return visit	DNA test done reflexively from same sample
Dropout Risk	At 3 stages: FBC-Hb, Hb-DNA, before post-test	Zero dropout risk
Time to Completion	6-12 months	<3 months

As P2 was not implemented in 2018, a hypothetical simulation was applied assuming full compliance, zero dropout, and equivalent diagnostic sensitivity. Direct medical costs from a provider perspective were included, with no discounting due to the single group of students.

The effectiveness of Incremental Cost-Effectiveness Ratio (ICER)³ was measured by comparing the cost difference and dropout reduction between P2 and P1, reflecting the additional cost per dropout averted using this calculation:

ICER = (Cost of P2 - Cost of P1) / (Dropouts averted by P2 - Dropouts averted by P1)
 Cost per carrier and lifetime savings from prevented births were estimated using inter-carrier marriage rates of 2%, 4%, and 6% with a 25% inheritance risk⁴. Sensitivity analysis benchmarked P2's ICER against the WHO threshold (RM25,000-75,000)⁵. Crucially, nationwide scale-up requires real-world pilot studies to assess operational feasibility.

Results and Discussion

While P2 incurred higher upfront costs (Sabah: RM793,326; Sarawak: RM485,716) compared to P1, it proved cost-effective. The ICER per averted dropout was RM25.14 (Sabah) and RM22.19 (Sarawak), which is well below the WHO threshold of RM25,000-75,000 (1-3 times the GDP per capita), indicating excellent economic value. Additionally, the cost per carrier detected was lower in Sabah (RM379.95) than in Sarawak (RM821.85), reflecting greater efficiency in high-prevalence settings.

The P2 eliminated all dropouts, compared to 2,950 in Sabah and 2,836 in Sarawak under P1, and increased diagnostic yield. Further analysis estimated 286 and 57 additional carriers detected, respectively. This translates to a 12% increase in detection in Sabah and 5% in Sarawak. Fisher's Exact Test confirmed the statistical significance of dropout elimination ($p < 0.001$) (Figure 1).

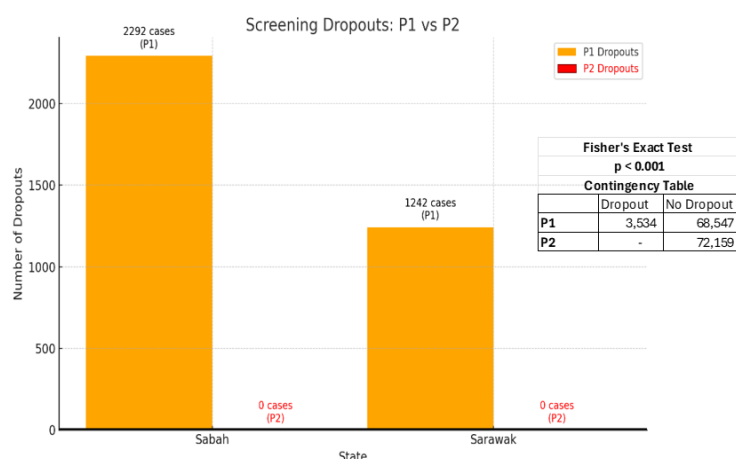


Figure 1: Dropout Comparison for P1 vs P2 Protocols using Fisher's Exact Test

Projected long-term savings were substantial. If the missed carriers under P1 entered inter-carrier marriages (2%-6%) (Figure 2), the lifetime treatment cost potentially avoided ranged from RM3.8 million to RM11.4 million in Sabah, and RM758,000 to RM2.3 million in Sarawak. These estimates were modelled using inter-carrier marriage probabilities and a 25% Mendelian inheritance risk⁴.

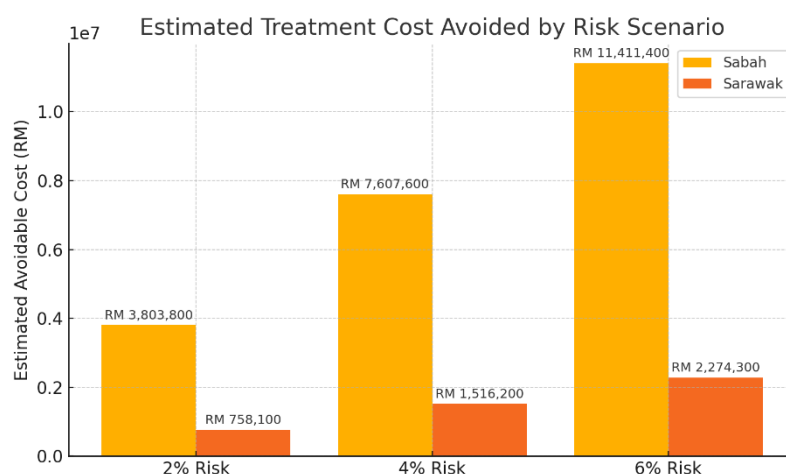


Figure 2: Estimated Avoidable Cost by Risk Scenario Under P1 Enter Inter-Marriages

With each thalassaemia major case costing RM2.66 million in lifetime treatment, the case for P2 is reinforced by both short-term diagnostic gains and long-term healthcare savings. Table 2 summarises the comparative performance of P1 and P2.

Table 2: Comparative Performance of Conventional (P1) vs. Reflex DNA (P2) Screenings

Item	Conventional Multi-Sample (P1)	Single-Sample Reflex DNA (P2)	Gains with P2
Dropouts	2,950 (Sabah) 2,836 (Sarawak)	0	100% dropout elimination
Carriers Detected (Est.)	~1,500 (Sabah) ~1,100 (Sarawak)	286 (Sabah) 57 (Sarawak)	12% (Sabah), 5% (Sarawak)
Cost per Carrier Detected	Not available	RM379.95 (Sabah) RM821.85 (5wk)	Lower in high-prevalence areas
ICER per Dropout Averted	Not available	RM25.14 (Sabah) RM22.19 (Sarawak)	Highly cost-effective
Preventable Treatment Costs	Not available	RM3.8M-11.4M (Sabah) RM758K-2.3M (Sarawak)	Significant long-term savings

Conclusion

The P2 approach demonstrates superior cost-effectiveness and operational efficiency compared to the P1 strategy, particularly in high-prevalence states such as Sabah. While based on modelled projections using retrospective data, these findings justify phased implementation, preceded by pilot studies, to reduce thalassaemia births and generate long-term savings across Malaysia's healthcare system.

Acknowledgements

The authors thank the Ministry of Health Malaysia and International Medical University for access to data and research support.

References

1. Shafie AA, Wong JHY, Ibrahim HM, Mohammed NS, Chhabra IK. Economic burden in the management of transfusion-dependent thalassaemia patients in Malaysia from a societal perspective. *Orphanet J Rare Dis*. **16**(1):1-12; 2021.
2. Division of Family Health Development, Ministry of Health Malaysia. *Thalassemia Screening Guidelines for Form 4 Students*. 2016:80. (Unpublished).
3. Incremental Cost-Effectiveness Ratio (ICER) [online]. York: York Health Economics Consortium; 2016. Available from: <https://yhec.co.uk/glossary/incremental-cost-effectiveness-ratio-icer/>
4. Kandolin M, Pöyhönen M, Jakkula E. Estimation of carrier frequencies utilizing the gnomAD database for ACMG recommended carrier screening and Finnish disease heritage conditions in non-Finnish European, Finnish, and Ashkenazi Jewish populations. *Am J Med Genet A*. **194A**:e63588; 2024.
5. World Health Organization. *Macroeconomics and health: investing in health for economic development: report of the Commission on Macroeconomics and Health*. Geneva: WHO; 2001:202-202.

OCCUPATIONAL HEALTH/ ENVIRONMENTAL HEALTH/ SOCIAL& HEALTH BEHAVIOUR/ OTHERS

OESHPP01 / 183

Effect of employer-sponsored health coverage on oral healthcare utilisation: Findings from National Health and Morbidity Survey (NHMS) 2019

Nur Elina Abdul Mutalib¹, Suhana Jawahir¹, Jabrullah Ab Hamid¹, Devi Shantini Rata Mohan¹, Adilius Manual¹, Iqbal Ab Rahim¹, Sarah Nurain Mohd Noh¹, Awatef Amer Nordin¹

¹Centre for Health Equity Research, Institute of Health Systems Research, National Institutes of Health, Ministry of Health Malaysia, Selangor, Malaysia

Corresponding author's email: nurelina.am@moh.gov.my

Abstract

This study explored the prevalence, determinants and socioeconomic inequalities of oral healthcare utilisation among adults in Malaysia with employer-sponsored coverage. Data from National Health and Morbidity Survey (NHMS) 2019 was used for descriptive statistics, logistic regression and concentration index (CI) analysis. Determinants for oral healthcare utilisation were female, aged 18-59 and 40-59, Malay and Indian ethnicities and high-income groups. CI analysis indicated that the distribution curve exhibits a less pro-rich tendency within this subpopulation. These results highlight the potential employer-sponsored coverage in ensuring equitable access to oral healthcare utilisation among employees.

Keywords

Oral healthcare services utilisation, determinants of healthcare use, Malaysia, employer-sponsored health coverage, socioeconomic inequalities

Introduction

In Malaysia, financial coverage for oral healthcare remains limited, with many individuals relying on out-of-pocket payments due to insufficient insurance options or lack of employer coverage for oral healthcare^{1,2}. This lack of comprehensive oral health coverage can lead to disparities in oral health access, particularly among lower-income groups who may forego necessary treatments. The increasing recognition of oral health as a crucial component of overall health has led to a growing interest in understanding the factors influencing oral healthcare utilisation. This study aims to explore the prevalence and determinants of oral healthcare utilisation among adults in employer-sponsored coverage as well as the socioeconomic inequalities of oral healthcare utilisation among those with or without employer-sponsored coverage. By identifying determinants and socioeconomic inequalities of oral healthcare utilisation, the research aims to provide insights into optimising employer-sponsored coverage for oral health to ensure better oral healthcare access and outcomes.

Methods

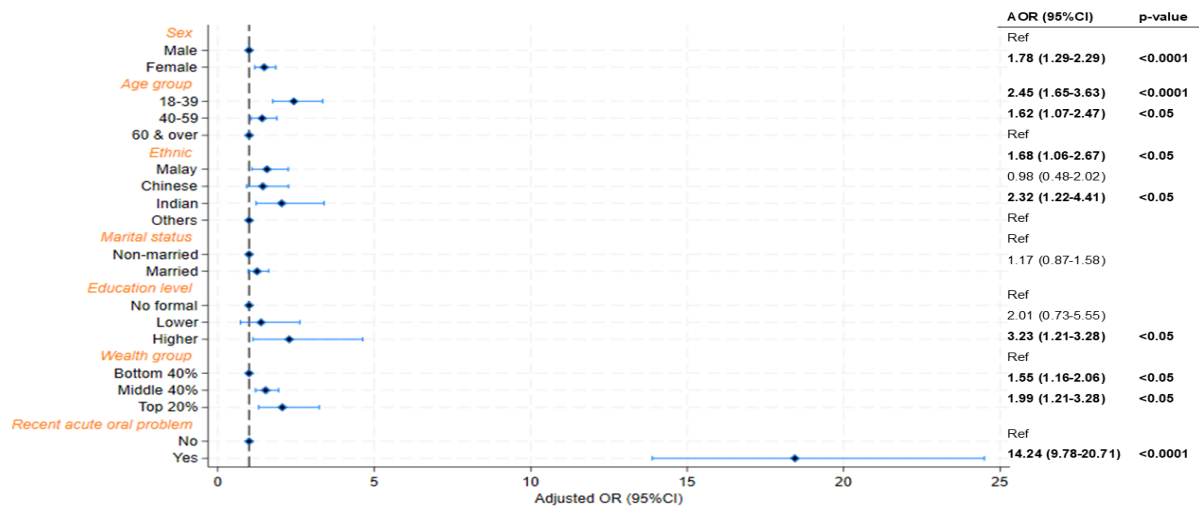
Secondary data analysis from NHMS 2019 among adults aged 18 and older (n=11,674), were performed. The survey employed a random two-stage, stratified, proportional-to-size sampling design to select a nationally representative sample. Oral healthcare utilisation refers the self-reported utilisation oral healthcare services in the past 12 months, while employer-sponsored coverage refers to any possession of government guarantee letter (G/L) or employer-sponsored health insurance or panel clinics. Descriptive statistics and logistic regression were also performed. Covariates included were sex, age groups, ethnicities, marital status, education level, income groups and recent acute oral health problem. The CI was used to assess socio-economic inequality. The positive CI demonstrates pro-rich inequality and vice versa, while a value of 0 indicates equal distribution. All analyses were conducted using STATA v18, taking into account the sampling weights and study design.

Results and discussion

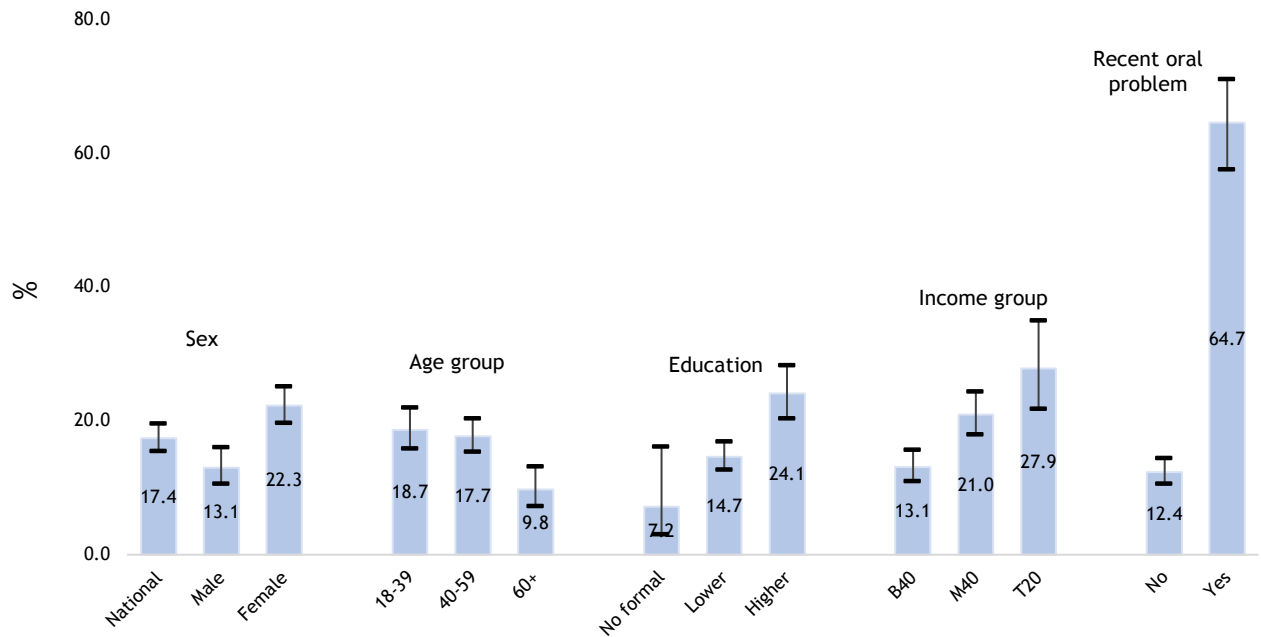
Descriptive analysis revealed that about 17.4% of adults with employer-sponsored coverage utilised oral healthcare in the last 12 months and the prevalence of utilisation is higher among female, those with higher education, T20 group and those experienced acute oral health problem (Figure 1). Among this subpopulation, female, those in economically active age group (aged 18-39 years and 40-59 years old), and Malay and Indian ethnicities and those with higher education and in the M40 and T20 income groups demonstrated increased odds for oral healthcare utilisation (Figure 2), which could be attributed to increased awareness of the importance of oral health and better financial capability to afford such services³. Meanwhile, Figure 3 showed the Lorenz curve becoming less pro-rich suggesting a more equitable distribution of oral healthcare utilisation across socioeconomic groups among those with employer-sponsored coverage. This finding is encouraging, as it implies that employer-sponsored health benefits may help bridge the gap in oral healthcare access across different socioeconomic groups. To further promote an equitable access to oral healthcare and/or reduce inequalities, policymakers should consider providing incentives to employers who offer oral health benefits to their employees. Such initiatives can encourage more employers to invest in employee well-being while helping bridge gaps in access across different socioeconomic groups.

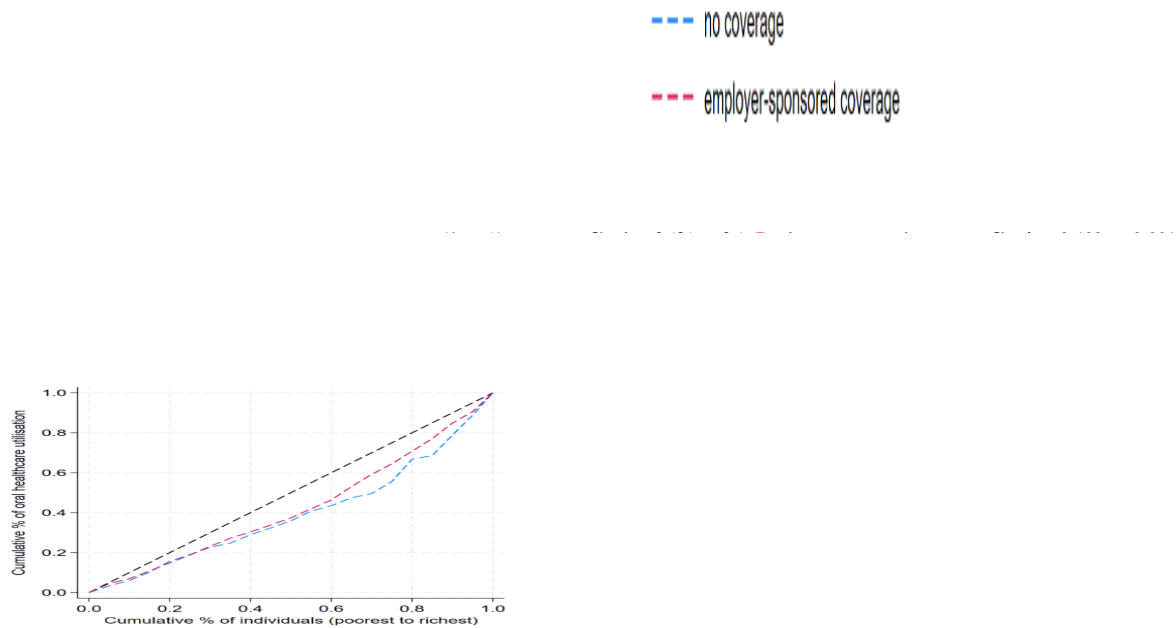
Conclusion

The study shows determinants of oral healthcare utilisation among adults with employer-sponsored coverage were females, economically active individuals, Malays and Indians, and those with higher education and income. Encouraging employer sponsored coverage and its expansion can potentially reduce inequalities and improve access to oral healthcare.



Note: Archer-Lemeshow test ($p=0.081$), % overall correctly classified = 88.19%, and area under the ROC curve (78.76%) were applied to check model fit. No multicollinearity and interaction detected.





References

1. Firdaus M, Musa C, Halim NA, et al. Current concept of oral health and its potential implications for policy and practice of dental health coverage and insurance: Post COVID-19 measurement. *IIUM Journal of Orofacial and Health Sciences*. 2021;2(1):4-13.
2. OHD. Dasar Kesihatan Pergigian Kebangsaan 2022 . Program Kesihatan Pergigian, Kementerian Kesihatan Malaysia; 2022. 1-17
3. Zardak AN, Amini-Rarani M, Abdollahpour I, et al. Utilization of dental care among adult populations: a scoping review of applied models. *BMC Oral Health*. 2023;23(1):1-14.

OESHPP02 / 184

THE EFFICACY OF ANTHELMINTICS AGAINST STH INFECTION IN POPULATION-BASED STUDIES IN MALAYSIA - RESULTS OF A SCOPING REVIEW ANALYSIS

Muhammad Faiz Mohd Hisham¹, Fazila Haryati Ahmad¹, Filza Noor Asari¹, Noor Aliza Lodz¹, Norzawati Yoep¹, Eida Nurhadzira Muhammad¹, Nor Asiah Muhamad²

¹Institute for Public Health, National Institute of Health, Shah Alam, Malaysia

²Evidence Based Healthcare, National Institute of Health, Shah Alam, Malaysia

Corresponding author's email: muhammadfaiz.mh@moh.gov.my

Summary

This paper examined the efficacy of anthelmintics for treating soil-transmitted helminth (STH) infections, which affect approximately 1.5 billion people worldwide. A systematic approach was used to retrieve manuscripts pertaining to population-based STH infection in Malaysia. Results indicated that interventions using albendazole and mebendazole yielded significant cure rates, particularly when administered as a single or triple dose. The study highlighted the importance of proper dosing, timing of assessments, and combining treatments with public health initiatives. Ongoing research is warranted to enhance interventions against STH infections in vulnerable populations.

Keyword : anthelmintic drug, efficacy, STH

Introduction

STH infections are among the most prevalent human infections, accounting for an estimated 1.5 billion infected people or 24% of the world's population [1]. These worm infections, particularly caused by *Trichuris*, *Ascaris*, and hookworms, are common in impoverished communities, harming nutrition and resulting various health issues. Preventive parasitic chemotherapy, characterised by the frequent and mass administration of anthelmintic medication to vulnerable groups, especially children, can substantially decrease worm infections caused by STH. As a public health intervention, WHO recommends administering a single dose of 400 mg albendazole or 500 mg mebendazole to all young children and school-age children in rural or in any areas with STH infection rates above 20% [2]. Chemotherapy is vital for controlling STH infections, in addition to the effective water and sanitation systems, and hygiene practices for long-term success.

Materials and Methods

A comprehensive search strategy was executed through electronic databases including Pubmed, Scopus, Embase and Web of Science. Medical Subject Headings (MeSH) terms were applied to assist the keyword search. A systematic approach was applied data extraction following the PRISMA-ScR guidelines guidelines [3]. Mendeley software and Microsoft Excel were used to manage the references and remove duplicates. Data was summarized descriptively in tabular form including types of interventions, study design, settings, and the outcomes of each study. A total of 164

relevant manuscripts were retrieved, of which only 13 revolved around the administration of anthelmintics, and were included in the review.

Results and Discussion

In the early years, the combination of oxantel-pyrantel pamoate resulted in varied cure rates especially a significantly lower efficacy towards hookworm, demonstrating that the effectiveness of treatments can differ among types of parasites, where some parasites may be more resilient to certain treatments compared to others. By 1996, the introduction of Albendazole at a 400 mg single dose demonstrated a notable increase in cure rates across all three parasites. It was particularly effective, with a single dose yielding cure rates ranging from 41.4% to 96.3% across different years and different parasite species. Exceptionally, triple doses resulted in even higher cure rates, consistently exceeding 90% for the major parasites over the years 1998 to 2023. The data reveal that the timing of efficacy assessments significantly influences reported cure rates. Samples tested for the presence of parasites at different intervals show erratic drug efficacy, with proximate intervals yielding much significant efficacy compared to the far-off intervals; where the likelihood of reinfections will occur due to the delayed assessment. Cure rates also differ between experimental and control groups, pointing to the necessity of considering interventional approaches such as assessing knowledge pertaining to STH and supplement uptakes.

Conclusion

While a large body of literature may exist on a topic, only a small fraction may directly address the efficacy of anthelmintics for population-based studies. Notable success against various STH infections with cure rates significantly exceeding 90% was observed for major parasites under certain treatment regimens. Further research is necessary to improve the evidence supporting public health initiatives, including additional studies evaluating the effectiveness of anthelmintic treatments in the future.

Result

Year	Drug	Dose	Target Population	Total Sample, (Prevalence ^a in %)	Cure rates (%)			Author(s)
					<i>Trichuris</i>	<i>Ascaris</i>	<i>Hookworm</i>	
1980	Oxantel-pyrantel pamoate	50mg/ml pyrantel 50mg/ml oxantel pamoate (single dose) ^δ	Estate Plantation Resident (Johor, Melaka, Negeri Sembilan)	719 (32.0)	84.3	96.0	75.8	Zahedi M, et al. [4]
1984	Oxantel-pyrantel pamoate	15mg/kg (single dose) ^γ	Primary school children (Kuala Lumpur)	271 (86.3)	60.3	90.6	53.8	Sinniah B. [5]
1984	Pyrantel-pamaote	10mg/kg (single dose) ^γ	Primary school children (Kuala Lumpur)	389 (64.0)	56.5	89.7	42.9	Sinniah B. [6]
1996	Albendazole	400mg (single dose) ^δ	Primary school children (Penang)	192 (96)	83.4	90.9	89.1	Rahman WA [7]
	Mebendazole	400mg (single dose) ^δ			89.0	81.2	48.2	
1998	Albendazole	400mg (triple dose) ^α	Rural Malay communities (Terengganu)	917 (19.2)	91.5	96.7	100	Penggabean M, et al. [8]
2008	Albendazole	400mg (triple dose) ^ε	Aboriginal primary school children (Pahang)	120 (98.6)	60.3	71.3	66.7	Al-Mekhlafi MH, et al. [9]
2012	Albendazole	400mg (triple dose) ^β	Aboriginal primary school children (Pahang)	254 (93.7)	92.6	96.7	100	Ahmed A, et al. [10]
2014	Albendazole	400mg (triple dose) ^δ	Aboriginal primary school children (Pahang)	317 (99.4)	96.9 ^b 89.6 ^c	96.1 ^b 94.1 ^c	95.6 ^b 73.6 ^c	Al-Delaimy AK, et al. [11]

Year	Drug	Dose	Target Population	Total Sample, (Prevalence ^a in %)	Cure rates (%)			Author(s)
					<i>Trichuris</i>	<i>Ascaris</i>	<i>Hookworm</i>	
2014	Albendazole	400mg (triple dose) ^ε	Aboriginal primary school children (Pahang)	250 (98.6)	58.7 ^b 59.3 ^c	59.9 ^b 56.4 ^c	0 (reinfection) ^{b,c}	<i>Al-Mekhlafi MH, et al.</i> [12]
2021	Albendazole	400mg (single dose) ^δ	Aboriginal children (Selangor)	68 (85.0)	41.4	93.1	Not studied	<i>Nisha M, et al.</i> [13]
2022	Albendazole	400mg (single dose) ^γ	Aboriginal community (Perak)	54 (81.2)	42.1	96.3	90.0	<i>Muslim A. and Lim YAL</i> [14]
2022	Albendazole	400mg (triple dose) ^γ	Aboriginal communities (Perak and Selangor)	253 (62.1)	64.6	100	100	<i>Tee MZ, et al.</i> [15]
2023	Albendazole	400mg (triple dose) ^ε	Rural school children (Pahang, Perak, Johor, Sabah, Sarawak)	343 (65.5)	0 (reinfection) ^{b,c}	82.4 ^b 17.5 ^c	79.5 ^b 59.5 ^c	<i>Tan PY, et al.</i> [16]

* the cure rate is determined by the collection of existing data or the earliest available post-treatment assessment, which can be ^a10 days, ^b2 weeks, ^γ3 weeks, ^δ1 month, or ^ε3 months.

^a infected with at least a single species of STH, ^b interventional group, ^c control group

References

1. World Health Organization. Soil-transmitted helminth infections. [Internet]. [updated 2021; cited 2023 Oct 10]. Available from: <https://www.who.int/news-room/fact-sheets/detail/soil-transmitted-helminth-infections>.
2. Guideline: Preventive chemotherapy to control soil-transmitted helminth infections in at-risk population groups. Geneva: World Health Organization; 2017. Licence: CC BY-NC-SA 3.0 IGO.
3. Page, M.J., McKenzie, J.E., Bossuyt, P.M. *et al*. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *Syst Rev* 10, 89 (2021). <https://doi.org/10.1186/s13643-021-01626-4>
4. Zahedi M, Oothuman P, Sabapathy NN, Abu Bakar N. Intestinal nematode infections and efficacy study of oxantel-pyrantel pamoate among plantation workers. *Med J Malaysia*. 1980 Sep;35(1):31-9.
5. Sinniah B. Intestinal protozoan and helminth infections and control of soil-transmitted helminths in Malay school children. *Publ Hlth Lond*. 1984;98:152-156.
6. Sinniah B. Prevalence, treatment and reinfection of intestinal helminths among schoolchildren in Kuala Lumpur, Malaysia. *Publ Hlth Lond*. 1984;98:38-42.
7. Rahman WA. Comparative trials using albendazole and mebendazole in the treatment of soil-transmitted helminths in schoolchildren on Penang, Malaysia. *Southeast Asian J Trop Med Public Health*. 1996 Dec;27(4):765-767.
8. Penggabean M, Norhayati D, Oothuman P, Fatmah MS. Efficacy of albendazole in the treatment of *Trichuris trichiura* and *Giardia intestinalis* infection in rural Malay communities. *Med J Malaysia*. 1998;53(4):411-6.
9. Al-Mekhlafi MH, Surin J, Atiya AS, Ariffin WA, Mahdy AK, Abdullah HC. Pattern and predictors of soil-transmitted helminth reinfection among aboriginal schoolchildren in rural Peninsular Malaysia. *Acta Tropica*. 2008;107(3):200-204. DOI: 10.1016/j.actatropica.2008.05.022.
10. Ahmed A, Al-Mekhlafi HM, Al-Adhroey AH, Ithoi I, Abdulsalam AM, Surin J. The nutritional impacts of soil-transmitted helminths infections among Orang Asli schoolchildren in rural Malaysia. *Parasites Vectors*. 2012;5:119. doi:10.1186/1756-3305-5-119.
11. Al-Delaimy AK, Al-Mekhlafi HM, Lim YAL, Nasr NA, Sady H, Atroosh WM, Mahmud R. Developing and evaluating health education learning package (HELP) to control soil-transmitted helminth infections among Orang Asli children in Malaysia. *Parasites Vectors*. 2014;7:416. doi:10.1186/1756-3305-7-416.
12. Al-Mekhlafi HM, Anuar TS, Al-Zabedi EM, Al-Maktari MT, Mahdy MAK, Ahmed A, et al. Does vitamin A supplementation protect schoolchildren from acquiring soil-transmitted helminthiasis? A randomized controlled trial. *Parasites Vectors*. 2014;7:367. doi:10.1186/1756-3305-7-367.
13. Nisha M, Faqiha N, Shafiqah N, Nurhidayah S, Davamani F. Efficacy of single dose albendazole treatment of soil-transmitted helminths among indigenous children in Malaysia. *Southeast Asian J Trop Med Public Health*. 2021;52(1):183-190.

14. Muslim A, Lim YAL. Higher efficacy of a single dosage albendazole and different soil-transmitted helminths re-infection profiles amongst indigenous Negritos from inland jungle versus those in resettlement at town peripheries. *Trop Biomed* 2022;39(3):402-11. doi: 10.47665/tb.39.3.010.
15. Tee MZ, Lee SC, Er YX, Yap NJ, Ngui R, Easton AV, et al. Efficacy of triple dose albendazole treatment for soil-transmitted helminth infections. *PLoS One*. 2022 Aug 12;17(8):e0272821. doi: 10.1371/journal.pone.0272821.
16. Tan PY, Loganathan R, Teng KT, Lee SC, Mohd Johari SN, Selvaduray KR, Ngui R, Lim YA-L. Red palm olein-enriched biscuit supplementation lowers *Ascaris lumbricoides* reinfection at 6-month after anthelmintic treatment among schoolchildren with vitamin A deficiency (VAD). *Acta Tropica*. 2023;240:106860. Available from: <https://doi.org/10.1016/j.actatropica.2023.106860>.

OESHPP03 / 186

Developing and Validating Instruments to Identify Preferred Features of Systematic Grey Literature Review Automation Tools

Ang Zen Yang¹, Shakirah Md Sharif¹, Melody Soong Yin Yin¹, Fun Weng Hong¹, Shaun Lee Wen Huey²

¹ Institute for Health Systems Research, National Institutes of Health, Ministry of Health

² School of Pharmacy, Monash University Malaysia

Corresponding author's email: angzenyang@moh.gov.my

Summary

This study developed two instruments to evaluate the features of systematic grey literature review automation tools and their outputs from the perspective of both reviewers and readers. The surveys employed the Best-Worst Scaling methodology and underwent validation and usability testing. Content validity indices were acceptable, but usability testing revealed reviewers found it challenging to compare nine options. However, all survey attributes were retained to avoid biased conclusions as they are rated as relevant in the content validity test.

Keywords

Best-Worst Scaling, MaxDiff analysis, questionnaire development

Introduction

Systematic grey literature reviews (SGLR) are crucial for health policy and systems research as they can uncover valuable documents often scarce in published academic literature. While conducting SGLR is time-consuming and tedious, automation tools powered by artificial intelligence could significantly improve their efficiency. This study aims to develop instruments to identify the preferred features of SGLR automation tools and the characteristics of their SGLR output from the perspective of reviewers and readers.

Materials and Methods

Two questionnaires were developed: a Reviewer Survey and a Reader Survey. The Best-Worst Scaling (BWS), a form of conjoint analysis, was selected to identify and rank respondents' preferred features (Table 1). Features/attributes in the BWS were pre-determined based on The Unified Theory of Acceptance and Use of Technology (UTAUT), which consisted of four domains (i.e. performance expectancy (PE), effort expectancy (EE), social influence (SI), and facilitating conditions (FC))². It was then modified to suit the SGLR automation context, with three levels (i.e. variations/degrees) added to each attribute. An invitation email outlining the study background and required tasks was sent to six experts. The tasks included content validity rating in terms of simplicity, relevancy, and clarity¹ [being the lowest score and 4 being the highest score] and providing comments. Their feedback was collected online using Google Spreadsheets. Item-level content validity index (I-CVI), Scale-level CVI based on average method (S-CVI/Ave) and Scale-level CVI based on universal agreement (S-CVI/UA) for the Reader Survey and Reviewer Survey were

calculated using Google Spreadsheets¹, and the levels of attributes for both surveys were modified according to the feedback. Subsequently, five experts were invited to provide feedback on survey usability using Google Spreadsheets. The Orthogonal Main Effects Plan (OMEP), a pre-defined structure that ensures balance in factor levels across the experiment and factor independence), was calculated using R (version 4.4.2)³.

Table 1 An example of Reader Survey BWS after content validation and usability test

Example of Reader* BWS Question: You are reading a systematic grey literature review (SGLR) to obtain evidence for your official tasks and realise there are elements of using machine learning-based automation tools. Of the following four items, please select one [MOST Important/Preferred] and one [LEAST Important/Preferred] feature of the SGLR that is important in deciding whether to accept or use the evidence presented in the review. (The following nine questions will feature the same scenario but with different options; therefore, each question is unrelated to another as the options differ. Please read the options carefully and make your choice appropriately.)		
MOST important/pref erred	Attributes of SGLR partially/entirely generated using automation tools.	LEAST important/preferr ed
■ (the selection)	AI involvement is acknowledged, with a brief explanation of the steps used to produce the SGLR.	☐
☐	SGLR has 70% precision and sensitivity compared to the manual method	☐
☐	Only my peer colleagues accept the evidence from the AI-involved SGLR	■ (the selection)
☐	Involve no human reviewer (fully automated)	☐

* Scenario for Reviewer Survey: Imagine you are going to perform a systematic grey literature review (SGLR), and someone recommends machine-learning-based automation tools. Considering only the following 9 items, please select one [MOST Important/Preferred] and one [LEAST Important/Preferred] feature of the tool.

Results and Discussion

Table 2 illustrates the S-CVI/Ave and S-CVI/UA for: (i) Reviewer survey-97% (26.2/27 items) and 85% (23/27 items), and (ii) Reader Survey-96% (14.3/15 Table items) and 73% (11/15 items), respectively, all within the acceptable range¹. The resultant Reviewer Survey consisted of 27 sets of BWS questions, each presenting the same scenario with nine attribute options at different levels. Meanwhile, the Reader Survey consisted of nine sets of questions with four attribute options each (Table 2). All five experts in the usability test commented that the BWS in the Reviewer Survey with nine options was challenging and time-consuming and might cause respondent fatigue. They suggested omitting some domains. However, we maintained nine

attributes with three levels in the Reviewer Survey (with the improvement of the statement in some attributes) because each attribute/option included derived from UTAUT and omitting a few of them from BWS's options might lead to a biased conclusion regarding the preferred features of SGLR automation tools. Furthermore, one expert suggested dropping the 3rd level of attribute (i.e. None of the journals, peer reviewers and audiences accept the outputs) in the "acceptance by the research community" domain from the option in the Reviewer Survey. While dropping the level is possible, it would then require the number of BWS questions to increase from 27 to either 36 or 54 to maintain the orthogonality in mixed-element OMEP. This is because removing a level disrupts this balance, requiring a different OA to maintain orthogonality³.

Table 2: Findings of content validity index for the Reviewer Survey and the Review Survey and final attribute and level after content validity and usability test

Attribute (UTAUT domain)	Level	The resultant attribute's level after content validity and usability test	Reviewer Survey		Reader Survey	
			I-CV I#	U A	I-CV I	U A
Integration with other tools (FC)	1 st	The tool is a one-stop platform that can integrate with other tools	1	1	-	-
	2 nd	...some integration capabilities...	1	1	-	-
	3 rd	...does not integrate well...	1	1	-	-
Acceptance by the research community (SI)	1 st	All journals, peer reviewers and audiences accept the outputs	0.83	0	-	-
	2 nd	Some...accept the outputs, but some do not	0.83	0	-	-
	3 rd	None...accept the outputs	0.67	0	-	-
Training, documentation and technical support (FC)	1 st	Comprehensive training and technical assistants are provided for the tools	1	1	-	-
	2 nd	Basic...	1	1	-	-
	3 rd	Limited...	1	1	-	-
Institution / management supports (SI)	1 st	Strong institutional/ management support on the use of automation tools	1	1	-	-
	2 nd	Moderate...	1	1	-	-
	3 rd	Weak/No...	1	1	-	-
Ease of Use (EE)	1 st	The tool is intuitive and easy to use	1	1	-	-
	2 nd	...requires some learning but is manageable	1	1	-	-
	3 rd	...is complex and difficult to use	1	1	-	-

Attribute (UTAUT domain)	Level	The resultant attribute's level after content validity and usability test	Reviewer Survey		Reader Survey	
			I-CV I#	U A	I-CV I	U A
Speed of Review Process (PE)	1 st	The tool speeds up the SGLR process by 90% (high efficiency) compared to the manual method	1	1	-	-
	2 nd	...50% (moderate efficiency)...	1	1	-	-
	3 rd	...10% (mere efficiency)...	1	1	-	-
Cost and open-access (FC)	1 st	Free with limited features	1	1	-	-
	2 nd	Paid access	1	1	-	-
	3 rd	Free with unlimited features	1	1	-	-
Explainability of the Outputs (EE)	1 st	A basic explanation of the AI algorithms, assumptions and how the tools derive their outputs	1	1	1	1
	2 nd	No background information...	0.83	0	0.83	0
	3 rd	A detailed explanation...	1	1	1	1
Quality of Synthesized Reviews (PE)	1 st	SGLR generated by automation has high (90-100%) precision and sensitivity compared to the manual method	1	1	1	1
	2 nd	...moderate (70%) precision and sensitivity...	1	1	1	1
	3 rd	...low (50%) precision and sensitivity...	1	1	1	1
Acceptance by the research community (SI)	1 st	Everyone (including my institutional top management, policymakers and colleagues) accepts the outputs	-	-	0.83	0
	2 nd	Only my institutional top management and policymakers...	-	-	0.83	0
	3 rd	Only my peer colleagues...	-	-	0.83	0
Human involvement (PE)	1 st	Involve 1 human reviewer with 1 robot reviewer (semi-automated)	-	-	1	1
	2 nd	Involve no human reviewer (fully automated)	-	-	1	1
	3 rd	Involve at least 2 independent human reviewers (semi-automated)	-	-	1	1

Attribute (UTAUT domain)	Level	The resultant attribute's level after content validity and usability test	Reviewer Survey		Reader Survey	
			I-CVI I#	UA	I-CVI	UA
Transparency of AI Involvement (FC)	1 st	AI involvement is clearly stated and explained <i>(the domain is</i>	-	-	1	1
	2 nd	<i>...mentioned but not explained merged with</i>	-	-	1	1
	3 rd	<i>...is not disclosed Explainability of Outputs)</i>	-	-	1	1
Sum of I-CVI			26.2	-	14.3	-
Sum of Item with universal agreement (UA)			-	23	-	11
S-CVI/Ave (Sum of I-CVI divided by no. of item)			97%	-	96%	-
S-CVI/UA (Sum of the item with UA divided by no. of item)			-	85%	-	73%

... indicates the same sentence structure as the 1st level of the same attribute.

I-CVI = the number of agreed items (i.e. rating 3 or 4) divided by the number of experts

Conclusion

The content validity index indicated that the attributes and levels of the Reviewer Survey and Reader Survey were relevant. Even though the usability testing showed that the Reviewer Survey was challenging, no attributes were dropped from the survey to avoid introducing bias. The BWS survey instruments are crucial for identifying preferred features of SGLR automation tools and the key characteristics of their SGLR output, ensuring user perspectives are incorporated into the automation tool's development to enhance adoption.

References

1. Yusoff MSB. ABC of Content Validation and Content Validity Index Calculation. Education in Medicine Journal. 2019. eduimed.usm.my/EIMJ20191102/EIMJ20191102_06.pdf (accessed 20 May 2024).
2. Andrews JE, Ward H, Yoon J. UTAUT as a Model for Understanding Intention to Adopt AI and Related Technologies among Librarians. *The Journal of Academic Librarianship*. 2021;47(6):102437.
3. Louviere JJ, Flynn TN, Marley AAJ. Best-worst scaling: Theory, methods and applications. *Cambridge University Press*. 2015.

OESHPP04 / 193

Effectiveness of KOSPEN Plus Mental Health Promotion Activity at Workplace: Findings from the KOSPEN-Plus Program in Malaysia

Lim Kuang Kuay¹, Maznieda Mahjom¹, S Maria Awaluddin¹, Noor Syaqlah Shawaluddin¹, Tuan Mohd Amin Tuan Lah¹, Chan Ying Ying¹, Hamizatul Akmal Abd Hamid¹, Muhammad Fadhli Mohd Yusoff¹, Mohd Azahadi Omar²

¹ Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia, Setia Alam, 40170, Shah Alam, Selangor, Malaysia

² Sector for Biostatistics & Data Repository, National Institutes of Health, Ministry of Health Malaysia, Setia Alam, 40170, Shah Alam, Selangor, Malaysia

Corresponding author's email: limkk@moh.gov.my

Summary

One of the goals of the KOSPEN Plus program at the workplace is to enhance the mental health of workers. This study aimed to evaluate the program effectiveness of this activity in Malaysia. This cross-sectional study was conducted among all the agencies that had implemented this program in their workplace. Data on mental health were obtained using a self-administered questionnaire. The regularity of activities conducted to address mental health problems at the workplace significantly increased after the program (13.0% vs 47.0%). While the agencies performed regular mental risk assessments on workers, was slightly decreased from 14.9% to 13.0%. Thus, further study is warranted.

Keywords:

KOSPEN Plus, Mental Health, Workplace, Workers, Malaysia

Introduction

Mental health and work are closely related. A supportive workplace promotes workers' well-being, and good mental health boosts productivity and satisfaction¹. Globally, approximately 15% of working-age adults have a mental illness at any point in time, and this number is likely higher among workers with a higher risk of exposure to psychosocial hazards¹. In Malaysia, the incidence of depression has doubled from 2019 to 2023, with the highest rates observed among working-age persons². More inclusivity and awareness of the workers' needs, especially those with mental health concerns, are required in all workplaces. Thus, in 2016, the Ministry of Health (MOH), Malaysia, launched the Healthy Community Empowers the Nation-Plus (KOSPEN-Plus) program to minimize non-communicable diseases (NCD), particularly mental health, among Malaysian workers³. This study aimed to assess the effectiveness of KOSPEN Plus mental health promotion activity at the workplace in Malaysia.

Materials and Methods

This nationwide cross-sectional survey was conducted from January to March 2020 at all agencies that implemented the KOSPEN Plus (KP) program at their workplaces between 2016 and 2018. In each state, a State Liaison Officer identified respondents from relevant agencies. The respondents must be the KP committee members who are familiar with the program carried out within the agency and who provided

informed consent to participate. An electronic self-administered questionnaire was used to acquire data on mental health from the identified KP coordinating committee members. The mental health scope consisted of two questions, namely; mental health risk assessments and addressing mental health problems at the workplace, with the expected answers being “Never,” “Sometimes,” and “Always”. The Pearson chi-square statistic was employed to assess the differences in mental health activities between the groups before and after the program. A p-value of less than 0.05 was considered significant.

Results and discussion

This study received responses from 362 individuals. Of these, 96.4% were government agencies, with 3.6% being private. The highest proportion of agencies are those with a worker size of more than 200 (33.1%), followed by those with a worker size of 50-99 (22.7%) and 10-49 (21.3%). The majority of respondents to the survey were ordinary members of the KOSPEN Plus Committee, accounting for 60.8% of the total responses (Table 1). Before KOSPEN-Plus mental health activities, 14.9% of the agencies performed regular mental risk assessments on workers. However, after the activities were implemented, the percentage was slightly decreased to 13.0% ($p = 0.45$). In terms of the regularity of the conduct of activities to address mental health problems at the workplace, a significant increment ($P < 0.001$) was observed after the implementation of the activities (13.0% vs 47.0%) (Table 2). Following the implementation of KOSPEN Plus, the number of agencies conducting The Depression Anxiety Stress Scales 21 (DASS-21) screenings saw a slight decrease (1.9%), while the number of agencies carrying out mental health-related activities in the workplace increased significantly by 34.0% (Table 3). The success of mental health activities depends on the agencies' understanding and commitment to fostering an environment that promotes employees' mental well-being. A workplace that values mental health initiatives cultivates a supportive and resilient culture for its workers⁴. The slight decrease in the number of agencies conducting DASS-21 screenings after KOSPEN Plus implementation raises concerns about workers' comprehension of the tool's purpose and its recommended frequency⁵. On the other hand, the significant increase in participation in mental health activities highlights the program's success in motivating agencies to incorporate such initiatives.

Table 1: Characteristics of the respondents, by sociodemographic

Characteristics	Total	
	n	%
Type of agency		
Government Agencies	349	96.4
Private Agencies	13	3.6
Workers Size		
<10	38	10.5
10-49	77	21.3
50-99	82	22.7
100-199	45	12.4
>=200	120	33.1
Respondent role		
Ordinary members	220	60.8
Secretary	90	24.9
Deputy Chairman	17	4.7
Chairman	35	9.7
Total	362	100.0%

Table 2: Mental Health activities before and after the program

Mental Health	Frequency (%)		p*
	Never/ Sometimes	Always	
a). Does your agency conduct regular mental risk assessments on employees? (DASS 21)			
i.Before	308 (85.1)	54 (14.9)	0.453
ii.After	315 (87.0)	47 (13.0)	
b). Are activities to address mental health problems in the workplace carried out? (e.g. psychosocial therapy, relaxation methods)			
i.Before	315 (87.0)	47 (13.0)	< 0.001
ii.After	192 (53.0)	170 (47.0)	

*Chi-Square test before vs after the program

Table 3: Difference of Mental Health practices before and after KOSPEN Plus

Components	Frequency (%)		Difference (%)
	Before	After	
a). Conduct regular mental risk assessments on employees (DASS-21)	54 (14.9)	47 (13.0)	-1.9%
b). Carried out activities to address mental health problems in the workplace	47 (13.0)	170 (47.0)	34.0

Conclusion

Despite an increase in activities addressing mental health problems in the workplace, the percentage of agencies performing regular mental health evaluations has somewhat decreased since the introduction of KOSPEN Plus. Thus, evaluating workers' mental health with anonymous identification could reduce stigmatization and simultaneously increase the use of current screening tools.

References

1. World Health Organization and International Labour Organization. Mental health at work: policy brief. Geneva: World Health Organization, 2022.
2. Institute for Public Health (IKU). National Health and Morbidity Survey (NHMS) 2023: Non-Communicable Diseases and Healthcare Demand: Technical Report; 2024.
3. Ministry of Health (MOH). KOSPEN Plus programme guideline: Intervention non communicable diseases risk factor at work place. Ministry of Health Malaysia, 2018.
4. Wu A, Roemer EC, Kent KB, Ballard DW, Goetzel RZ. Organizational Best Practices Supporting Mental Health in the Workplace. *J Occup Environ Med*. 2021 Dec 1;**63**(12):e925-e931.
5. Saeedi Z, Ghorbani N, Sarafranz MR, Shoar TK. A bias of self-reports among repressors: Examining the evidence for the validity of self-relevant and health-relevant personal reports. *Int J Psychol*. 2020;**55**(1):76-82.

OESHPP05 / 194

The Role of Strained Family Relationships and Economic Hardship During COVID-19 Pandemic in Determining Adolescent Depression Based on Patient Health Questionnaire (PHQ-9) scores

S Maria Awaluddin¹, Muhamad Khairul Nazrin Khalil¹, Lim Kuang Kuay¹, Noor Syaqlah Shawaluddin¹, Tuan Mohd Amin Tuan Lah¹, Maznieda Mahjom¹, Noor Ani Ahmad¹

¹Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: smaria@moh.gov.my

Summary

This study examines the impact of economic hardship and strained family relationships on adolescent depression during the COVID-19 pandemic using PHQ-9 scores. A total of 33,407 adolescents were surveyed, revealing a mean PHQ-9 score of 6.9 (95% CI: 6.7, 7.0). Adolescents reporting strained family relationships had the highest mean depression scores (11.5, 95% CI: 11.1, 12.0, $p < 0.001$). Female gender, older age, Bumiputera Sabah and Sarawak ethnicity, parental separation, and perceived economic hardship were significantly associated with higher depression scores. These findings highlight the critical role of socioeconomic and familial stressors in adolescent mental health.

Keywords

adolescent, depression, COVID-19 pandemic, economic hardship, strained family relationship

Introduction

The COVID-19 pandemic has significantly disrupted family dynamics and economic stability, potentially exacerbating mental health issues among adolescents. Economic hardship, including job losses and financial strain among parents, has been linked to increased psychological distress within families¹. Moreover, family relationships are vital to adolescent well-being, with strained connections leading to increased stress and depressive symptoms². Understanding the extent of these associations can inform targeted mental health interventions. This study aimed to assess the impact of economic hardship and strained family relationships on adolescent depression using data from a nationwide survey in Malaysia.

Materials and Methods

A cross-sectional survey was conducted among 33,407 adolescents from 239 randomly selected schools across Malaysia in 2022. A validated self-administered questionnaire, including the Patient Health Questionnaire-9 (PHQ-9), was used to assess adolescents' health risk behaviour and depression. PHQ-9 scores ranging from 0 to 27 with a cut-off of 10 and above were considered positive for depression^{3,4}. A few questions were included to explore adolescent perception on COVID-19 impact using categorical answers of "Yes" or "No". A family was considered to be the most economically affected if the adolescent agreed that their family had to cut expenses, move to a less expensive rental house or had to sell properties, or if parents lost their jobs during the pandemic. Adolescents were also asked how they perceived family relationships as either strained or not. The Complex Sample General Linear

Model (CSGLM) was applied to analyse PHQ-9 scores, adjusting for complex survey design factors. All predictors were categorical. Binary variables (e.g., gender, parental status) were included directly, while ethnicity (five categories) was analysed using automatic contrast coding, with the Indian group as the reference. Overall model significance was tested using the Wald F-test, while individual predictors were assessed using t-tests in IBM SPSS Statistics version 29.0. Variables with p-values < 0.05 were considered statistically significant. This study received ethical approval from the Medical and Research Ethics Committee (MREC), Ministry of Health, Malaysia (NMRR-21-157-58261). Written parental consent was obtained one month before data collection, and adolescents provided their assent before responding to the self-administered questionnaire.

Results and Discussion

The overall mean PHQ-9 score was 6.9 (95% CI: 6.7, 7.0), as shown in Table 1. Adolescents who reported strained family relationships exhibited the highest depression scores (11.5, 95% CI: 11.1, 12.0, $p < 0.001$). Gender differences were evident, with female adolescents reporting significantly higher scores (8.3, 95% CI: 8.1, 8.5) compared to males (5.4, 95% CI: 5.3, 5.6). Ethnic disparities were also observed, with Bumiputera Sabah and Sarawak adolescents having the highest adjusted PHQ-9 scores (7.5, 95% CI: 7.0, 8.0). Adolescents with parents living apart reported higher scores (8.0, 95% CI: 7.8, 8.2) than those whose parents stayed together (6.6, 95% CI: 6.4, 6.8). Furthermore, those perceiving their families as the most economically affected had significantly higher depression scores (8.4, 95% CI: 8.1, 8.7, $p < 0.001$). The adjusted general linear model analysis showed that strained family relationships had the strongest association with higher PHQ-9 scores, followed by female gender, Bumiputera Sabah and Sarawak ethnicity, Malay ethnicity, other ethnicities, perceived severe economic impact, parental separation, and older age. These findings underscore the interplay between economic and familial stressors in adolescent mental health during crises, as found in previous studies⁵.

Table 1: Complex Sample General Linear Model Analysis of PHQ-9 Scores Assessing Depression Levels Among Adolescents

Variables	N (%) (Unweighted)	PHQ-9 Score (Mean , 95% CI)	Crude B (95% CI)	p- value	^a Adjusted B (95% CI)	p- value
Overall	33,407 (100.0)	6.9 (6.7, 7.0)	-	-	-	-
Age Group						
13-14 years ^b	14,053 (42.1)	6.4 (6.2, 6.6)	0.0 (reference)	-	0.0 (reference)	-

15-17 years	19,354 (57.9)	7.2 (7.0, 7.4)	0.8 (0.6, 1.0)	<0.00 1	0.7 (0.5, 0.9)	<0.00 1
Gender						
Male ^b	15,443 (46.2)	5.4 (5.3, 5.6)	0.0 (reference)	-	0.0 (reference)	-
Female	17,964 (53.8)	8.3 (8.1, 8.5)	2.9 (2.6, 3.1)	<0.00 1	2.7 (2.5, 2.9)	<0.00 1
Ethnicity						
Malay	23,048 (69.0)	7.1 (7.0, 7.3)	1.6 (1.1, 2.1)	<0.00 1	1.9 (1.5, 2.3)	<0.00 1
Chinese	5,064 (15.2)	6.0 (5.6, 6.4)	0.5 (0.0, 0.9)	0.05	-	-
Indian ^b	1,548 (4.6)	5.5 (5.1, 6.0)	0.0 (reference)	-	0.0 (reference)	-
Bumiputera Sabah & Sarawak	2,958 (8.9)	7.5 (7.0, 8.0)	2.0 (1.4, 2.6)	<0.00 1	2.0 (1.4, 2.6)	<0.00 1
Others	789 (2.4)	7.0 (6.3, 7.7)	1.5 (0.7, 2.3)	<0.00 1	1.7 (0.9, 2.4)	<0.00 1
Parental Status						
Stayed Together ^b	26,717 (81.4)	6.6 (6.4, 6.8)	0.0 (reference)	-	0.0 (reference)	-
Living Apart	6,086 (18.6)	8.0 (7.8, 8.2)	1.4 (1.2, 1.6)	<0.00 1	0.8 (0.5, 1.0)	<0.00 1
Strained Family						

Relationships						
No ^b	31,039 (92.7)	6.5 (6.3, 6.6)	0.0 (reference)	-	0.0 (reference)	-
Yes	2,445 (7.3)	11.5 (11.1, 12.0)	5.1 (4.6, 5.5)	<0.001	4.5 (4.1, 4.9)	<0.001
Economic Hardship						
No ^b	30,217 (90.3)	6.7 (6.5, 6.8)	0.0 (reference)	-	0.0 (reference)	-
Yes	3,261 (9.7)	8.4 (8.1, 8.7)	1.7 (1.4, 2.0)	<0.001	1.0 (0.7, 1.3)	<0.001

B= adjusted regression coefficients, a=the final model was adjusted with all the variables, b = reference category

Conclusion

Strained family relationships and economic hardship were significantly associated with higher depression scores among adolescents in Malaysia during the COVID-19 pandemic. These findings emphasize the need for targeted mental health interventions that address both economic and family-related stressors during difficult life events or pandemics.

References

1. Prime H, Wade M, Browne DT. Risk and resilience in family well-being during the COVID-19 pandemic. *Am Psychol*. 2020;**75**(5):631-43.
2. Zietz S, Lansford JE, Liu Q, Long Q, Oburu P, Pastorelli C, et al. A longitudinal examination of the family stress model of economic hardship in seven countries. *Child Youth Serv Rev*. 2022;**143**(September 2021).
3. Ibrahim N, Sidik SM, Kar PC, Mukhtar F, Awang H, Kiat AJ, et al. Prevalence and predictors of depression and suicidal ideation among adolescents attending government secondary schools in Malaysia. *Med J Malaysia*. 2017;**72**(4):221-7.
4. Sidik SM, Arroll B, Goodyear-Smith F, Ahmad R. Prevalence of depression among women attending a primary urban care clinic in Malaysia. *Singapore Med J*. 2012;**53**(7):468-73.
5. Fong VC, Iarocci G. Child and family outcomes following pandemics: A systematic review and recommendations on COVID-19 policies. *J Pediatr Psychol*. 2021;**45**(10):1124-43.

OESHPP06 / 196

Healthcare Without Hardship: Are we are Financially Protected?

Adilius Manual¹, Jabrullah Ab Hamid¹, Suhana Jawahir¹, Awatef Amer Nordin¹, Iqbal Ab Rahim¹, Sarah Nurain Mohd Noh¹, Nur Elina Abdul Motalib¹, Devi Shantini Rata Mohan¹

¹ Institute for Health Systems Research, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: adilius.m@moh.gov.my

Summary

Financial protection is essential for Universal Health Coverage, ensuring Malaysians can access healthcare without financial hardship. This study examines healthcare spending trends from 2014 to 2022 using Household Income and Expenditure Survey data. While public healthcare remains accessible, private care often involves high out-of-pocket costs, leaving 2.5% of households financially vulnerable. Post-pandemic, spending on health products—such as medical devices, and personal protective equipment—tripled, reflecting changing healthcare behaviours. Rising costs and inflation have worsened financial pressures, particularly for lower-income groups. Strengthening safety nets, expanding government healthcare funding, and improving insurance coverage are crucial to ensuring equitable and affordable healthcare.

Keywords

Out-of-pocket expenses, health expenditures, universal health coverage, impoverishing health expenditures, financial protection.

Introduction

Financial protection is a key aspect of Universal Health Coverage, ensuring individuals can access healthcare without facing financial hardship¹. In Malaysia, both public and private healthcare services are available, but private healthcare often requires out-of-pocket (OOP) payments, which can strain household finances. When healthcare expenses consume a significant portion of income, families may struggle to afford other essential needs. A crucial measure of financial protection is Sustainable Development Goal 3.8.2, which tracks the proportion of people facing high health expenditures. This study examines financial protection in Malaysia from 2014 to 2022, analysing trends in healthcare spending and their effects on household financial stability. By assessing these trends, the study highlights progress and ongoing challenges in ensuring that healthcare remains accessible and affordable for all Malaysians.

Materials and Methods

Data from the Household Income and Expenditure Surveys (2014, 2016, 2019, and 2022) were analysed to assess the financial burden of healthcare costs on Malaysian households. The capacity to pay was defined using the Organisation for Economic Co-

operation and Development framework¹, which considers a household's ability to afford healthcare after covering basic living expenses. Impoverishing health expenditure was identified when healthcare costs pushed households below the poverty line, based on their capacity to pay. All analyses were conducted using STATA 18.

Results and Discussion

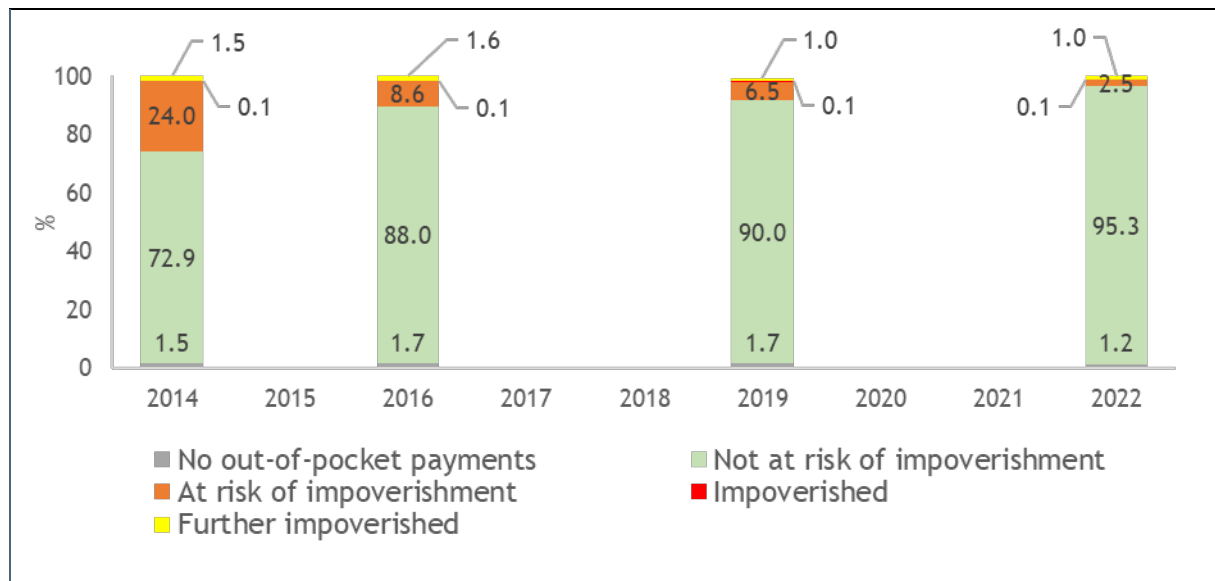
Malaysia's economy has undergone significant shifts before and after the COVID-19 pandemic, affecting major industries such as tourism, manufacturing, and services. The pandemic led to business closures, job losses, and reduced household incomes, prompting the government to implement stimulus packages, including wage subsidies and financial assistance. Despite these efforts, inflation and the rising cost of living, particularly healthcare, continue to pose challenges.

While Malaysia's public healthcare system remains accessible and affordable, reliance on private healthcare often results in significant financial burdens. While only a small percentage of households struggled to afford healthcare costs, 2.5% remained at risk (Figure 1), indicating ongoing affordability concerns, particularly among lower-income groups. A significant post-pandemic trend is the three-fold increase in spending on health products (Figure 2), likely driven by greater health awareness, preventive care measures, and rising demand for medical devices, and personal protective equipment as noted in recent literature². Studies indicate that as healthcare costs rise, individuals may turn to self-medication or alternative treatments instead of seeking professional care, potentially delaying necessary treatment and worsening health conditions³. While OOP spending for medicine has alleviated financial strain for some, it has also pushed others below their capacity to pay, particularly among lower-income households. Rising healthcare costs and inflation disproportionately affect vulnerable groups, forcing difficult financial trade-offs and limiting their ability to afford other essential needs.

Conclusion

Malaysia's healthcare system mitigates financial hardship, yet some households still face high healthcare costs. Strengthening safety nets, expanding government funding, improving insurance coverage, and enhancing access to affordable care are crucial to reducing healthcare-related poverty. Targeted support for vulnerable groups will be key to achieving better financial protection for all.

Figure 1: Breakdown of households by risk of impoverishing health spending

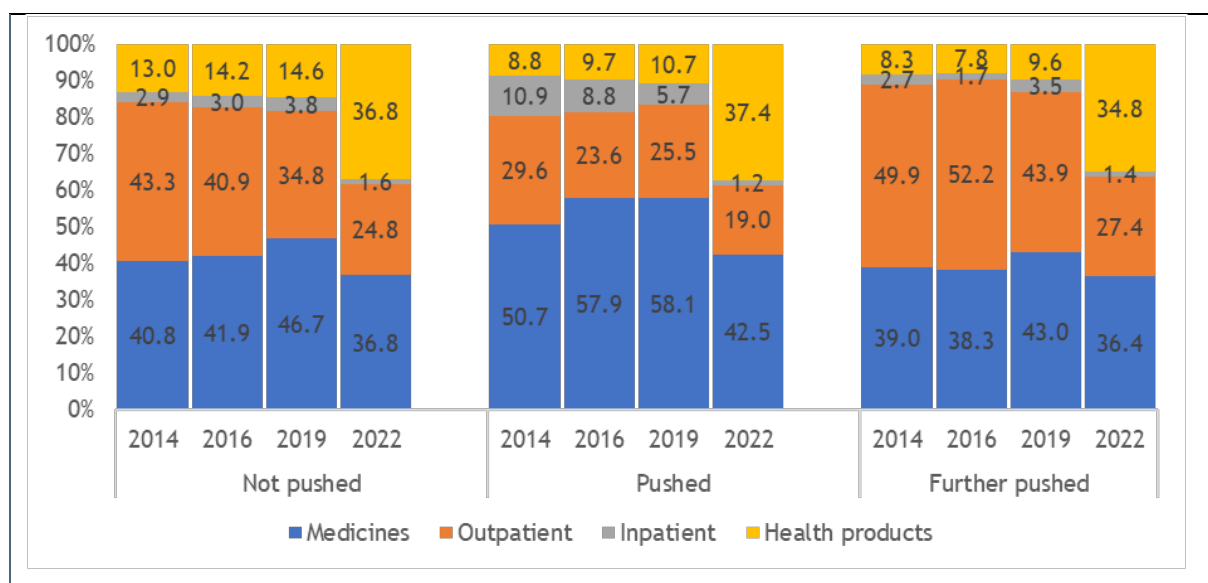


Note: Capacity to pay for healthcare is calculated as total household consumption minus a set amount for essential expenses (food, housing, and utilities). A household is classified as:

- Impoverished if OOP payments reduce total consumption below the poverty line.
- Further impoverished if total consumption was already below the poverty line before OOP payments.
- At risk of impoverishment if, after OOP payments, total consumption remains within 120% of the poverty line.

The poverty line is a relative measure based on the cost of essential needs.

Figure 2: Composition of spending by poverty status



Note: Pushed: Refers to households that are pushed below their capacity to pay due to OOP health expenditures. This occurs when healthcare costs exceed their financial

ability, forcing them into poverty. Further pushed: Refers to households already living below their capacity to pay that are driven deeper into poverty due to additional OOP health expenditures.

References

1. World Health Organization. Tracking Universal Health Coverage: 2023 Global Monitoring Report. 2023.
2. Djaoudene O, Romano A, Bradai YD, et al. A Global Overview of Dietary Supplements: Regulation, Market Trends, Usage during the COVID-19 Pandemic, and Health Effects. *Nutrients*. 2023;**15**:3320.
3. Zheng Y, Liu J, Tang PK, et al. A systematic review of self-medication practice during the COVID-19 pandemic: implications for pharmacy practice in supporting public health measures. *Front Public Health*. 2023;**11**:1184882

OESHPP07 / 200

Do Our Adolescents Eat an Adequate Healthier Diet During The COVID-19 Pandemic?

Eida Nurhadzira Muhammad¹, Filza Noor Asari¹, Muhammad Faiz Mohd Hisham¹, Ruhaya Salleh¹, Chong Zhuo Lin¹

¹ Institute for Public Health, National Institute of Health, Malaysia

Corresponding author's email: enurhadzira@moh.gov.my

Summary

A balanced diet is important for adolescents' growth and development. Findings found that most adolescents maintained their daily intake of fruits and vegetables during the COVID-19 pandemic, with 68.6% and 74.5% of participants reporting no changes in their consumption of these food groups. However, the average daily intake was low, with mean $\pm$ SD values of 1.42 ± 0.78 servings for fruits and 1.53 ± 0.87 servings for vegetables. Overall, 70.1% and 86.2% of participants consumed inadequate amounts of fruits and vegetables, respectively, while 58.0% had supplement intake.

Keywords

Fruit and vegetable intake, Adolescents, COVID-19

Introduction

The COVID-19 pandemic has significantly impacted daily life, particularly for adolescents. With a shift to remote learning, social isolation, and increased screen time, many adolescents have experienced changes in their lifestyle and dietary habits¹. This study aims to assess changes in daily fruit and vegetable intake and the frequency of intake per week among adolescents. Additionally, the study determines the adequacy of fruit and vegetable intake and supplement use based on sex and nationality.

Materials and Methods

This retrospective study used secondary data from the Post-vaccination COVID-19 Immunity and Disease Surveillance in Malaysia (IMSURE) study. The study was conducted via face-to-face interviews during the COVID-19 pandemic in Malaysia. Changes in daily fruit and vegetable intake and weekly consumption frequency among adolescents were assessed. Participants were asked whether their daily fruit and vegetable intake during the COVID-19 pandemic had "increased", "decreased", "no changes", or "not sure". Fruit and vegetable intakes were calculated based on the number of servings consumed per day, with inadequate fruit and vegetable intakes being defined as less than two and three servings daily, respectively². The supplement intake was based on 'yes' or 'no.' Associations between supplement intake, inadequate daily intake of fruit and inadequate daily intake of vegetables with the sex and nationality of the participants were presented using descriptive and chi-square analyses.

Results and Discussion

A total of 153 adolescent participants were included in this study. This study suggests that most adolescents maintained their daily intake of fruits and vegetables during the COVID-19 pandemic, with 68.6% and 74.5% reporting no changes in their consumption of these food groups. About 17.0% and 15.7% of adolescents increased their fruit and vegetable intake, respectively, implying an improvement in their dietary habits. In the meantime, the daily intake of fruits and vegetables was decreased by 7.8% and 5.2%. A small percentage were unsure about their intake. Overall, 51.6% and 65.3% of participants consumed fruits and vegetables at least three days per week.

An analysis of the daily servings revealed that the mean $\pm$ SD intake of fruit (Table 1) and vegetables (Table 2) per day was relatively low. This highlights that while some adolescents may have made healthier choices, these changes were insufficient to meet the recommended daily servings of fruits and vegetables. This may be due to factors such as sensory properties, availability of fruits/vegetables at home, family meal patterns, and food insecurity³. According to nationality, non-Malaysians consumed more fruits (1.46 ± 0.79) and vegetables (1.64 ± 0.89) compared to Malaysians (1.30 ± 0.74 and 1.24 ± 0.76 , respectively). This suggests that cultural and regional dietary differences might influence food choices^{4,5}.

Table 1: Analysis of mean daily serving and inadequate fruit intake per day among adolescents (n=137).

Variables	Participant (N)	Fruit intake (serving/day), Mean (SD)	p-value ^a	Inadequate fruit intake (<2 servings/day), %(n)	p-value ^b
Total	137	1.41 $\pm$ 0.77	-	70.1 (96)	-
Sex					
Male	76	1.48 $\pm$ 0.84	0.228	54.2 (52)	0.709
Female	61	1.32 $\pm$ 0.67		45.8 (44)	
Nationality					
Malaysian	43	1.30 $\pm$ 0.74	0.277	37.5 (36)	0.026*
Non-Malaysian	94	1.46 $\pm$ 0.79		62.5 (60)	

Note: a - Independent t-test; b - chi-square test; *Statistical significance was at $p < 0.05$

Table 2: Analysis of mean daily serving and inadequate vegetable intake per day among adolescents (n=131).

Variables	Participant (N)	Vegetable intake (serving/day), Mean (SD)	p-value ^a	Inadequate vegetable intake (<3 servings/day), %(n)	p-value ^b
Total	131	1.53 ± 0.87	-	86.2 (112)	-
Sex					
Male	72	1.53 ± 0.88	0.988	55.4 (62)	0.800
Female	59	1.53 ± 0.87		44.6 (50)	
Nationality					
Malaysian	37	1.24 ± 0.76	0.019*	31.3 (35)	0.024*
Non-Malaysian	94	1.64 ± 0.89		68.8 (77)	

Note: a - Independent t-test; b - chi-square test; *Statistical significance was at $p < 0.05$

In total, 70.1% and 86.2% of participants consumed inadequate amounts of fruits and vegetables, respectively. Compared to females, males had a higher percentage of inadequate intake of fruits (54.2%) and vegetables (55.4%). Non-Malaysians showed a higher percentage of inadequate intake of fruits (62.5%) and vegetables (68.8%) in comparison to Malaysians. Additionally, most males (51.7%) and Malaysians (53.4%) consumed supplements, including multivitamin, vitamin C, probiotics, spirulina, and fish oil (Table 3). There were significant associations between Malaysians and non-Malaysians for inadequate fruit intake ($p=0.026$), inadequate vegetable intake ($p=0.024$), and supplement intake ($p<0.001$).

Table 3: Analysis on supplement intake among adolescent (n=153).

Variables	Participants (n)	Supplement intake, %(n)	p-value ^b
Total	153	58.0 (58)	-

Sex			
Male	85	51.7 (30)	0.504
Female	68	48.3 (28)	
Nationality			
Malaysian	50	53.4 (31)	<0.001*
Non-Malaysian	103	46.6 (27)	

Note: b - chi-square test; *Statistical significance was at $p < 0.05$

Conclusion

In conclusion, even though many adolescents have maintained and some have improved their fruits and vegetables intake during the pandemic, the high prevalence of inadequate consumption highlights the need for greater public health initiatives on improving adolescent nutrition. Educating adolescents about the importance of balanced nutrition should be prioritised in future health campaigns.

References

1. Breaux R, Cash AR, Lewis J, Garcia KM, Dvorsky MR, Becker SP. Impacts of COVID-19 quarantine and isolation on adolescent social functioning. *Curr Opin Psychol.* 2023;**52**:101613.
2. Malaysian Dietary Guidelines for Children and Adolescents. National Coordinating Committee on Food and Nutrition. 2013. Ministry of Health, Malaysia.
3. Neumark-Sztainer D, Wall M, Perry C, Story M. Correlates of fruit and vegetable intake among adolescents. Findings from Project EAT. *Prev Med.* 2003;**37**(3):198-208.
4. Jeong S, Lee J. Effects of cultural background on consumer perception and acceptability of foods and drinks: a review of latest cross-cultural studies. *Current Opinion in Food Science.* 2021;**42**:248-56.
5. Rathi N, Worsley A, Bruening M. Perceived influences of fruit and vegetable consumption among Indian adolescents - A qualitative inquiry. *BMC Public Health.* 2025;**25**(1):271.

OESHPP08 / 201

Tracking Lymphatic Filariasis Transmission Through Molecular Surveillance of *Brugia* Species in Sabah's Mosquito Vectors

Faizul Akmal Abdul Rahim¹, Mohd Amierul Fikri Mahmud¹, Mohd Hatta Abdul Mutalip¹, Tanrang Yusin², Mohd Azrool Rizal Mohd Azahari², Izhah Shahrin Jaafar³

¹ Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

² Sabah State Health Department, Kota Kinabalu, Sabah

³ Public Health Laboratory, Kota Bharu, Kelantan

Corresponding author's email: faizul.abdrahim@moh.gov.my

Summary

Despite Malaysia's elimination efforts, lymphatic filariasis (LF) remains a public health concern in Sabah. This study identified mosquito species involved in LF transmission using Human Landing Collection (HLC), Resting Catch (RC), and Human-Baited Double Net Trap (HDNT) methods in eight LF-endemic villages. Polymerase Chain Reaction (PCR) detected *Brugia malayi* in *Anopheles sunaicus* and *Culex whitmorei*, while *Brugia timori* was found in *Aedes albopictus*. These findings highlight previously under-recognised LF vectors, emphasising the need for enhanced vector surveillance and targeted control strategies to support Malaysia's LF elimination goals.

Keywords

Lymphatic filariasis, *Brugia malayi*, *Brugia timori*, PCR, Mosquito vectors.

Introduction

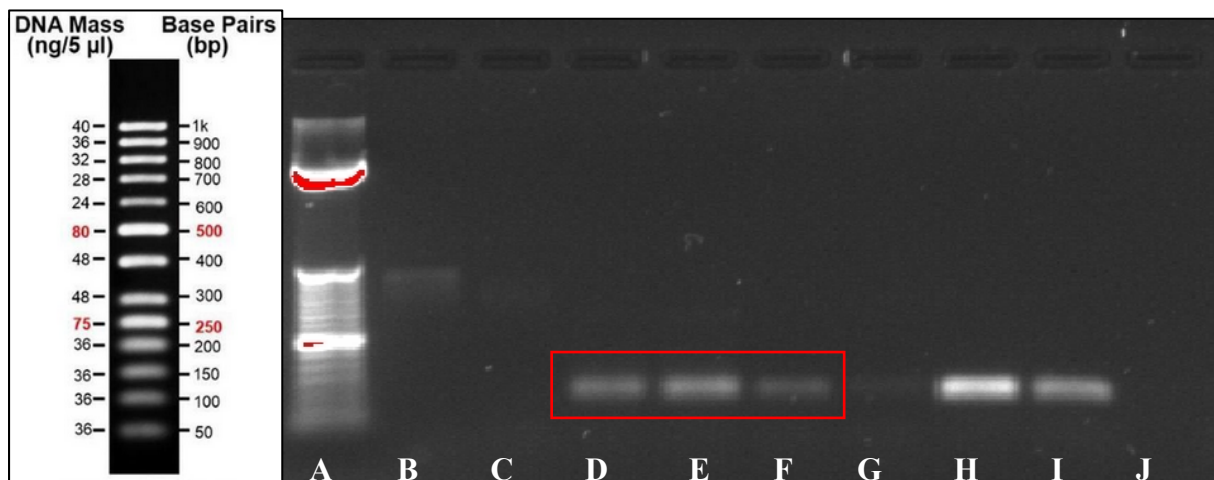
Lymphatic filariasis (LF) is a mosquito-borne parasitic disease caused by *Wuchereria bancrofti*, *B. malayi*, and *B. timori*¹. It is primarily transmitted by *Mansonia* and *Anopheles* mosquitoes², affecting the lymphatic system and leading to lymphedema, hydrocele, and elephantiasis³. Although LF cases have declined globally by 74%, approximately 657 million people remain at risk, with 51.4 million suffering long-term disabilities as of 2023³. Malaysia's National Lymphatic Filariasis Elimination Programme (NLFE) has reduced LF prevalence to below 2%, but transmission remains active in certain areas of Sabah, where environmental conditions support mosquito breeding⁴. Identifying LF vectors is essential for designing targeted control strategies and supporting Malaysia's LF elimination efforts.

Materials and Methods

The study was conducted in eight LF-endemic villages in Beluran and Pitas districts, Sabah. Adult mosquitoes were collected continuously for 12 hours (6.00 PM-6.00 AM) over three consecutive nights using Human Landing Collection (HLC), Resting Catch (RC), and Human-Baited Double Net Trap (HDNT) methods. To maximise mosquito capture, all collections were performed outdoors. Collected mosquitoes were preserved in labelled paper cups specifying the date, time, and collection site. Morphological identification was performed to classify species, and *Mansonia* species were dissected for third-stage filarial larvae (L3) detection. Other mosquito species underwent PCR analysis to detect *Brugia* species DNA. Post-PCR sequence alignment

Results and Discussion

Figure 1: Polymerase chain reaction profile of *Brugia* species from the mosquito collected.



Notes: A- 50bp ladder, B- (*Cx. tritaeniorhynchus*; Kg. Penubukan), C- (*An. sundaicus*; Kg. Kapok), D- (*Cx. whitmorei*; Kg. Golong), E- (*An. sundaicus*; Kg. Golong), F- (*Ae. albopictus*; Kg. Kipahung), G- (Unknown; Kg. Taradas), H- Positive control 1, I- Positive control 2, J- Negative control

Table 1: PCR results for the pooled mosquito samples.

#	Sampling site	Mosquito species	Sampling methods	PCR	Electrophoresis gel detection	Phylogenetic analysis
1.	Kg. Golong	<i>Cx. whitmorei</i>	HLC	Positive	Positive	<i>B. malayi</i>
2.	Kg. Golong	<i>An. sundaicus</i>	HLC	Positive	Positive	<i>B. malayi</i>
3.	Kg. Kipahung	<i>Ae. albopictus</i>	HLC	Positive	Positive	<i>B. timori</i>

Conclusion

This study confirms *B. malayi* and *B. timori* in previously unrecognised mosquito vectors, highlighting the need to re-evaluate LF vector control strategies. While Mass Drug Administration (MDA) remains essential, integrating enhanced vector surveillance, targeted insecticide interventions, and environmental management is critical for sustained transmission reduction. Strengthening vector monitoring will accelerate Malaysia's LF elimination efforts and contribute to the World Health Organization (WHO) 2030 Neglected Tropical Diseases Roadmap.

References

1. World Health Organization. Lymphatic filariasis 2023 [Available from: <https://www.who.int/news-room/fact-sheets/detail/lymphatic-filariasis>.
2. Noordin R. Lymphatic filariasis and the global elimination program. *Malays J Med Sci*. 2007;14(1):1-3.
3. Wilairatana P, Kotepui KU, Mala W, Wangdi K, Kotepui M. Prevalence, probability, and characteristics of malaria and filariasis co-infections: A systematic review and meta-analysis. *PLoS Negl Trop Dis*. 2022;16(10):e0010857.
4. Ministry of Health Malaysia. (2022). National Lymphatic Filariasis Elimination Programme: Progress Report.
5. Davis EL, Prada J, Reimer LJ, Hollingsworth TD. Modelling the Impact of Vector Control on Lymphatic Filariasis Programs: Current Approaches and Limitations. *Clin Infect Dis*. 2021 Jun 14;72(Suppl 3): S152-S157.

OESHPP09 / 202

Targeting Dengue at Its Source: Spatial and Principal Component Analyses on *Aedes* Breeding Sites.

Mohd Amierul Fikri Mahmud ¹, Faizul Akmal Abdul Rahim ¹, Eida Nurhadzira Muhammad ¹, Mohd Hazrin Hashim ¹, Mohd Hatta Abdul Mutalip ¹, Hanipah Shahar ², Izfa Riza Hazmi ³

¹ Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

² Entomology and Pest Unit, Kuala Lumpur & Putrajaya Health Department

³ Department of Bioscience and Biotechnology, Faculty of Science and Technology, Universiti Kebangsaan Malaysia

Corresponding author's email: amierul.fikri@moh.gov.my

Summary

This study investigates the spatial distribution and breeding characteristics of *Aedes aegypti* and *Aedes albopictus* in dengue outbreaks areas of Bandar Tasik Selatan, Kuala Lumpur, using entomological data from 2022 to 2023. Spatial analyses, including Average Nearest Neighbour, Moran's I, and Kernel Density Estimation, identified significant clustering of breeding sites, while principal component analysis (PCA) highlighted key breeding characteristics across four main locality types: residential areas, public facilities, schools, and food courts. These findings provide crucial insights for targeted vector control, enabling public health authorities to optimise intervention strategies and resource allocation to reduce dengue transmission in high-risk areas.

Keywords

Aedes, spatial analysis, dengue, breeding characteristics, vector

Introduction

Dengue incidence has surged globally, with cases rising from 505,430 in 2000 to over 6.5 million in 2023, causing 7,300 deaths¹. Malaysia faces recurrent dengue outbreaks, with urban centres like Kuala Lumpur reporting high case numbers. The dengue virus is transmitted by *Aedes aegypti* and *Aedes albopictus*, which predominantly breed in artificial and natural water containers in outbreak areas. Despite the proven benefits of Geographic Information System (GIS) and spatial analysis in vector control, their operational application in Kuala Lumpur remains limited. This study aims to analyse the spatial distribution and characteristics of *Aedes* breeding sites in Bandar Tasik Selatan to enhance targeted vector control strategies.

Materials and Methods

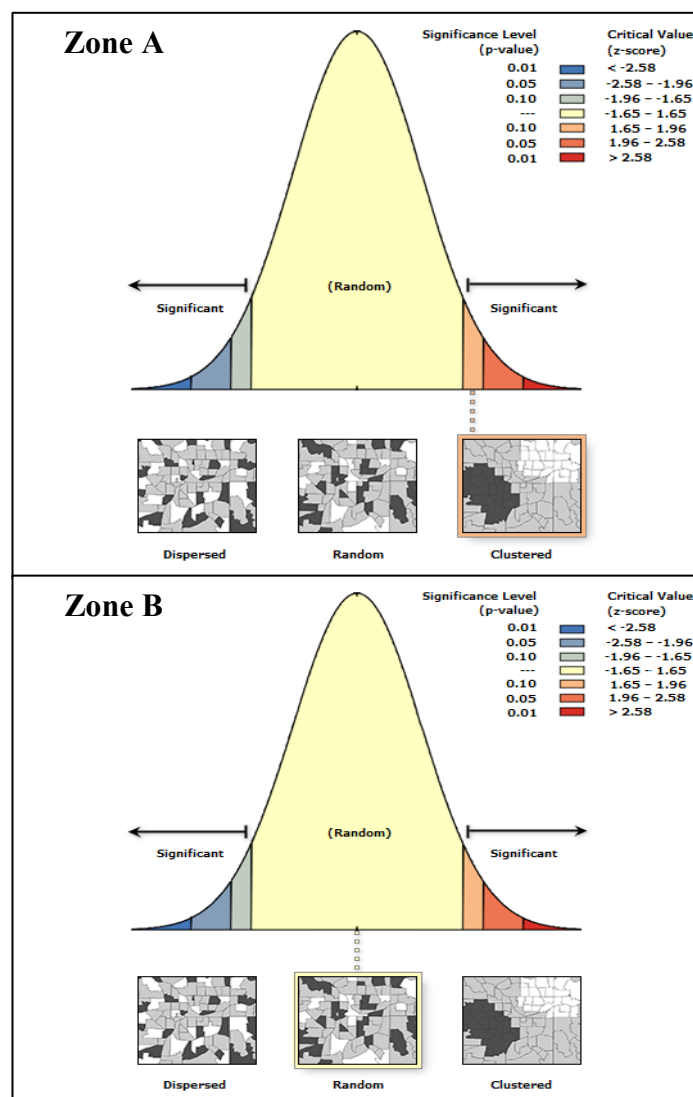
The study was conducted in Bandar Tasik Selatan, Kuala Lumpur, an area with 21 recorded dengue outbreaks in 2022. The site features high-rise apartments, schools, parks, and public facilities. Entomological data from the Kuala Lumpur Health Department (2022-2023) were collected through routine vector control assessments at outbreak sites and adjacent areas. Data included breeding site characteristics, entomological indices, and larval counts. Visual inspections and dipping techniques

were used to identify *Aedes aegypti* and *Aedes albopictus* breeding sites. Larvae were collected, identified microscopically, and recorded with GPS coordinates. Breeding sites were categorised by container type, material, water source, and environmental conditions. Spatial analysis using ArcGIS (ANN, Moran's I, KDE) identified high-risk areas. PCA determined key breeding site characteristics across residential areas, schools, and public facilities.

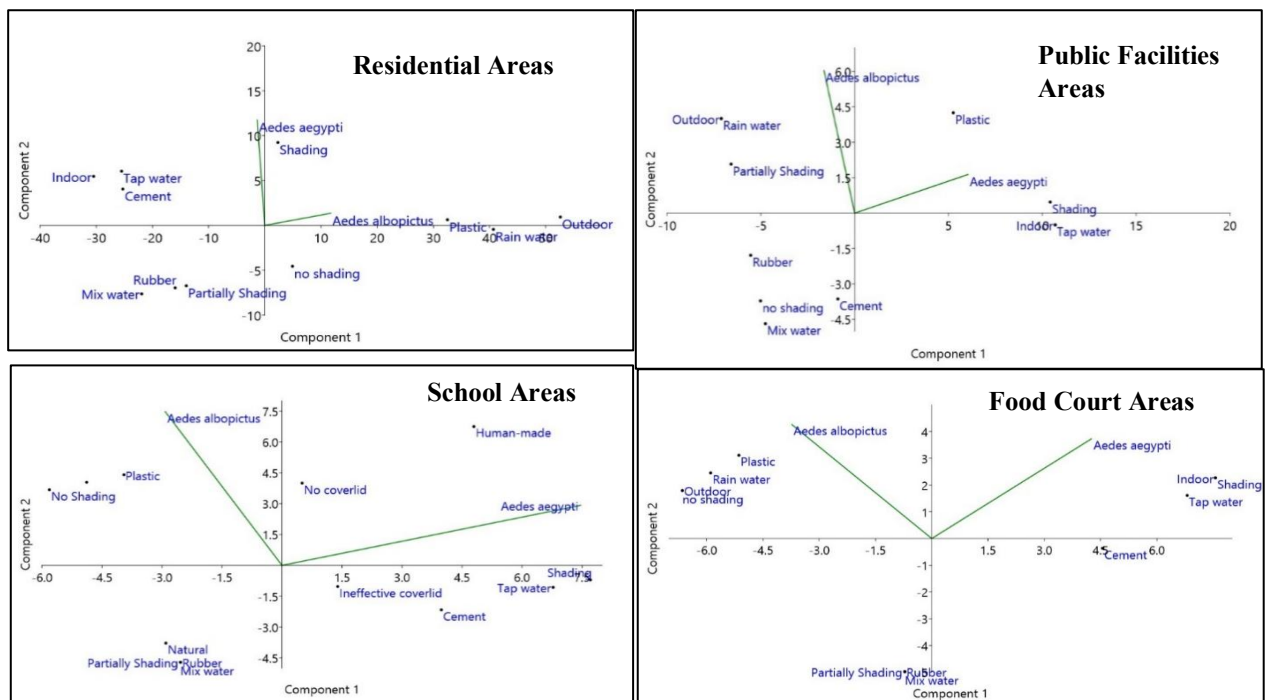
Results and Discussion

A total of 6,027 potential mosquito breeding containers were inspected, with 402 (6.7%) were positive for *Aedes* larvae. *Aedes aegypti* was found in 141 (2.3%) indoor containers, while *Aedes albopictus* was detected in 261 (4.3%) outdoor containers. Spatial analysis showed clustering of breeding sites in Zone A (ANN index = -10.52, $p < 0.001$), while Zone B exhibited a random pattern (ANN index = -8.34, $p < 0.001$), with higher densities observed in residential and public areas (Figure 1). KDE mapping identified *Aedes* breeding hotspots at Tasik Height Apartment, Pangsapuri Kos Rendah, Desa Tasik Polis, and no-man's land areas, mainly in parking lots and residential zones (Figure 2). PCA revealed that breeding characteristics varied by location: outdoor areas and shaded containers were significant in residential zones, while indoor areas and tap water were dominant in public facilities. Schools and food courts had significant associations with indoor breeding sites and plastic containers (Figure 3).

Figure 1: Global Moran's I of Zone A and B analysis results.



The map displays the distribution of breeding hotspots for the Asian Golden Plover in the South Lake Residence area. The hotspots are represented by semi-transparent yellow and red circles, where red indicates a higher density. Key locations labeled include South Lake Residence, Taman Kristal, Bandar Tasik Selatan, Taman Pasar 2, Taman Desa Tasik, and Kem Perdana Sungai Besi. Major roads shown are Jalan 1/11A, Jalan 1/12A, Jalan 1/13A, Jalan 1/14A, Jalan 1/15A, Jalan 1/16A, Jalan 1/17A, Jalan 1/18A, Jalan 1/19A, Jalan 1/20A, Jalan 1/21A, Jalan 1/22A, Jalan 1/23A, Jalan 1/24A, Jalan 1/25A, Jalan 1/26A, Jalan 1/27A, Jalan 1/28A, Jalan 1/29A, Jalan 1/30A, Jalan 1/31A, Jalan 1/32A, Jalan 1/33A, Jalan 1/34A, Jalan 1/35A, Jalan 1/36A, Jalan 1/37A, Jalan 1/38A, Jalan 1/39A, Jalan 1/40A, Jalan 1/41A, Jalan 1/42A, Jalan 1/43A, Jalan 1/44A, Jalan 1/45A, Jalan 1/46A, Jalan 1/47A, Jalan 1/48A, Jalan 1/49A, Jalan 1/50A, Jalan 1/51A, Jalan 1/52A, Jalan 1/53A, Jalan 1/54A, Jalan 1/55A, Jalan 1/56A, Jalan 1/57A, Jalan 1/58A, Jalan 1/59A, Jalan 1/60A, Jalan 1/61A, Jalan 1/62A, Jalan 1/63A, Jalan 1/64A, Jalan 1/65A, Jalan 1/66A, Jalan 1/67A, Jalan 1/68A, Jalan 1/69A, Jalan 1/70A, Jalan 1/71A, Jalan 1/72A, Jalan 1/73A, Jalan 1/74A, Jalan 1/75A, Jalan 1/76A, Jalan 1/77A, Jalan 1/78A, Jalan 1/79A, Jalan 1/80A, Jalan 1/81A, Jalan 1/82A, Jalan 1/83A, Jalan 1/84A, Jalan 1/85A, Jalan 1/86A, Jalan 1/87A, Jalan 1/88A, Jalan 1/89A, Jalan 1/90A, Jalan 1/91A, Jalan 1/92A, Jalan 1/93A, Jalan 1/94A, Jalan 1/95A, Jalan 1/96A, Jalan 1/97A, Jalan 1/98A, Jalan 1/99A, Jalan 1/100A. A scale bar indicates distances up to 500 meters, and a north arrow is present in the top right corner.



The study also revealed a significant clustering of *Aedes* spp. breeding sites in Bandar Tasik Selatan, particularly in Zones A. ANN and Moran's I analysis indicated a mean distance of 19.5 meters in Zone A and 32.4 meters in Zone B, consistent with the oviposition behaviour of *Aedes aegypti*². The distance aligns with previous studies and highlights the need for targeted vector control strategies, such as focused inspections and strategic ovitrap or mosquito trap placement³. Hotspot analysis identified high-risk areas, including residential zones, parking lots, and neglected spaces, emphasising the importance of resource prioritisation. Poor sanitation and illegal dumping contribute to mosquito breeding, particularly in high-rise apartments, public facilities, and schools. Integrating GIS-based surveillance can enhance control efforts by pinpointing breeding hotspots⁴. Identifying *Aedes* breeding sites hotspots and characteristics is crucial for effective targeted vector controls. Moreover, effective vector control should integrate insecticide applications, waste management, and community engagement to mitigate dengue risk and optimise public health interventions.

Conclusion

This study emphasises the spatial distribution and clustering of *Aedes* breeding sites in Bandar Tasik Selatan, facilitating targeted vector control. Hotspot mapping and PCA managed to identify key risk areas and breeding site characteristics. These insights enable efficient resource allocation, improving dengue prevention and vector management through focused interventions and community engagement.

References

1. World Health Organization. Dengue and severe dengue 2024 [Available from: <https://www.who.int/news-room/fact-sheets/detail/dengue-and-severe-dengue/> Accessed 15 April 2024.
2. Koenraadt CJ, Aldstadt J, Kijchalao U, Set al. Spatial and temporal patterns in pupal and adult production of the dengue vector *Aedes aegypti* in Kamphaeng Phet, Thailand. *The American Journal of Tropical Medicine and Hygiene*. 2008;**79**(2): 230-238.
3. Schafrick NH, Milbrath MO, Berrocal VJ, et al. Spatial clustering of *Aedes aegypti* related to breeding container characteristics in Coastal Ecuador: implications for dengue control. *The American Journal of Tropical Medicine and Hygiene*. 2013;**89**(4): 758.
4. LaCon G, Morrison AC, Astete H, et al. Shifting patterns of *Aedes aegypti* fine scale spatial clustering in Iquitos, Peru. *PLoS Neglected Tropical Diseases*. 2014;**8**(8): e3038.

OESHPP10 / 206

Primary Water Sources in Remote Communities: A Descriptive Study

Tuan Mohd Amin Tuan Lah¹, Lim Kuang Kuay¹, Maznieda Mahjom¹, S Maria Awaluddin¹, Noor Syaqlah Shawaluddin¹

¹Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: tuanmohdamin@moh.gov.my

Summary

This study examines disparities in water accessibility among remote communities, revealing significant inequalities. While Estate Quarters (100%), Structured Residences (99.2%), and Traditional Villages (91%) have widespread access to public treated water, only 16.1% of Orang Asli Villages do, relying instead on rivers/lakes (50%) and gravity-fed systems (30.4%). Addressing these disparities requires infrastructure improvements, expansion of treated water networks, and promotion of safe water storage. Future research should explore socio-economic impacts and policy interventions to enhance water security.

Keywords

Remote communities, water accessibility, public treated water, rural water sources, water security

Introduction

Access to clean and reliable water sources is a fundamental human right and crucial for public health and development¹. However, many remote communities face challenges in securing adequate water supplies due to geographical, infrastructural, and socio-economic constraints^{2,3}. Understanding the disparities in water source accessibility can help inform policy decisions and infrastructure development⁴. This study examines the primary water sources in different types of remote communities, including Traditional Villages, Structured Residences, Estate Quarters, and Orang Asli Villages, to assess the extent of dependency on various water sources and identify areas for improvement⁵.

Materials and Methods

A cross-sectional study was conducted in selected remote areas of Johor, Kelantan, Pahang, Perak, and Terengganu from September 14 to October 21, 2021. The study included Traditional Villages, Structured Residences, Estate Quarters, and Orang Asli Villages. A two-stage stratified random sampling method was employed to select eligible heads of households. The primary water source data was collected through household surveys, with responses provided by the head of the household. Descriptive statistical analysis was performed using IBM SPSS Version 29.0.

Results and Discussion

The analysis reveals significant disparities in water source reliance across different community types (Table 1). Public treated water is the dominant source in most

communities, with 91% of Traditional Villages, 99.2% of Structured Residences, and 100% of Estate Quarters having access to it. However, only 16.1% of Orang Asli Villages have access to treated water, relying instead on rivers, lakes, or mines (50%) and gravity-fed systems (30.4%), highlighting critical infrastructure gaps. These disparities align with previous studies emphasising limited water access in Indigenous and rural communities due to geographical and policy constraints (4). Well and tube well usage is minimal, reported by only 5.6% of Traditional Villages and 3.6% of Orang Asli Villages. Rainwater collection was not recorded as a significant water source in the communities. Furthermore, dependence on multiple water sources is extremely low, indicating that most communities rely on a single primary water source. These findings underscore the urgent need for infrastructure development in Orang Asli Villages, where reliance on untreated water sources poses potential health risks. Previous studies have linked untreated water consumption to higher incidences of waterborne diseases, particularly in remote and underserved communities (5). Additionally, while Traditional Villages predominantly depend on treated water, the minor use of wells and gravity-fed systems suggests lingering infrastructure limitations that should also be addressed.

Table 1 : Primary source of water in remote community

Source	Traditional village		Structured Residence		Estate Quarters		Orang Asli Village	
	No.	%	No.	%	No.	%	No.	%
Public treated water supply	213	91.0	130	99.2	83	100.0	9	16.1
Gravity feed system	6	2.6	0	0.0	0	0	17	30.4
Well/ tube well	13	5.6	0	0.0	0	0	2	3.6
River/lakes/ mines	1	0.4	0	0.0	0	0	28	50.0
Rain	0	0.0	0	0.0	0	0	0	0.0
More than one source	1	0.4	1	0.8	0	0	0	0.0
Total	234	100.0	131	100.0	83	100.0	56	100.0

Conclusion

This study reveals disparities in water access, with Estate Quarters and Structured Residences having near-universal access, while Orang Asli Villages remain disadvantaged. Bridging this gap requires targeted infrastructure, expanded water supply networks, and improved filtration methods. Future research should explore socio-economic impacts and community-driven solutions for water security.

References

1. United Nations. The human rights to safe drinking water and sanitation. 2021. Available from: <https://www.ohchr.org/en/water-and-sanitation>

2. World Health Organization (WHO). Guidelines on drinking-water quality. 4th ed. Geneva: WHO; 2017. Available from: <https://www.who.int/publications/i/item/9789241549950>
3. UNICEF & WHO. Progress on household drinking water, sanitation, and hygiene 2000-2020. 2021. Available from: <https://washdata.org>
4. Fuad S, Hashim H, Omar N, et al. Water access and sanitation facilities in the Johor River Basin, Malaysia: a comparison between indigenous and more modernised communities. Res Gate. 2023. www.researchgate.net/publication/374186768
5. Ngai WC, Khan M, Ibrahim MH. Using Malaysia as a detailed case study: The impact of untreated river water on health outcomes. *Front Water*. 2022;4:779860.

OESHPP11 / 211

The Influence of Temperature on Dengue Transmission Dynamics in Kuantan, Pahang

Mohd Amiru Hariz Aminuddin¹, Muhammad Al Azim Baharudin², Muhamad Isa Abdul Aziz¹, Khairul Aizat Mahdin¹

¹ Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

² Kuantan Health District Office, Ministry of Health Malaysia

Corresponding author's email: amiruhariz@moh.gov.my

Summary

This research examines the impact of temperature on dengue transmission dynamics in Kuantan, Pahang, Malaysia, a region known for a tropical climate. This study aims to identify the critical temperatures at which the prevalence of dengue fever (DF) is most affected, using a mixed-methods approach that combines epidemiological and meteorological data. By integrating retrospective dengue case data from the Ministry of Health Malaysia spanning from 1st January 2024 until 31st December 2024 and meteorological records from the Malaysian Meteorological Department over the same period, this study aims to assess the impact of climate on the dengue outbreak.

Keywords

Dengue Fever, Temperature, Aedes Mosquito, Public Health, Vector Control.

Introduction

Dengue fever (DF) remains a primary global health concern, with an estimated 6.5 million infections and 7,300 deaths reported in 2023¹. In Malaysia, dengue is a significant public health challenge, with a high incidence rate and periodic outbreaks occurring throughout the country. The Ministry of Health reported over 90,000 dengue cases and 145 deaths in 2020, highlighting the substantial impact of the disease². Dengue fever poses a significant public health burden in tropical regions, with its spread closely linked to environmental factors, particularly temperature. Temperature influences the Aedes mosquito vector and the dengue virus's extrinsic incubation period³. In Kuantan, Pahang a region characterised by its tropical climate and fluctuating temperatures, understanding the precise impact of temperature on dengue transmission dynamics is crucial for developing effective control strategies⁴. This research aims to investigate this relationship, providing data-driven insights for targeted public health interventions.

Methodology

This study will employ a mixed-methods approach, integrating epidemiological and meteorological data. Historical dengue case data from the Ministry of Health Malaysia will be analysed to identify dengue case patterns and outbreaks. Daily temperature data will be obtained from the Malaysian Meteorological Department. Statistical analyses will include descriptive statistics and Pearson correlation to examine the relationship between temperature fluctuations and dengue outbreaks. This study has several limitations that should be considered when interpreting the findings. Notably, the absence of humidity, rainfall data, and socioeconomic variables may have limited our ability to fully clarify the independent effect of

temperature on dengue transmission. Future research should prioritize the collection of these data to provide a more comprehensive understanding of the complex factors driving dengue dynamics.

Result and Discussion

As shown in Table 1, the average weekly maximum temperature is 33.6 °C with a standard deviation of 1.33 °C. In 2024, the weekly maximum and minimum temperatures are 35.4 °C and 29.8 °C respectively. The mean DF prevalence during 2024 in Kuantan was 13.9 cases with an SD of 7.5. The maximum prevalence of DF cases in a week is 36 and the lowest is 3 cases. As shown in Table 2, the Pearson correlation between weekly maximum temperature and DF prevalence is statistically significant ($p = 0.007$, $p < 0.05$). The correlation coefficient ($r = -0.370$) indicates a significant association between temperature and DF prevalence, demonstrating a statistically significant but moderate negative correlation (Table 2). While the peak DF prevalence of 36 cases occurs at 33.2 °C, the minimum of 3 cases is observed at 34.6 °C (Figure 1). The time series reveals an inverse relationship between temperature and dengue fever (DF) prevalence. The findings suggest that higher temperatures tend to be associated with lower dengue fever prevalence in this dataset. Contrary to the expected positive association between temperature and mosquito-borne disease transmission, this study revealed a statistically significant moderate negative correlation between weekly maximum temperature and dengue fever prevalence. Temperature is a critical factor influencing mosquito biology, affecting virus development in the mosquito, biting rate, resting and mating behaviour, spread and duration of the gonotrophic cycle, and causing a slowing of physiological processes above 35 °C. The optimal temperature range for mosquito growth is 25-30 °C⁵. People may use air conditioning more frequently and spend more time indoors during periods of higher temperatures, thus limiting their contact with mosquitoes. Despite a surprising link between higher temperatures and fewer dengue cases, Kuantan must maintain strong vector control. This includes sustained larval control, targeted adult mosquito control, enhanced surveillance of mosquito populations and environmental factors, robust community engagement and education, and further research to understand the unusual trend, all while preparing for potential climate-driven shifts in disease transmission.

Table 1. Mean, median, standard deviation, minimum and maximum value of weekly maximum temperature and prevalence of DF in Kuantan, Pahang 2024.

Variable	Mean	Median	SD	Min	Max
Weekly Maximum Temperature (°C)	33.6	33.9	1.33	29.8	35.4
Prevalence of DF	13.9	12.5	7.5	3	36

Table 2. Results of Pearson correlation analysis between weekly maximum temperature and prevalence of DF during 2024 Kuantan, Pahang.

Variables (n=52)	Prevalence of dengue fever		Statistical Significance
	P-value (p)	Correlation coefficient (r)	
Weekly maximum temperature	0.007	-0.370	moderate negative correlation

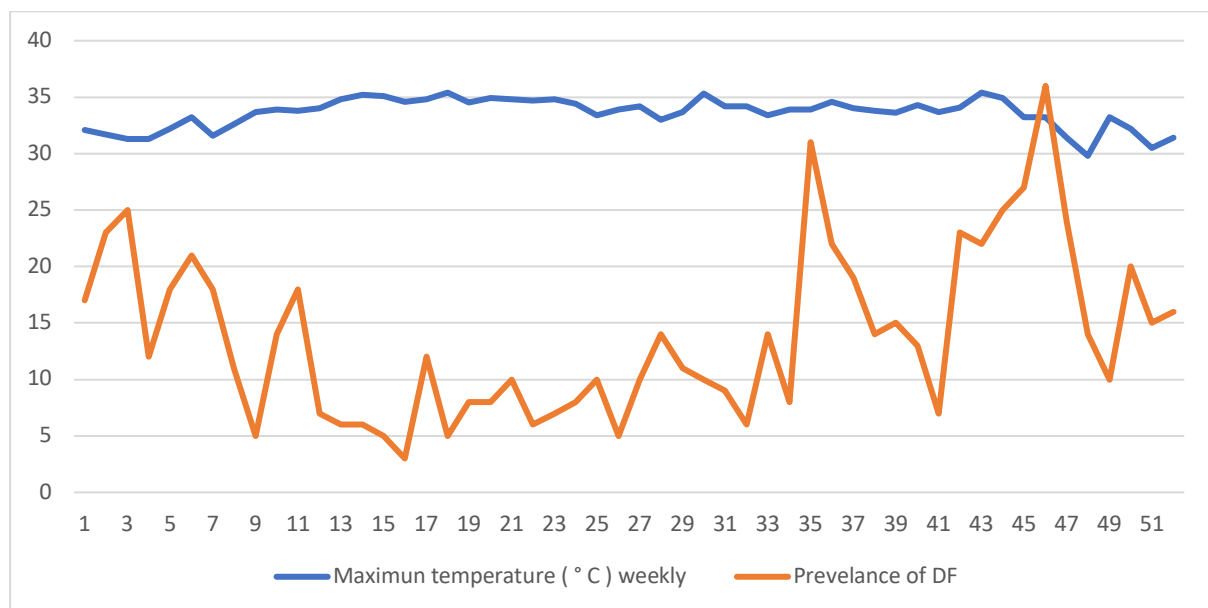


Figure 1. Time-series analysis between weekly maximum temperature and prevalence of DF during 2024 Kuantan, Pahang.

Conclusion

This study reveals a surprising inverse relationship between weekly maximum temperature and dengue fever prevalence, with higher temperatures correlating to fewer cases. Dengue remains a significant public health concern with notable prevalence. This necessitates continued robust vector control measures and further research to understand the underlying ecological and behavioural factors driving this unexpected trend.

References

1. WHO. World Health Organization - Technical Report Series. 2024. p. 1-13
Dengue and severe dengue. Available from:
<http://www.who.int/mediacentre/factsheets/fs117/en/>
<https://www.who.int/news-room/fact-sheets/detail/dengue-and-severe-dengue>
https://www.who.int/health-topics/dengue-and-severe-dengue#tab=tab_1
2. Malaysian Society of Infectious Diseases & Chemotherapy. The 3rd Edition Guidelines for Adult Immunisation provides healthcare providers with comprehensive information on adult vaccines in Malaysia and the diseases they prevent. 2023. Upcoming Vaccines: Dengue. Available from:
[https://adultimmunisation.msdc.my/dengue/#:~:text=In Malaysia in year 2020,2023 are steadily going upwards.](https://adultimmunisation.msdc.my/dengue/#:~:text=In%20Malaysia%20in%20year%2020%2C2023%20are%20steadily%20going%20upwards.)
3. Mordecai EA, Cohen JM, Evans MV, et al. Detecting the impact of temperature on transmission of Zika, dengue, and chikungunya using mechanistic models. *PLoS Negl Trop Dis*. 2017;**11**(4):e0005568.
4. Mohamad Hanapi MH, Shafie FA. Spatio-Temporal analysis of Dengue distribution pattern in Kuantan from 2015-2019. *Healthscope: The Official Research Book of Faculty of Health Sciences, UiTM*. 2021;**4**(1):31-7.
5. Jahan Y, Rahman A. Management of dengue hemorrhagic fever in a secondary level hospital in Bangladesh: A case report. *IDCases*. 2020;**21**:e00880.

OESHPP12 / 213

Determinants for injury among healthcare workers involved in occupational accidents and dangerous occurrence in Terengganu

Hafizuddin Awang¹, Noriah Mahmud², Mohd Anuar Abd Rahman², Kasemani Embong²

¹Besut District Health Department, Kampung Raja, Besut, Terengganu

²Terengganu State Health Department, Kuala Terengganu, Terengganu

*Correspondence: drhafizuddin@moh.gov.my

Summary:

Occupational accident and dangerous occurrence among healthcare workforce may result in various unfavourable outcomes which reduce the productivity of Terengganu's healthcare industry. Motorcycle use, allied health group, and motor vehicle accidents mechanism were the significant factors associated with injury among healthcare workers involved in occupational accidents and dangerous occurrence in Terengganu. Factors associated with injury among healthcare workers in occupational accidents and dangerous occurrence in Terengganu are explored to mitigate the impact of these accidents and occurrence on the quality of healthcare delivery.

Keywords

Occupational accidents, dangerous occurrence, motor vehicle accidents, occupational fatigue, Malaysia

Introduction:

Occupational accident is an occurrence arising out of or in the course of work which result in fatal injury or non-fatal injury, meanwhile dangerous occurrence is an occurrence, which arises out of or in connection with work¹. The healthcare sector is among the most unsafe working environments, putting many healthcare workers (HCWs) at risk of being exposed to various occupational hazards². In 2023, there were 6951 and 167 cases of occupational accidents reported to DOSH in Malaysia and Terengganu, respectively¹. There is no well-published study to explore the epidemiology of injury among healthcare workers (HCW) involved in occupational accidents and dangerous occurrence in Terengganu. By delineating the magnitude and determinants for these mishaps, we may strategise policies to enhance safety of our healthcare workers particularly in unsafe working environment.

Materials and Methods:

A cross-sectional study was conducted between injured and non-injured Terengganu HCW involved in occupational accidents and dangerous occurrence. All notified cases using JKKP6 form to Terengganu State Health Department that fulfilled the inclusion and exclusion criteria from 1st January 2023 until 30th April 2024 were included in the study. Descriptive statistics, simple and multiple logistic regressions were employed for data analysis. Clinically important variables and variables with p-value less than 0.25 in the univariable analysis were selected for multivariable analysis.

Results and Discussion:

There were 206 HCW in Terengganu notified using JKPP6 form during the study period, and 74.3% of total notified cases sustained injury from the accidents. Majority of the accidents involved female HCW (56.8%), paramedics group (41.3%), hospital working group (60.2%), motorcycle use (30.1%) and resulted from motor vehicle accidents (MVA) (72.3%). Multiple logistic regression revealed motorcycle use, allied health group, and MVA mechanism were the significant factors associated with injury among HCW involved in occupational accidents and dangerous occurrence in Terengganu with an adjusted odds ratio (AOR) 80.02 (95%CI: 5.78, 1106.36); $p=0.001$; 0.11 (95%CI: 0.02, 0.56; $p=0.008$); and 11.38 (95%CI: 1.33, 96.99; $p=0.026$), respectively (Table 1).

Table 1: Determinants for injury among HCW involved in occupational accidents and dangerous occurrence in Terengganu (N=206)

Characteristics	Crude OR (95% CI) ^a	p-value ^a	Adj. OR (95% CI) ^b	p-value ^b
Age	0.97 (0.94, 1.02)	0.239	-	-
Gender				
Female	1		-	
Male	0.99 (0.53, 1.86)	0.974	-	-
Job categories				
Auxiliary staff	1		1	
Medical & dental professionals	0.49 (0.14, 1.75)	0.276	0.50 (0.11, 2.32)	0.378
Allied health staff	0.22 (0.06, 0.74)	0.015*	0.11 (0.02, 0.56)	0.008*
Paramedics	0.45 (0.18, 1.14)	0.091	0.62 (0.18, 2.09)	0.437
Drivers	0.08 (0.02, 0.25)	<0.001*	0.53 (0.09, 3.30)	0.496
Mechanisms of accident				
Others	1		1	
Motor vehicle accident	7.00 (0.94, 52.04)	0.057	11.38 (1.33, 96.99)	0.026*
Fall	2.24 (0.44, 11.52)	0.335	4.21 (0.21, 15.22)	0.545
Manual injury	16.15 (0.24, 84.29)	0.598	17.21 (0.31, 101.23)	0.748

Hazardous exposure	9.00 (0.66, 122.79)	0.099	9.61 (0.64, 144.76)	0.102
Type of vehicles involved				
None	1		1	
Ambulance	0.02 (0.01, 0.09)	<0.001*	0.17 (0.02, 1.44)	0.103
Personal car	0.24 (0.09, 0.61)	0.003*	2.18 (0.38, 12.29)	0.376
Personal motorcycle	8.54 (1.02, 71.75)	0.048*	80.02 (5.79, 1106.36)	0.001*
Office vehicles	0.00 (0.00, 0.00)	0.999	0.00 (0.00, 0.00)	0.999

*p-value < 0.05 ^aSimple logistic regression ^bMultiple logistic regression Forward LR method applied.

Motorcycle-related accident contributed significantly to HCW injury in Terengganu which could be attributed to rider vulnerability, vehicle instability, and rider behaviour³. Allied health group is significantly protected from involvement in occupational accident and dangerous occurrence due to their less involvement in night shift or on-call duty which subsequently contributed to less risk to develop occupational fatigue and sleepiness^{4,5}. MVA mechanism contributed significantly to injury in occupational accident as 94% of causes are due to driver error and reckless driver behaviour such as decision error, performance error, recognition error and non-performance error which are largely attributed from occupational fatigue (contributed from long working hour (on-call duty) and sleep deprivation (night shift))⁵.

Conclusion:

Motorcycle use, allied health group, and MVA mechanism were the significant factors associated with injury among HCWs. These data provide preliminary evidence to guide the development of any initiative addressing commuter motorcycle collisions, whether these be behavioural, educational, training, engineering and or system-wide enhancements.

References

1. DOSH. OCCUPATIONAL ACCIDENT STATISTICS BY STATE JANUARY - OCTOBER 2023 (REPORTED TO DOSH ONLY) Malaysia: Department of Occupational Safety and Health Ministry of Human Resources Malaysia; 2024 Available from: <https://www.dosh.gov.my/index.php/statistic-v/occupational-accident-statistics/occupational-accident-statistic-2023/4665-occupational-accident-statistics-by-state-january-october-2023/file>.
2. Debelu D, Mengistu DA, Tolera ST, et al. Occupational-related injuries and associated risk factors among healthcare workers working in developing countries: a systematic review. *Health services research managerial epidemiology*. 2023;**10**:23333928231192834.
3. Oxley J, Yuen J, Ravi MD, et al. Commuter motorcycle crashes in Malaysia: An understanding of contributing factors. *Annals of advances in automotive medicine*. 2013;**57**:45.
4. Fauzi MFM, Yusoff HM, Abd Manaf MR, et al. Intervention for occupational fatigue and sleepiness among healthcare workers working in shift: a systematic review. *Malaysian Journal of Public Health Medicine*. 2019;**19**(2):47-53.
5. Zuwairy MS, Harith AA, Nobuyaki H, et al. Road traffic accidents: a descriptive study of commuting injury among healthcare workers in Malaysia 2014-2016. *International Journal of Public Health Clinical Sciences*. 2020;**7**(1):58-71.

OESHPP13 / 214

Predictors of Delayed Healthcare Seeking Among Dengue Patients in Klang District: A Logistic Regression Approach

Nur Nabila Abd Rahim¹, Hazwa Harith², Nurul Farehah Shahrir¹, Gurpreet Kaur Karpal Singh³

¹ Institute for Medical Research, National Institutes of Health, Ministry of Health, Malaysia.

² Institute for Health Systems Research, National Institutes of Health, Ministry of Health, Malaysia.

³ Klang District Health Office, Ministry of Health, Malaysia.

Corresponding author's email: nurnabila.ar@moh.gov.my

Summary

Delayed healthcare-seeking in dengue has been associated with increased morbidity and mortality. This study examined prevalence and predictors of delayed healthcare seeking among dengue patients in Klang District. Of 8,183 cases, 56% experienced delay. Key predictors identified through multiple logistic regression included ethnicity, healthcare facility type, and symptoms (rash, diarrhoea). Compared to Malays, Chinese (AOR: 0.71, 95% CI: 0.62-0.81) and Indian (AOR: 0.76, 95% CI: 0.68-0.86) patients had lower odds of delay. Seeking treatment at hospitals was associated with delay (AOR: 1.51, 95% CI: 1.36-1.68). Findings highlight the need for targeted interventions to improve early healthcare seeking.

Keywords

Dengue, healthcare seeking, treatment delay, predictors, Malaysia

Introduction

Dengue remains a major public health challenge in Malaysia, with an increasing incidence and frequent outbreaks¹. Early treatment is crucial to prevent complications, yet many patients delay seeking healthcare^{2,3}. Understanding these delays is vital for targeted interventions. While previous research has examined healthcare-seeking behaviours, limited studies have explored this in Klang District, a densely populated area with high dengue burden. This study investigates predictors associated with delayed healthcare-seeking among dengue patients.

Materials and Methods

This retrospective cross-sectional study analysed 8,183 dengue cases reported in Klang District in 2024, obtained from the eDengue system. Time to healthcare-seeking was defined as the number of days from symptom onset to case notification. Patients were categorised as “No Delay (<3 days)” and “Delayed (≥3 days).” Key variables included demographics (age, sex, ethnicity, locality), healthcare facility type, and symptoms. Simple and multiple logistic regression analyses were performed using the backward stepwise selection method to identify significant predictors of delayed healthcare-seeking. Multicollinearity was assessed to ensure

model stability. Statistical significance was set at $p < 0.05$. Analysis was conducted using R version 4.4.2.

Results and Discussion

Table 1 presents the characteristics of dengue patients in Klang District. Among the 8,183 cases analysed, 56% experienced treatment delays.

Table 1: Characteristics of Dengue Cases in Klang District, 2024

Variable	Total, n (%)	No Delay, n (%)	Delayed, n (%)	p-value ²
Number of Cases	8,183 (100.0%)	3,604 (44.0%)	4,579 (56.0%)	
Age (years)¹	31.2 (17.3)	31.7 (17.2)	30.9 (17.4)	0.033
Sex				0.006
Male	4,955 (61.0%)	2,243 (62.0%)	2,712 (59.0%)	
Female	3,228 (39.0%)	1,361 (38.0%)	1,867 (41.0%)	
Ethnicity				<0.001
Malay	3,942 (57.0%)	1,571 (54.0%)	2,371 (60%)	
Chinese	1,184 (17.0%)	540 (19.0%)	644 (16.0%)	
Indian	1,595 (23.0%)	742 (26.0%)	853 (22.0%)	
Others	136 (2.0%)	46 (1.6%)	90 (2.3%)	
Locality				0.400
Urban	7,646 (94.0%)	3,378 (94.0%)	4,268 (94.0%)	
Rural	506 (6.2%)	214 (6.0%)	292 (6.4%)	
Healthcare Facility Type				<0.001
Clinic	5,534 (68.0%)	2,651 (74.0%)	2,883 (63.0%)	
Hospital	2,649 (32.0%)	953 (26.0%)	1,696 (37.0%)	
Symptoms and Signs				
Fever	8,183 (100.0%)	3,604 (100.0%)	4,579 (100.0%)	
Headache	7,430 (91.0%)	3,295 (91.0%)	4,135 (90.0%)	0.081
Retroorbital Pain	2,254 (28.0%)	1,067 (30.0%)	1,187 (26.0%)	<0.001
Myalgia	5,286 (65.0%)	2,287 (63.0%)	2,999 (65.0%)	0.056
Nausea and Vomiting	2,576 (31.0%)	1,076 (30.0%)	1,500 (33.0%)	0.005
Gastrointestinal Symptoms	654 (8.0%)	260 (7.2%)	394 (8.6%)	0.021
Diarrhoea	1,203 (15.0%)	458 (13.0%)	745 (16.0%)	<0.001
Rash	675 (8.2%)	187 (5.2%)	488 (11.0%)	<0.001
Bleeding Tendencies	36 (0.4%)	11 (0.3%)	25 (0.5%)	0.100

¹ Mean (SD); n (%)

² Independent t-test for continuous variables and Chi-square test for categorical variables. Bold indicates significance at $p < 0.05$.

Table 2 presents the crude and adjusted odds ratios (AORs) for predictors of delayed healthcare-seeking. Multivariable analysis found that ethnicity, healthcare facility type, and symptoms were significant predictors of delayed healthcare seeking. Compared to Malays, Chinese patients had lower odds of delay (AOR: 0.71, 95% CI: 0.62-0.81), as did Indian patients (AOR: 0.76, 95% CI: 0.68-0.86). Patients seeking treatment at hospitals were more likely to experience delays (AOR: 1.51, 95% CI: 1.36-1.68). Among symptoms, diarrhoea (AOR: 1.26, 95% CI: 1.09-1.45) and rash (AOR: 2.07, 95% CI: 1.72-2.50) were associated with increased odds of delay.

Table 2: Crude and Adjusted Odds Ratios for Delayed Healthcare Seeking

Variable	Crude OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value ¹
Age (years)				
≤5	Reference			
6 to 19	1.03 (0.83, 1.29)	0.224	1.08 (0.85, 1.35)	0.534
20 to 39	0.76 (0.62, 0.94)	0.473	0.86 (0.69, 1.07)	0.180
40 to 59	0.91 (0.73, 1.13)	0.107	0.98 (0.77, 1.23)	0.835
≥60	0.77 (0.60, 0.99)	0.185	0.85 (0.65, 1.10)	0.223
Sex				
Male	Reference			
Female	1.13 (1.04, 1.24)	0.006	1.04 (0.94, 1.14)	0.468
Ethnicity				
Malay	Reference			
Chinese	0.79 (0.69, 0.90)	<0.001	0.71 (0.62, 0.81)	<0.001
Indian	0.76 (0.68, 0.86)	<0.001	0.76 (0.68, 0.86)	<0.001
Others	1.30 (0.91, 1.87)	0.159	1.28 (0.88, 1.88)	0.207
Locality				
Urban	Reference			
Rural	1.08 (0.90, 1.30)	0.408	1.03 (0.84, 1.26)	0.793
Healthcare Facility Type				
Clinic	Reference			
Hospital	1.64 (1.49, 1.80)	<0.001	1.51 (1.36, 1.68)	<0.001

Symptoms and Signs				
Headache	0.87 (0.75, 1.02)	0.081	1.13 (0.94, 1.35)	0.191
Retroorbital Pain	0.83 (0.75, 0.92)	<0.001	1.08 (0.92, 1.25)	0.343
Myalgia	1.09 (1.00, 1.20)	0.056	1.08 (0.94, 1.23)	0.281
Nausea and Vomiting	1.14 (1.04, 1.26)	0.005	0.95 (0.85, 1.07)	0.389
Gastrointestinal Symptoms	1.21 (1.03, 1.43)	0.021	1.02 (0.85, 1.22)	0.849
Diarrhoea	1.33 (1.18, 1.51)	<0.001	1.26 (1.09, 1.45)	0.002
Rash	2.18 (1.83, 2.60)	<0.001	2.07 (1.72, 2.50)	<0.001
Bleeding Tendencies	1.79 (0.90, 3.80)	0.107	1.41 (0.66, 3.19)	0.388

¹ **Bold** indicates significance at $p < 0.05$.

Figure 1 presents the final adjusted odds ratios, highlighting final predictors retained through model selection. These findings suggest that ethnicity, healthcare type, and specific symptoms play critical roles in treatment-seeking behaviour.

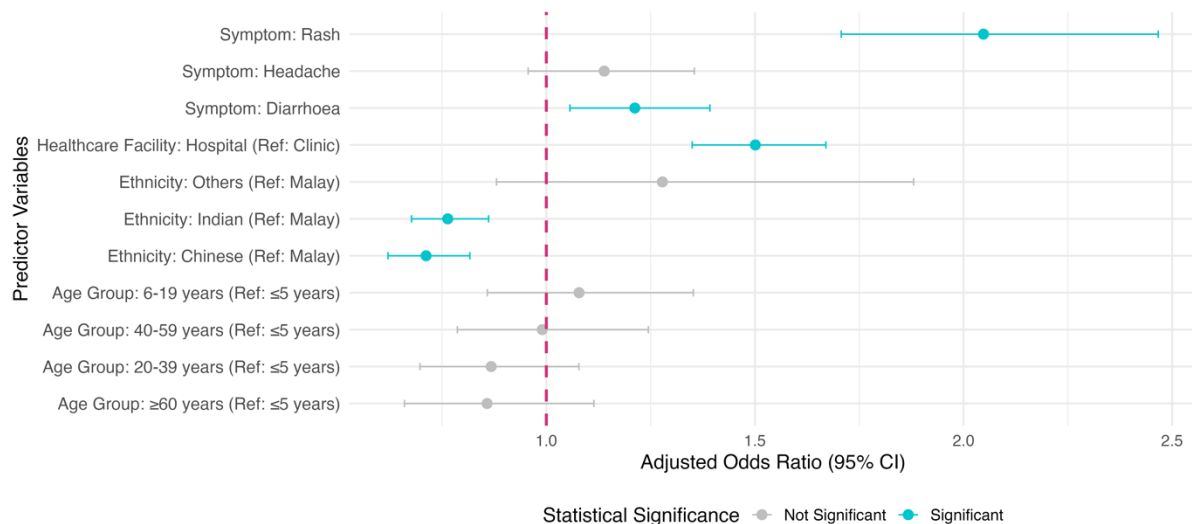


Figure 1: Adjusted Odds Ratios for Predictors of Delayed Healthcare Seeking (Final Model using Backward Stepwise Selection)

Conclusion

This study identified key predictors of delayed healthcare-seeking among dengue patients in Klang District, including ethnicity, healthcare facility type, and symptoms such as diarrhoea and rash. Targeted health promotion initiatives emphasising early recognition of warning signs, particularly among high-risk groups in primary healthcare settings, may facilitate timely healthcare-seeking and optimise dengue case management.

References

1. Bahagian Kawalan Penyakit, Agensi Angkasa Malaysia, Kementerian Tenaga S, Teknologi & Inovasi. Statistik Denggi 2025 [Available from: https://idengue.mysa.gov.my/ide_v3/pdf/statistik.pdf#page=3].
2. Ng TC, Teo CH, Toh JY, et al. Factors influencing healthcare seeking in patients with dengue: Systematic review. *Tropical Medicine & International Health*. 2022;**27**(1):13-27.
3. Mallhi TH, Khan AH, Sarrieff A, et al. Patients related diagnostic delay in dengue: An important cause of morbidity and mortality. *Clinical Epidemiology and Global Health*. 2016;**4**(4):200-1.

OESHPP14 / 222

Insufficient Water Intake and its Association with Nutritional Status: Findings From The Adult Population Survey

Sulhariza Husni Zain¹, Nurzaime Zulaily¹, Khairul Hasnan Amali¹, Halizah Mat Rifin¹

¹ Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: sulhariza@moh.gov.my

Summary

Water is vital for physiological functions, and emerging evidence suggests its role in weight management and body composition. However, data on this relationship in Malaysia remains limited. This study investigates the association between plain water intake (PWI) and nutritional status among adults in Malaysia using data from the National Health and Morbidity Survey (NHMS) 2023. Analyses of plain water intake, nutritional status, and sociodemographic factors revealed that underweight adults consumed significantly less plain water, even after adjustments of covariates. Improving hydration may enhance nutrient absorption, appetite, and overall health in underweight adults, highlighting the need for targeted hydration strategies.

Keywords: Underweight adult, plain water, adult nutritional status, insufficient water intake, adult BMI

Introduction

Inadequate water intake is a prevalent issue that significantly impacts health outcomes and adults' nutritional status. Insufficient hydration can impair cognitive functions such as memory and attention¹. Moreover, inadequate water consumption may also affect normal metabolic processes, potentially influencing body composition and weight management². This study aimed to examine the association between plain water intake and the nutritional status of adults in Malaysia.

Materials and Methods

This study uses data from the NHMS 2023, a nationwide cross-sectional survey employing a two-stage stratified sampling technique to represent national estimates. Overall, the analyses included 13,616 adults in Malaysia. The study involved face-to-face interviews and anthropometric measurements. Plain water intake was categorised as inadequate (<6 glasses/day) or adequate (≥6 glasses/day). Nutritional status was based on the BMI classification of the WHO. Bivariate logistic regression, accounting for complex sampling, was used to identify factors associated with inadequate plain water intake. All variables with a p-value <0.25 were entered into the multivariate logistic regression analysis to build a model.

Results and Discussion

The prevalence of insufficient PWI intake among adults in Malaysia was 22.2% (95% CI: 20.83, 23.71), impacting an estimated five million individuals. PWI is commonly associated with weight management, playing a role in both weight maintenance and loss^{3,5}. After adjusting for socioeconomic factors (strata, sex, age, marital status,

employment status, and household income), the study revealed that underweight adults were significantly more likely to consume fewer than six glasses of plain water daily as presented in Table 1 [AOR: 1.7 (95% CI: 1.21, 2.32; p : 0.002)]. Conversely, previous literature suggests that overweight and obese adults are more prone to inadequate PWI³. However, a cohort study indicated that plain water intake does not increase the risk of overweight but may help prevent its onset⁵. Additionally, underweight adults are often associated with poor dietary habits, which could also influence their water intake patterns⁵.

Table 1: Prevalence and adjusted odds ratio and 95% CI for the associations of nutritional status and insufficient plain water intake.

Variables	Estimated Population	Prevalence (%) [95% CI]	Adjusted odds ratio (95% CI)	p -value
Malaysia	5,071,360	22.2 (20.83, 23.71)		
Strata				
Rural	1,285,294	25.6 (22.52, 29.04)	1.2 (0.97, 1.51)	0.097
Urban	3,786,065	21.3 (19.72, 22.92)	1.00	
Sex				
Male	2,435,684	20.6 (18.85, 22.42)	1.00	
Female	2,635,675	24.0 (22.23, 25.92)	1.1 (0.86, 1.28)	0.627
Age groups				
18-39	1,341,906	22.2 (19.96, 24.67)	1.1 (0.92, 1.42)	0.228
40-59	1,759,931	18.6 (16.95, 20.40)	1.00	
60 and above	861,731	23.2 (20.44, 26.16)	1.2 (0.99, 1.45)	0.057
Marital Status				
Married/Living with Partner	3,122,643	21.7 (20.08, 23.43)	1.00	
Separated/ Divorcee/ Widowed	575,900	29.5 (26.08, 33.19)	1.1 (0.81, 1.50)	0.527
Never Married	1,366,646	21.2 (19.08, 23.47)	0.9 (0.76, 1.17)	0.577
Employment Status				
Employed	2,513,267	18.2 (16.72, 19.75)	1.00	
Unemployed	2,543,088	28.6 (26.62, 30.64)	1.4 (1.19, 1.72)	0.000**
Household Income Category				
B40	3,205,145	23.5 (21.82, 25.32)	1.1 (0.86, 1.47)	0.377
M40	1,332,731	21.3 (19.17, 23.61)	1.0 (0.85, 1.46)	0.435
T20	513,650	18.2 (15.08, 21.92)	1.00	
Nutritional Status (BMI)				
Underweight	332,907	31.3 (25.59, 37.30)	1.7 (1.21, 2.32)	0.002**
Normal weight	1,875,888	22.1 (20.01, 24.26)	1.00	
Overweight	1,518,430	22.2 (19.97, 24.51)	1.0 (0.84, 1.23)	0.896
Obese	960,958	21.0 (18.82, 23.36)	0.9 (0.76, 1.12)	0.922

Conclusion

Underweight adults tend to drink insufficient PWI, which can further impact their overall nutritional status. Findings have shown that drinking enough water may reduce the risk of overweight onset among underweight and normal weight adults. Health campaigns should promote adequate PWI as a preventive measure against overweight and obesity.

References

1. Shaheen NA, Alqahtani AA, Assiri H, et al. Public knowledge of dehydration and fluid intake practices: variation by participants' characteristics. *BMC Public Health*. 2018;**18**(1):1346.
2. Li S, Xiao X, Zhang X. Hydration Status in Older Adults: Current Knowledge and Future Challenges. *Nutrients*. 2023;**15**(11):2609.
3. Daniels MC, Popkin BM. Impact of water intake on energy intake and weight status: a systematic review. *Nutr Rev*. 2010;**68**(9):505-21.
4. World Health Organization. Consultation on Obesity (1997: Geneva), World Health Organization Programme of Nutrition, Family and Reproductive Health. Obesity: Preventing and managing the global epidemic: report of a WHO consultation on obesity. Geneva, 3-5 June 1997. 1998.
5. Pan XB, Wang HJ, Zhang B, et al. Plain Water Intake and Association With the Risk of Overweight in the Chinese Adult Population: China Health and Nutrition Survey 2006-2011. *J Epidemiol*. 2020;**30**(3):128-135.

OESHPP15 / 227

Breaking the Barrier: What's Keeping Malaysians from Eating Fruits and Veggies?

Noorhayati Kassim¹, Teh Wai Siew², Rosnani Kassim¹, Nadia Amirudin¹, Siti Nurhanim Mohamed Aiman¹, Nurashma Juatan¹, Manimaran Krishnan¹

¹Health Education Officer, Institute of Health Behavioural Research, National Institutes of Health

²Nutritionist, Nutrition Division, Ministry of Health Malaysia

Corresponding author's email: noorhayati@moh.gov.my

Summary

Many Malaysian adults do not consume enough fruits and vegetables despite dietary recommendations. This study examined personal, environmental, and behavioural barriers affecting intake using a cross-sectional online survey with 745 respondents. Results showed that 75.3% lacked sufficient fruit intake, while 79.6% had inadequate vegetable intake. Environmental and behavioural factors moderately hindered fruit consumption, whereas all factors posed lesser barriers to vegetable intake. The findings emphasize the need for targeted interventions to address different barriers for fruits and vegetables. Further research is necessary to develop effective strategies for improving consumption.

Keywords

Fruits, vegetables, barriers, inadequate intake, adolescents

Introduction

Eating fruits and vegetables is important to good health and disease prevention, but many Malaysian adults do not consume enough despite healthy eating recommendations. Identifying barriers to fruit and vegetable intake is needed to understand challenges and develop targeted strategies to overcome these barriers and improve consumption. This study aimed to determine personal, environmental and behavioural factors affecting adults in Malaysia for not taking adequate fruits and vegetables.

Materials and Methods

A cross-sectional study using convenience sampling was conducted through an online self-administered questionnaire disseminated via social media and email. A total of 745 Malaysian adults responded (response rate: 93.5%). Descriptive and post-hoc analyses were performed using a significance set at $p < 0.05$.

Results and Discussion

561 participants (75.3%) did not consume enough fruit; 593 participants (79.6%) did not consume enough vegetables. Barriers were categorized into personal, social, and environmental factors.

Barriers were categorized as: (1) personal - related to individual preferences and beliefs, (2) behavioural - linked to eating habits and practices, and (3) environmental - related to external conditions such as food availability and affordability.

Lack of fruit availability when eating out¹ (Mean: 3.69 $\pm$ 1.05) and irregular working hours¹ (Mean: 2.95 $\pm$ 1.19) were identified as environmental barriers to fruit consumption. Quick spoilage¹ (Fruits - Mean: 2.85 $\pm$ 1.14; Vegetables - Mean: 2.66 $\pm$ 1.17) and affordability¹ (Fruits - Mean: 3.10 $\pm$ 1.23; Vegetables - Mean: 2.35 $\pm$ 1.07) were also environmental barriers to the consumption of both fruits and vegetables.

Behavioural barriers included not eat fruit during main meals¹ (Mean: 2.62 $\pm$ 0.98). The effort required for fruit preparation and vegetable cooking¹ was a barrier to the consumption of both fruits and vegetables (Fruits - Mean: 2.54 $\pm$ 1.22; Vegetables - Mean: 2.12 $\pm$ 1.01). Preference¹ for fast food and snacks over fruits (Mean: 2.09 $\pm$ 1.02) and vegetables (Mean: 2.12 $\pm$ 1.08) was considered a low barrier.

Health concerns¹ was a personal barrier to fruit consumption (Mean: 2.85 $\pm$ 1.23). Taste preference¹ (Fruits - Mean: 2.59 $\pm$ 1.24; Vegetables - Mean: 2.63 $\pm$ 1.29) and concerns about pesticide residues¹ (Fruits - Mean: 2.42 $\pm$ 1.03; Vegetables - Mean: 2.41 $\pm$ 1.03) were personal barriers to the consumption of both fruits and vegetables.

Environmental (overall mean score 2.58 $\pm$ 0.59) and behavioural (overall mean score 2.43 $\pm$ 0.57) factors have moderate barriers while personal factors pose lesser barrier to fruits intake. All environmental, behavioural and personal factors pose lesser barrier to vegetables intake.

Post-hoc comparison tests for fruit intake examined environmental factors, specifically across different age groups (e.g., age group like 50 years and above vs 18-25 years) and occupation (government vs. private employees). For vegetable intake, post-hoc tests were conducted for both behavioural factors (e.g., age groups like 36-45 years vs. 18-25 years) and personal factors (e.g., private employee vs. not working). Significant differences in barriers were observed across occupations and age groups.

Similar to National Health and Morbidity Survey (NHMS) 2023 finding, this study reported that the majority of adult respondents had insufficient fruit and vegetable consumption. The perception of a moderate environmental barrier to inadequate fruit intake reflects the challenges of a busy, urban lifestyle². Similar finding was observed by a Canadian study³ exploring the benefits and barriers to fruits and vegetables intake among women. The study reported that long preparation time, the effort required to prepare, and lack of availability due to high costs and seasonality serve as barrier. Despite the low barriers for vegetable, the intake remains insufficient. Cultural influences⁴ may reduce the likelihood of incorporating vegetables, even if they are easily available. Perceived environmental barriers to fruit intake among older individuals and government employees probably due to fixed incomes⁵, limiting their purchasing power; and busy work routines⁵, restricting access to fresh produce during the day.

Conclusion

Addressing specific challenges in fruit and vegetable intake is essential for promoting healthier eating habits. The observed differences highlight the complexity of dietary

behaviours, emphasizing the need for separate, targeted interventions for fruits and vegetables. Further exploration of fruit and vegetable intake barriers is needed to develop effective strategies.

Acknowledgement

We would like to express our gratitude to the Director-General of Health and Deputy Director of Health (Research and Technical Support) Malaysia for allowing this presentation. We would like also express appreciation for the support from all parties that have contribute directly to complete this study.

References

1. Institute for Health Behavioural Research (2020). Factors Influencing Fruit, Vegetables and Milk Consumption Behaviour Among Adults. A Scoping Review, Technical Report.
2. Kaewpradup T, Tangmongkhonsuk M, Chusak C, et al. Examining Sociodemographic Factors, Reasons, and Barriers in the Diversity of Fruit and Vegetable Intake among Undergraduate Students. *Nutrients*. 2024;**16**(6)
3. Maclellan DL, Gottschall-Pass K, Larsen R. Fruit and vegetable consumption: benefits and barriers. *Can J Diet Pract Res*. 2004;**65**(3):101-5.
4. Ismail N, Ab Karim M, Karim R, et al. Fruits and Vegetables Consumption Factor Based on Different Culture in Selangor State. *Academic Journal of Interdisciplinary Studies*. 2013;**2**.
5. Ohen SB, Umeze GE, Inyang EO. Consumer purchasing behaviour for fruits and vegetables among civil servants in Essien Udim Local Government Area, Akwa Ibom State, Nigeria. *Food Science and Quality Management*. 2014;**23**: 55-64.

OESHPP16 / 233

Bridging Spatial And Temporal Gaps in Dengue Prediction: A Deep Learning Approach

Sakshaleni Rajendiran¹, Noraishah Mohd Sham¹, Sarbhan Singh Lakha Singh², Yuvaneswary Veloo¹, Syahidiah Syed Abu Thahir¹, Nurulhusna Ab Hamid³, Wan Ming Keong⁴, Siti Morni Umor⁵, Md Nazri Safar⁵, Norimaniah Mazlan⁵, Siti Masayu Yahaya⁵, Nor Atika Abd Manap⁴, Imanul Hassan Abdul Shukor¹, Jeyanthi Suppiah³, Rozainanee Mohd Zain³, Mohd Khairuddin Che Ibrahim⁶, Radi Mohamad⁷, Uswah Khairuddin⁸, Ahmad `Athif Mohd Faudzi⁹, Rohaida Ismail¹

¹ Environmental Health Research Centre, Institute for Medical Research, National Institutes of Health, Ministry of Health Malaysia

² Special Resource Centre, Institute for Medical Research, National Institutes of Health, Ministry of Health Malaysia

³ Infectious Disease Research Centre, Institute for Medical Research, National Institutes of Health, Ministry of Health Malaysia

⁴ Disease Control Division, Ministry of Health Malaysia

⁵ Malaysian Space Agency, Ministry of Science Technology and Innovation (MOSTI)

⁶ Director office, Institute for Medical Research, National Institutes of Health, Ministry of Health Malaysia

⁷ Information Technology Sector, National Institutes of Health, Ministry of Health Malaysia

⁸ Malaysia-Japan International Institute of Technology, Universiti Teknologi Malaysia

⁹ Centre for Artificial Intelligence and Robotics, Universiti Teknologi Malaysia

Corresponding author's email: sakshaleni@moh.gov.my

Summary

Dengue prediction at city level is crucial for effective public health interventions. Enhancing dengue prediction by bridging spatial and temporal gaps, offering a comprehensive forecasting tool is imperative. Hence, this study proposed a protocol on the approach to dengue prediction in Petaling district by integrating deep learning and geostatistical methods. The study will use dengue incidence data, serotypes, entomology data, and environmental variables. It will use Long Short-Term Memory (LSTM) model to capture temporal patterns from time-series data, employing a multi-step prediction strategy to forecast future dengue cases. Kriging interpolation will map spatial variations across localities.

Keywords

Long Short-Term Memory (LSTM) model, dengue, prediction, kriging interpolation

Introduction

City-level dengue prediction remains a critical challenge in public health, requiring robust forecasting models to support timely interventions. Traditional models often struggle to capture the intricate relationships between temporal dynamics and spatial heterogeneity. Deep learning models, particularly LSTM networks, excel in handling sequential data and recognising temporal dependencies¹. Meanwhile

geostatistical methods like kriging enable spatial interpolation², filling gaps in geographic dengue prediction. The integration of these methods aims to enhance dengue risk assessment by unifying time-series forecasting and spatial analysis. Hence, this study aimed to develop a protocol by leveraging LSTM models and geostatistics for dengue prediction at city level in Petaling district, Selangor.

Materials and methods

The dataset will consist of daily reported dengue cases in Petaling district which covers a 10 year period (2014-2024), with explanatory variables includes circulating dengue serotypes, entomology metrics (mosquito population density), climate variables (temperature, rainfall, humidity, wind speed), and geographic indicators (normalised difference vegetation index). The dataset will be structured based on epidemiological week and year. Python programming language will be used for data preprocessing, LSTM modelling and Kriging interpolation. LSTM models will be developed and tested using: vanilla LSTM (single-layer), stacked LSTM (multiple layers), and attention-based LSTM. The parameters and settings for the models will be adapted from previous LSTM studies in time series forecasting and will be tested to achieve good forecasting performances. Evaluation metrics will be performed to quantify the forecasting performance. The output from LSTM model will be used for Kriging interpolation to generate spatial risk maps.

Results and discussion

Forecasting dengue incidence cases weekly at city level using deep learning technique is a relatively new research area. Hence, this study proposes protocol leveraging LSTM model and interpolation in dengue prediction in Petaling, a district with higher number of cases in Selangor, Malaysia by integrating temporal, and spatial information. The LSTM outputs will be reported based on model performance metrics, including root-mean-square-error (RMSE), mean absolute error (MAE), and R-squared (R^2) values.

Feature selection plays a crucial role in model performance. The performance of different combinations of variables for each type of LSTM model will be tabulated to determine the most effective input features. Hence, the best feature combination and model type will be identified. However, longer term prediction may affect the accuracy due to cumulative prediction errors.

Further, the performance of different look-back windows will be reported. This will aid in optimising the LSTM's model ability to capture temporal patterns in dengue transmission and selection of optimal input window to reduce under- and over-fitting the model. Additionally, performance of multi-step prediction approach which will allow forecasts over different time horizons, such as one week, two weeks, and four weeks in advance will be reported. This flexibility supports both immediate response efforts and long-term strategic planning for public health authorities.

Then, cross-validated of the performed kriging interpolation of estimated dengue cases in unsampled areas using the best model output will be reported. Kriging is a geostatistical method that estimates values at unobserved locations based on spatial correlations in observed data. This technique ensures smooth spatial predictions, bridging data gaps and providing comprehensive geographic coverage³. Finally, by merging LSTM-kriging output, dengue risk map will be generated. This study hypothesize that Kriging will enhance spatial resolution of dengue forecasts, aiding public health officials in resource allocation.

Conclusion

This study presents a robust protocol for dengue prediction at city level. The LSTM-Kriging model could offer a holistic tool for proactive dengue risk management which will aid policymakers and health officials in making data-driven decisions, enhancing early warning systems and mitigating the impact of dengue outbreaks in high-risk areas.

References

1. Chen X, Moraga P. Forecasting dengue across Brazil with LSTM neural networks and SHAP-driven lagged climate and spatial effects. *BMC Public Health*. 2025;12;25(1):973.
2. Hou J, Wang Y, Hou B, et al. Spatial Simulation and Prediction of Air Temperature Based on CNN-LSTM. *Appl Artif Intell*. 2023;37(1):2166235.
3. Berke O. Exploratory disease mapping: kriging the spatial risk function from regional count data. *Int J Health Geogr*. 2004;3(1):18.

OESHPP17 / 238

Knowledge of antibiotic resistance among the general population in Malaysia

Chong Zhuo Lin¹, Noor Aliza Lodz¹

¹Institute for Public Health, National Institutes of Health, Ministry of Health, Malaysia.

Corresponding author's email: chongzl@moh.gov.my

Summary

Antibiotic resistance is a major public health concern caused by the misuse and overuse of antibiotics. This study categorised public knowledge on antibiotic resistance into lower- and higher-score groups using a validated questionnaire administered through telephone interviews. Of 3,051 respondents, 78.1% had lower knowledge score, particularly among the <18 years age group, female, rural dwellers, Indian ethnicity and people of other nationalities, and lower education and income groups. These findings are comparable to a previous study in Malaysia, except age group and ethnicity. Targeted interventions are needed to improve the knowledge of antibiotic resistance among Malaysia general population.

Keywords

Knowledge, antibiotic resistance, NHMS, Malaysia

Introduction

Antibiotic resistance poses a significant public health threat. It occurs when bacteria acquire the ability to withstand the drugs designed to kill them, making infections harder to treat, which lead to prolonged and severe illness, and even death¹. Knowledge of antibiotic resistance is the first step to curb its main driver - the overuse or misuse of antibiotics. This study aimed to assess the knowledge of antibiotic resistance among the general population in Malaysia.

Materials and Methods

This study was part of Malaysia's National Health and Morbidity Survey (NHMS) 2020, focusing on communicable diseases. It used a nationwide, two-stage stratified random cluster sampling method to ensure representation of the community-dwelling general population aged 15 and above. Data collection occurred in two phases: first, in-person recruitment of respondents and socio-demographic data collection from August to October 2020; second, computer-assisted telephone interviews using a validated questionnaire adapted from WHO's Antibiotics Resistance: Public Awareness Survey². Six questions/statements related to antibiotic resistance were used for the analysis (Table 1). A correct response was assigned one score, while incorrect or any other responses was given zero, making six the highest possible score. Median split was used to categorise all respondents into two groups: lower (0-3) and higher (4-6) knowledge score. Descriptive analysis and chi-square tests were performed using the Statistical Package for the Social Sciences (SPSS) version 29 for Windows (IBM, USA). A p-value of <0.05 for chi-square tests was considered significant.

Table 1 Questions/Statement related to Antibiotic Resistance

No	Question/Statement	1 score for
1	Most common colds and sore throats are caused by viruses and not bacteria.	Yes
2	Does antibiotic kill viruses?	No
3	Is antibiotic effective to treat common cold and sore throats?	No
4	Do you know what antibiotic resistance is?	Yes
5	Does overuse or misuse of antibiotic among human cause antibiotic resistance (make antibiotic less effective) to treat bacterial infections?	Yes
6	Does overuse or misuse of antibiotic in animal farming lead to antibiotic resistance in humans and animals?	Yes

Results and Discussion

A total of 3,051 respondents answered the questionnaire (response rate=54.9%), with 78.1% of them in the lower-score (0-3) group. The proportion of lower-score group was significantly higher among the youngest age group (<18 years), female, rural dwellers, Indian ethnicity and people of other nationalities, and lower education and income groups (Table 2).

A previous study using a 52-item questionnaire found that the proportion of lower-score group was significantly higher among the oldest age group (>51 years), rural dwellers, non-Malay ethnicities, and lower education and income groups³. The discrepancy in the findings is most likely due to the difference in questionnaire and response rate. While using a more comprehensive questionnaire, this previous study was limited by its 9.1% response rate. Our study was more representative of Malaysia, even though the instrument used was simpler.

Table 2 Knowledge of Antibiotic Resistance by Socio-demographic Characteristics

Characteristics	n (%)	Knowledge Score		p-value (chi-square test)
		Lower (0-3)	Higher (4-6)	
		n (%)	n (%)	
Overall	3,051 (100.0)	2383 (78.1)	668 (21.9)	-
Age group				
<18 years	189 (6.2)	162 (85.7)	27 (14.3)	0.016
18-59	2,449 (80.3)	1891 (77.2)	558 (22.8)	
>=60	413 (13.5)	330 (79.9)	83 (20.1)	
Sex				
Male	1,397 (45.8)	1061 (75.9)	336 (24.1)	0.008

Female	1,654 (54.2)	1322 (79.9)	332 (20.1)	
Location				
Urban	1,700 (55.7)	1270 (74.7)	430 (25.3)	<0.001
Rural	1,351 (44.3)	1113 (82.4)	238 (17.6)	
Zone				
Central	558 (18.3)	415 (74.4)	143 (25.6)	0.568
South	660 (21.6)	527 (79.8)	133 (20.2)	
North	525 (17.2)	417 (79.4)	108 (20.6)	
East	411 (13.5)	319 (77.6)	92 (22.4)	
Sabah & Labuan	430 (14.1)	344 (80.0)	86 (20.0)	
Sarawak	467 (15.3)	361 (77.3)	106 (22.7)	
Ethnicity				
Malay	1,943 (63.7)	1516 (78.0)	427 (22.0)	<0.001
Chinese	260 (8.5)	173 (66.5)	87 (33.5)	
Indian	135 (4.4)	113 (83.7)	22 (16.3)	
Other bumiputra	526 (17.2)	420 (79.8)	106 (20.2)	
Others nationalities	187 (6.2)	161 (86.1)	26 (13.9)	
Education				
No formal education	108 (3.5)	96 (88.9)	12 (11.1)	<0.001
Primary	549 (18.0)	467 (85.1)	82 (14.9)	
Secondary	1,522 (49.9)	1237 (81.3)	285 (18.7)	
Tertiary	867 (28.4)	578 (66.7)	289 (33.3)	
Missing	5 (0.2)			
Income				
B40	1,933 (63.4)	1563 (80.9)	370 (19.1)	<0.001
M40	685 (22.5)	518 (75.6)	167 (24.4)	
T20	274 (9.0)	175 (63.9)	99 (36.1)	
Missing	159 (5.1)			

Conclusion

The knowledge of antibiotic resistance in Malaysia was low, especially among the youngest age group (<18 years), female, rural dwellers, Indian ethnicity and people of other nationalities, and lower education and income groups. Targeted intervention is required to improve the knowledge of antibiotic resistance in Malaysia.

Acknowledgement

The author would like to thank the Director General of Health, Malaysia, for the permission to publish this abstract.

References

1. World Health Organization. Antibiotic Resistance: Multi-Country Public Awareness Survey. 2015. Available from: https://apps.who.int/iris/bitstream/handle/10665/194460/9789241509817_eng.pdf
2. Institute for Public Health (IPH). National Health and Morbidity Survey (NHMS) 2020: Communicable Diseases. Volume I. 2021 [cited 2024 Nov 19] p. 1-280. Available from: <https://iku.gov.my/nhms2020>
3. Wong LP, Alias H, Husin SA, et al. Factors influencing inappropriate use of antibiotics: Findings from a nationwide survey of the general public in Malaysia. *PloS one*. 2021;**16**(10):e0258698.

OESHPP18 / 241

Comparing Urban-Rural Disparities in Travel-Related Physical Inactivity: A Nationwide Study of the Malaysian Population

Nurfatehar Ramly¹, Nor Izzati Amsah¹, Hasimah Ismail¹, Halizah Mat Riffin¹, Kishwen Kanna Yoga Ratnam¹, Syafinaz Mohd Sallehudin¹, Tuan Mohd Amin Tuan Lah¹, Sulhariza Husni Zain¹, Mohd Aznudin Abdul Razak¹, Lim Kuang Kay¹

¹Institute for Public Health, National Institutes of Public Health, Ministry of Health Malaysia

Summary

This study examines travel-related physical inactivity in Malaysia, highlighting urban-rural disparities. Urban areas provide better active commuting infrastructure, yet reliance on motorised transport remains high. Rural regions face greater inactivity due to inadequate infrastructure. Gender differences were significant, with women more inactive than men ($p < 0.001$). Occupational status, smoking, hypertension, and disability also influenced inactivity levels. Rural non-smokers and individuals with disabilities showed higher inactivity ($p < 0.001$). Addressing these issues requires gender-sensitive urban planning, employer-sponsored wellness programmes, smoking cessation with physical activity promotion, and disability-inclusive transport policies to enhance active commuting and improve public health outcomes.

Keywords

Physical inactivity, travel-related activity, urban-rural disparity, Malaysia

Introduction

Physical activity is crucial for overall health, encompassing work-related, recreational, and travel-related domains. In Malaysia, travel-related physical inactivity is a growing concern, with notable disparities between urban and rural populations¹. Urban residents often rely on public transport and personal vehicles, reducing opportunities for active commuting, such as walking or cycling. In contrast, rural populations may engage in more travel-related physical activity due to limited transportation options, but they face challenges such as inadequate pedestrian pathways and longer travel distances. The built environment significantly influences active living; urban areas typically offer recreational facilities and walkable spaces, though traffic congestion and safety concerns may deter physical activity. While providing open spaces, rural areas often lack structured environments for active commuting². Addressing these disparities is essential for improving infrastructure and policy interventions, ensuring that both urban and rural populations have equal opportunities to engage in physical activity. This study compares urban and rural differences in travel-related physical inactivity, focusing on sociodemographic factors to inform targeted interventions and promote active living across diverse communities.

Materials and Methods

A cross-sectional study was conducted using data from a nationwide population survey to assess physical activity levels across different domains in both rural and urban areas. The survey included a representative sample of 10,852 participants

aged 18 and older, selected through stratified random sampling. The primary sampling unit consisted of the states of Malaysia, while the secondary sampling unit included both urban and rural areas. The Global Physical Activity Questionnaire (GPAQ) Malay version measures the activity levels in each domain³. Data were analysed using descriptive statistics and Rao-Scott chi-square tests for categorical comparisons.

Results and Discussion

This study explores the factors that contribute to travel-related physical inactivity across urban and rural populations with a focus on gender disparities. Gender disparities were evident, with women showing higher inactivity levels than men. In urban areas, female inactivity was 88.8% (95% CI: 87.5, 90.1), significantly higher than males at 80.5% (95% CI: 78.2, 82.7). A similar trend was observed in rural areas, where female inactivity was 88.6% (95% CI: 86.0, 90.8) compared to 78.4% (95% CI: 74.1, 82.1) for males. These differences are attributed to sociocultural norms, safety concerns, and household responsibilities, highlighting the need for gender-sensitive urban planning to promote active mobility.

Occupational status also affects inactivity, with unpaid workers reporting the highest inactivity (91.4%, 95% CI: 89.4, 93.1 in urban; 90.7%, 95% CI: 87.0, 93.4 in rural), followed by those not working (90.1%, 95% CI: 87.5, 92.2 in urban; 93.3%, 95% CI: 90.2, 95.5 in rural). Employment influences movement patterns, with structured work environments encouraging active commuting. Policies promoting employer-sponsored wellness programmes and active transport options could help mitigate this issue.

Smoking status showed differing trends between urban and rural areas. In urban settings, non-smokers were more inactive (85.3%, 95% CI: 83.7, 86.8) than smokers (80.9%, 95% CI: 77.6, 83.8,). In contrast, rural smokers had lower inactivity (74.9%, 95% CI: 70.3, 79.0) than non-smokers (86.7%, 95% CI: 84.3, 88.7), likely due to engagement in manual labour. Integrating physical activity promotion into smoking cessation programmes may be beneficial.

Hypertension was associated with higher inactivity in rural areas (86.8%, 95% CI: 83.0, 89.8) compared to non-hypertensive individuals (81.7%, 95% CI: 78.4, 84.7). Additionally, disabled individuals in rural areas had significantly higher inactivity (90.7%, 95% CI: 87.0, 93.5) than those without disabilities (82.5%, 95% CI: 79.7, 84.9). This suggests that improved accessibility through disability-friendly urban planning and transport policies is essential for reducing physical inactivity across all populations.

Conclusion

Addressing travel-related physical inactivity requires gender-sensitive urban planning, workplace wellness programs, integrating physical activity promotion with smoking cessation programs, and improved accessibility for disabled individuals. Targeted interventions can reduce inactivity, particularly among vulnerable groups, fostering active commuting and better public health outcomes in urban and rural areas⁴.

References

1. Institute for Public Health (IKU). National Health and Morbidity Survey (NHMS) 2023: Non-Communicable Diseases and Healthcare Demand: Technical Report. 2024.
2. Yu Z, Zhao P. The factors in residents' mobility in rural towns of China: Car ownership, road infrastructure and public transport services. *J Transp Geogr.* 2021;**91**:102950.
3. Soo K, Wan Abdul Manan W, Wan Suriati W. The Bahasa Melayu Version of the Global Physical Activity Questionnaire. *Asia Pacific Journal of Public Health.* 2015;**27**(2):NP184-93.
4. Zukowska J, Gobis A, Krajewski P, et al. Which transport policies increase physical activity of the whole of society? A systematic review. *J Transp Health.* 2022;**27**:101488.

OESHPP19 / 245

It Takes Two to Tango - Understanding Perspectives on Indicators in Ministry of Health Malaysia

Iqbal Ab Rahim¹, Muna Zahira Mohd Yusof², Awatef Amer Nordin¹, Devi Shantini Rata Mohan¹, Nur Elina Abdul Mutalib¹, Suhana Jawahir¹, Sarah Nurain Mohd Noh¹, Adilius Manual¹

¹ Centre for Health Equity Research, Institute for Health Systems Research, National Institutes of Health, Ministry of Health Malaysia

² Planning Division, Ministry of Health Malaysia

Corresponding author's email: devishantini@moh.gov.my

Summary

In large organisations, policy-makers and data providers often work independently of each other, which may result in differences in data use. As part of a broader study evaluating data sources for SDG Indicators on Health in Malaysia, this qualitative exercise explored differences in perspectives among health sector officers. Using in-depth interviews, findings revealed gaps in indicator interpretation, data underutilisation, and communication inefficiencies. Addressing these issues through improved transparency, stakeholder engagement, and data-sharing strategies is crucial to fostering trust and ensuring data-driven policy improvements.

Keywords

Sustainable Development, Data Collection, Communication Barriers, Organisational Decision Making, Malaysia

Introduction

In large organisations, the tasks of policy-making and data collection are usually handled separately; the policy-makers deal with the intricacies of data use & projected use, while the data providers manage the technicalities of data provision¹. Oftentimes, communications between these two entities were insufficient to reach a shared understanding^{1,2}. As part of the bigger study on the evaluation of data sources for SDG Indicators on Health (SDG-IH)³, this qualitative activity aimed to understand the perspectives among officers in the health sector in Malaysia regarding the indicators and datasets that were used.

Materials and Methods

Earlier in the study, a checklist questionnaire was distributed to all participants (policy-makers and data managers); answering questions regarding datasets that were used to report the national-level SDG-IH that they were in-charge of³. As discrepancies in the answers were noted between the two groups, nine in-depth interview (IDI) sessions with Ministry of Health officers were conducted to obtain a deeper understanding. Subsequent three additional IDIs with the private sector were also conducted to further clarify emerging issues from the earlier IDIs. All interviews

were conducted face-to-face for an average of 30 minutes, but were not audio-recorded to encourage the voluntary participation for the IDI from the two groups - only field notes and interview notes were taken, and were clarified immediately with the participants after the interview. The two main questions related to this article revolved around the participants' personal views of what an indicator should be and their understanding on the variables available in the datasets used to report their respective indicators. The findings were then open-coded, discussed between the research team members and subsequently thematically analysed.

Results and Discussion

Table 1 below highlights the differing perspectives on what an indicator is, while also revealing insights into dataset utilisation. These findings highlight a communication gap in how indicators and datasets are understood and utilised. These differences in perceptions suggest opportunities for an organisational realignment of understanding related to indicator use and its related datasets^{1,2}. Additionally, concerns about data underutilisation and limited awareness of available variables suggest potential strengthening opportunities between policy-makers and data managers^{1,2}. Effective communication strategies, including transparent data-sharing practices and stakeholder involvement, are essential to ensure that indicators guide continual improvements²⁻⁴. Bridging this gap can enhance transparency, encourage data-driven decision-making, and maximise the utility of collected information in the formulation of policies⁴.

Table 1: Select statements of perspectives on indicator and dataset, according to categories and themes.

Categories/ Themes	Statement
Perspective on indicators <i>Indicator as a measuring stick</i>	Indicator is a marker that shows where we are now, as compared to others or where we were before, and how much we need to make improvements. - Policy-maker
<i>Indicator as a punishing stick</i>	Indicator is a target set for us to achieve or surpass regardless; otherwise, there will be repercussions. - Policy-maker
Dataset content <i>Underutilisation of dataset</i>	We have always wondered why (the policy-makers) never asked for (these other) variables. It felt like we are collecting (data) for the sake of collecting. - Data manager

<i>Stagnation in data provision</i>	Data collection remained status quo. There was no input received (from policy-makers) whether there are things needed for improvement or whether any variable can be dropped. - <i>Data manager</i>
<i>Uninformed on other variable availability</i>	We don't even know what else are available in that dataset, (the data managers) never informed us. If we knew, we could probably have done more. - <i>Policy-maker</i>

Conclusion

Clear communication is essential to promote effective data use, as differences in indicator interpretation and issues with data-sharing can hinder progress. Enhancing transparency, stakeholder engagement, and information dissemination can build trust and ensure data supports improvement, leading to better decision-making and more meaningful policy outcomes.

Acknowledgement

Authors wish to thank the Director-General of Health Malaysia for his permission to publish this study.

References

1. Lockheed ME, Wagemaker H. International large-scale assessments: Thermometers, whips or useful policy tools? *Research in Comparative and International Education*. 2013;**8**(3):296-306.
2. Barclay M, Dixon-Woods M, Lyratzopoulos G. The problem with composite indicators. *BMJ quality & safety*. 2019;**28**(4):338-44.
3. Institute for Health Systems Research. Evaluation of Data Sources for SDG Indicators on Health and UHC Indicators in Ministry of Health Malaysia. Selangor MYS: Institute for Health Systems Research (IHSR), Ministry of Health Malaysia; 2022.
4. Fotopoulou A. Conceptualising critical data literacies for civil society organisations: agency, care, and social responsibility. *Information, Communication & Society*. 2021;**24**(11):1640-57.

OESHPP20 / 246

Breaking the Burnout Cycle: A Modified Delphi Protocol on the Development of a Psychoeducation Intervention Package for Nurses

Norehan Jinah¹, Pangie Bakit¹, Ili Abdullah Sharin¹, Nor Haniza Zakaria¹, Siti Zubaidah Ahmad Subki¹, Izzuan Khirman Adnan¹, Nursyahda Zakaria¹, Lee Kun Yun¹

¹ Institute for Health Management, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: norehan.j@moh.gov.my

Summary

Nurse burnout is a critical issue in healthcare, affecting both staff well-being and patient outcomes. While psychoeducational interventions have been shown to be effective in mitigating burnout, consensus on their implementation in Malaysian public hospitals is lacking. This study aims to develop a Psychoeducation-based Burnout Intervention Package (P-BIP) using a Modified Delphi method. The study will consist of three steps: (1) qualitative assessment by a Steering Group, (2) ranking evaluation through multiple rounds of surveys by an Advisory Panel, and (3) a final consensus meeting. The findings will support a structured, consensus-driven burnout intervention tailored to Malaysian public hospital nurses.

Keywords

Nurses, burnout, psychoeducation, intervention, Modified Delphi

Introduction

Nurses in public hospitals face increasing workloads, high patient demands, and limited resources, leading to high levels of burnout. Burnout, characterised by emotional exhaustion, depersonalisation, and reduced professional efficacy, negatively affects job performance, patient safety, and staff retention. Despite the availability of burnout interventions, many lack customisation for local healthcare settings, necessitating a structured, expert-driven approach. Person-directed burnout interventions offer an immediate, feasible response by enhancing resilience, promoting self-care, and improving well-being without requiring significant systemic changes. Psychoeducational approaches, which focus on mental health literacy, stress management, and coping skills, have proven effectiveness in reducing burnout.

The Modified Delphi method is a recognised technique for achieving consensus in areas with limited consolidated knowledge. Unlike the traditional Delphi, Modified Delphi allows for direct expert interactions, iterative discussions, and dynamic consensus-building. This study aims to develop a Psychoeducation-Based Person-Directed Burnout Intervention Package (P-BIP) through expert consensus using a Modified Delphi method.

Materials and Methods

A three-steps Modified Delphi approach will be conducted. In Step 1 (Quality Assessment), a Steering Group of 12 experts, including policymakers, nursing leaders, psychologists, and mental health professionals, will review a list of psychoeducational interventions identified from a systematic review. Experts will

evaluate each intervention based on feasibility, relevance, and effectiveness. In Step 2 (Ranking Evaluation), a minimum of 80 Advisory Panel from subject matter experts, stakeholders and potential intervention participants, will participate in multiple rounds of web-based surveys via REDCap. Panellists will rank interventions using a five-point Likert scale (5 = Very High Priority to 1 = Very Low Priority), with consensus defined as $\geq 80\%$ agreement. Interventions rated between 70-79% will be re-evaluated in subsequent rounds, while those $<70\%$ will be excluded. Finally, in Step 3 (Consensus Meeting), an in-depth expert discussion will be conducted to finalise the list of interventions for the P-BIP. Descriptive statistics will be used to analyse the data, with consensus thresholds guiding the final selection of interventions.

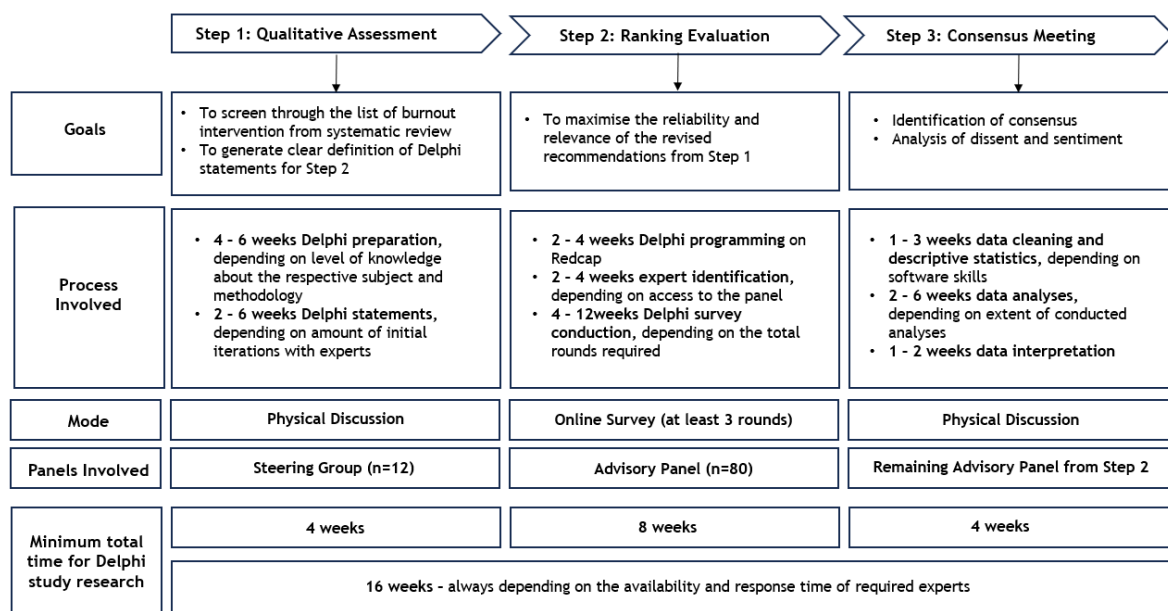


Figure 1: Sequential Delphi methodology for determining psychoeducational intervention outcomes

Results and Discussion

This study will generate a consensus-driven psychoeducational burnout intervention package (P-BIP) tailored to Malaysian public hospital nurses. The Modified Delphi process will facilitate expert evaluation to systematically identifying the most effective, feasible, and contextually relevant interventions for burnout mitigation. The results will provide a structured framework for implementing psychoeducational programmes that enhance nurses' coping mechanisms, reduce burnout, and improve job satisfaction. By integrating expert recommendations, the P-BIP will be practical, evidence-based, and adaptable to real-world hospital settings. Furthermore, the study will contribute valuable insights to policymakers and healthcare administrators, supporting the development of structured mental health initiatives for nursing staff.

Conclusion

This study will develop an evidence-based, consensus-driven burnout intervention package for Malaysian public hospital nurses. The Modified Delphi method ensures

the package is reliable and practical. Future research will pilot test the P-BIP for effectiveness in real-world settings. If successful, this model can be replicated and adapted globally, providing a structured approach to burnout prevention and mental well-being among healthcare professionals.

References

1. World Health Organization. Burn-out an "occupational phenomenon": International Classification of Diseases 2019 [Available from: <https://www.who.int/news/item/28-05-2019-burn-out-an-occupational-phenomenon-international-classification-of-diseases>].
2. Poghosyan L, Clarke SP, Finlayson M, et al. Nurse burnout and quality of care: cross-national investigation in six countries. *Res Nurs Health*. 2010;**33**(4):288-98.
3. Rezaei S, Karami Matin B, Hajizadeh M, et al. Prevalence of burnout among nurses in Iran: a systematic review and meta-analysis. *Int Nurs Rev*. 2018;**65**(3):361-9.
4. Sawyer AT, Pepe J, Robinson PS, et al. Employment Status of Nurses After a Psychoeducational Group Intervention: A Matched Case-Control Study. *J Nurs Adm*. 2022;**52**(11):620-4.
5. Leong S, Yang N, Ray A, et al. Development of an optimized preoperative computed tomography imaging checklist for endoscopic sinus surgery utilizing a systematic review of the literature and the modified Delphi method. *Int Forum Allergy Rhinol*. 2023;**13**(3):196-204.

OESHPP21 / 248

Factors Influencing Cigarette Smoking Initiation Among Children: A Systematic Review And Meta-Analysis

Nor Asiah Muhamad¹, Izzah Athirah Rosli¹, Nur Hasnah Ma'amor¹, Fatin Norhasny Leman¹, Tengku Puteri Nadiah Tengku Baharudin Shah¹, Nik Athirah Farhana Nik Azhan¹, Nurul Hidayah Jamalluddin¹, Nazihah Nazri¹, Normi Mustapha², Zulkarnain Abd Karim³, Norliza Chemi⁴, Nor Fariza Ngah⁵, Muhammad Radzi Abu Hassan⁶

¹Sector for Evidence Based Healthcare, National Institutes of Health, Ministry of Health, Malaysia, Setia Alam, Selangor

²Faculty of Science and Technology, Open University, Kuala Lumpur

³Institute for Medical Research, National Institutes of Health, Ministry of Health, Malaysia, Setia Alam, Selangor

⁴Department of Psychiatry, Kajang Hospital, Ministry of Health, Selangor, Malaysia

⁵Office of Deputy Director General of Health, Ministry of Health Malaysia, Putrajaya

⁶Office of Director General of Health, Ministry of Health Malaysia, Putrajaya

Corresponding author: norasiahdr@gmail.com

Summary

Cigarette smoking remains a major public health and identifying factors influencing smoking initiation among children is critical for developing effective prevention strategies. This review systematically pools all evidence on factors associated with cigarette smoking initiation among children aged 17 years and younger. Literature searches were performed across PubMed, Embase, PsycINFO, and Cochrane. A total of 27 studies were included. The overall prevalence of smoking initiation was 18% (95% CI: 13% - 23%), with the main risk factor associated is psychological factors (OR=3.17, 95% CI: 1.18 - 8.51). Effective prevention strategies should include school-based interventions, family-focused approaches, and policies restricting tobacco access.

Keywords: smoking, children, systematic review, meta-analysis, factors

Introduction

Numerous studies have reported on the impact of smoking on health, and the overall toxic effects of smoking are generally recognised. The World Health Organization (WHO) estimated that 82,000-100,000 young people under 18 years old become addicted to tobacco every day worldwide¹. Another report stated that 88.0% of adult smokers admitted that they started smoking before the age of 18². Many risk factors that may cause children to start smoking include family members who smoke, tobacco advertisements, peer pressure, curiosity about smoking, socioeconomic status, cultural norms, accessibility to tobacco³, and the influence of social media and the internet⁴. Current smoking prevention strategies include school-based programs, media campaigns, pricing policies, and access restrictions⁵. However, their effectiveness varies significantly, highlighting the need to better understand initiation factors. This review aims to systematically gather evidence on the factors of cigarette smoking initiation among children.

Materials and Methods

We conducted a systematic review with inclusion criteria were based on PECOS mnemonic: “P (population)” represents children aged 17 years and younger, “E (exposure)” encompasses any potential risk factors related to smoking initiation. “C (comparison)” consists of children without the investigated exposures, “O (outcome)” for prevalence and risk factor associated with initiation of smoking and “S (study design)” indicate population-based cohort or longitudinal study design. We excluded any review papers, editorials, commentaries, case studies, abstract and English language articles. A comprehensive systematic literature search was conducted across four electronic databases: PubMed, Embase, PsycINFO and Cochrane. Later we performed study selection, extract interest data, performed risk of bias using Risk of Bias in Non-randomized Studies of Exposures (ROBINS-E) tool, data synthesis and analysed using STATA version 17 (estimate the pool prevalence) and Review Manager (RevMan) version 5.4 (observe the pooled effects of identified risk factors).

Results and Discussion

A total of 15,288 records (5,735 from MEDLINE, 8,559 from Embase, 48 from PsycINFO, and 946 from CENTRAL) were identified. After the removal of duplicates, performed titles and abstracts screening, retrieval full-text, and assessment for eligibility, 27 studies (N=55,198) were included.

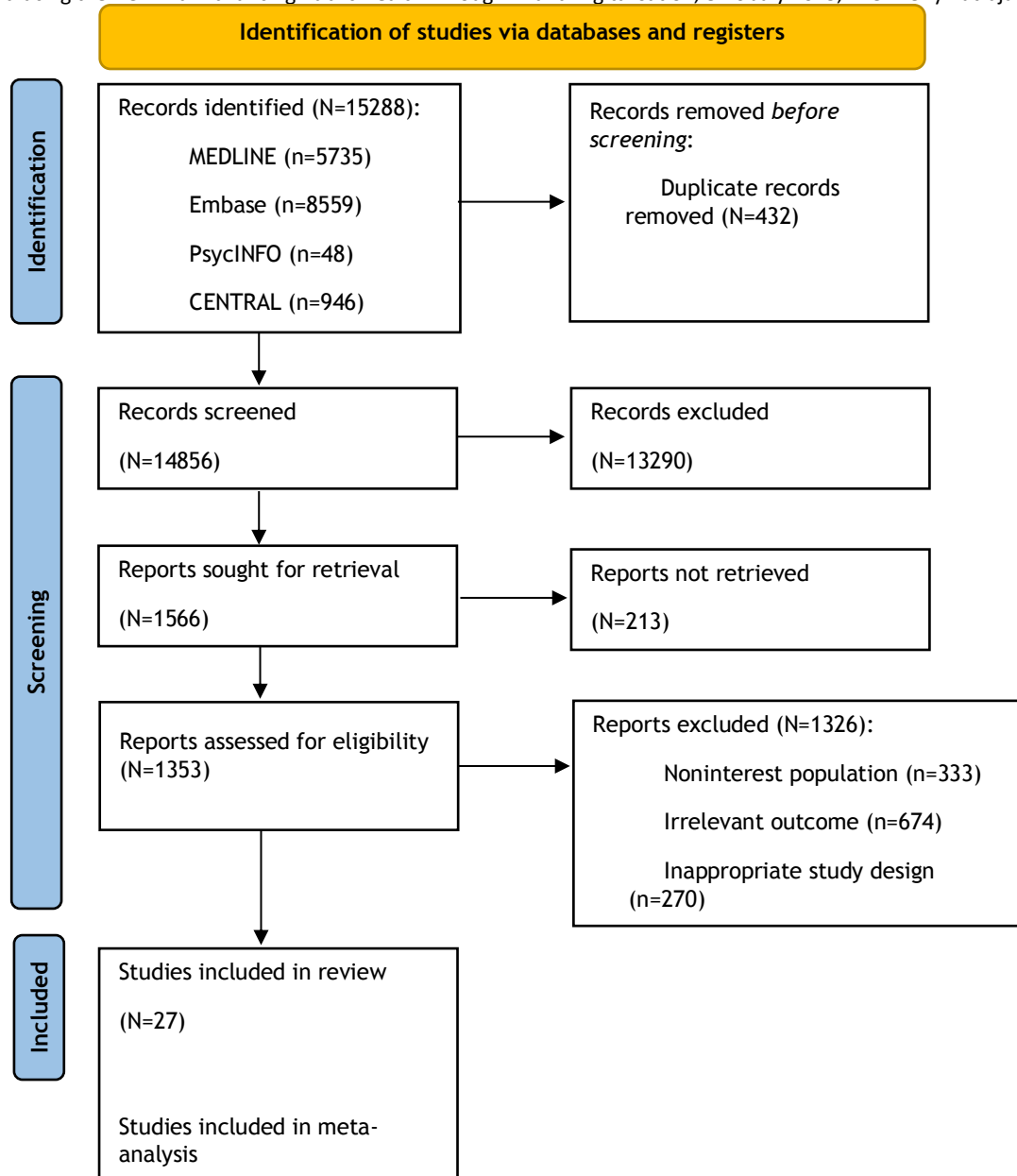


Figure 1: PRISMA flow diagram of study selection

Earliest age of smoking initiation was observed at 9 years old. Overall risk of bias assessment revealed 12 studies were rated as 'high/very high risk' and 15 studies as having 'some concerns'. Overall prevalence of smoking initiation among children is 18% (95% CI 13% - 23%, $p < 0.001$, $I^2 = 99.67\%$). To address the high heterogeneity, a subgroup analysis based on regions (North America, Europe, and others) was conducted. However, substantial heterogeneity persisted across all regions, with I^2 ranging from 55.69% in other regions to 99.74% in Europe. This variability may be attributed to differences in the study year, age of participants, and other sociodemographic factors across countries.

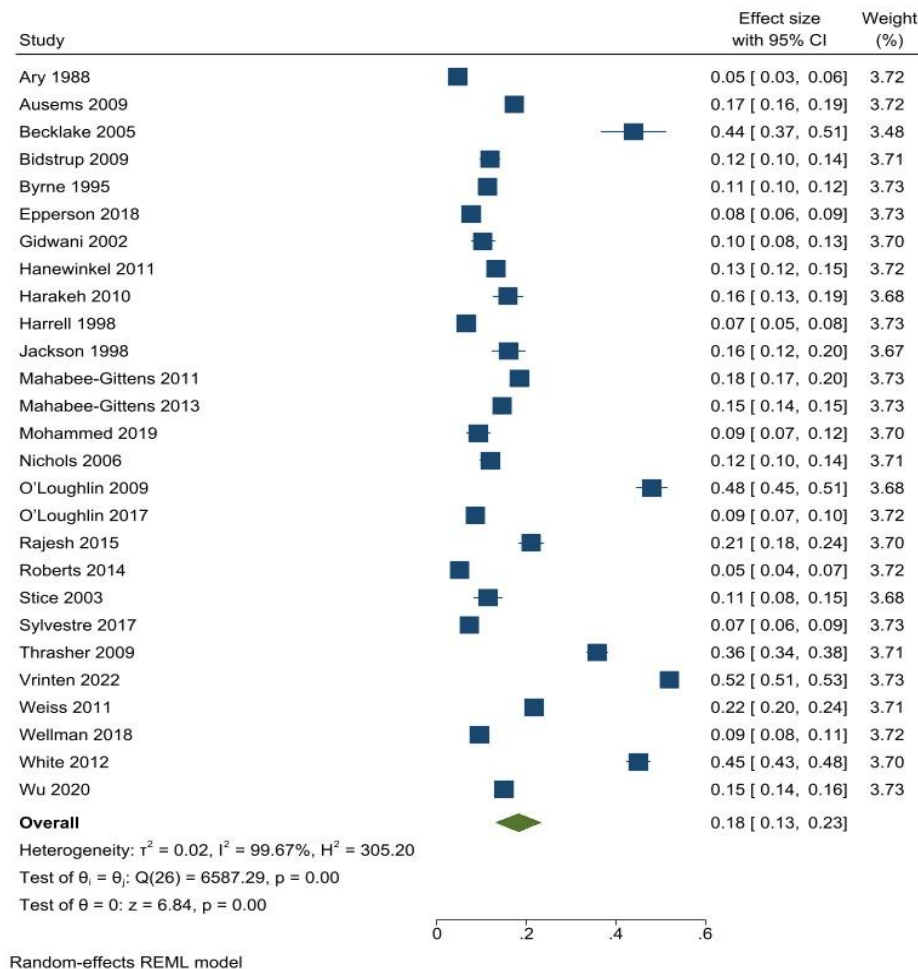


Figure 2. Overall prevalence of smoking initiation among children.

Multiple risk factors of smoking initiation were observed and divided into few groups: social influence, environmental influence, psychological and personal factors, parental and behavioural factors. Psychological factors under intent to smoke was identified as the main risk factor associated with smoking initiation: OR=3.17, 95% CI: 1.18 - 8.51, $p = 0.020$.

Table 1. Effect estimates of risk factors on smoking initiation among children.

Factors	No. of studies	Statistical method ^a	Effect estimate (95% CI)	p-value ^b	Heterogeneity ^c	
					Q	I ²
A. Social Influences						
Smoking friends	11	OR	1.97 (1.32, 2.94)	0.0009	26.66, p=0.003	62%
B. Environmental Influences						
Easy access to cigarettes	3	OR	1.71 (1.01, 2.89)	0.050	0.63, p=0.73	0%
C. Psychological & Personal Factors						
Intent to smoke	2	OR	3.17 (1.18, 8.51)	0.020	0.03, p=0.85	0%
D. Parental Factors						
Living with one parent	3	OR	1.55 (1.03, 2.32)	0.030	0.13, p=0.94	0%
E. Behavioural Factors						
Use of other tobacco products	2	OR	4.39 (0.39, 49.89)	0.230	0.01, p=0.91	0%

ETS environmental tobacco smoke; OR odds ratio

^ainverse variance, random effects model

^bsignificant at p<0.05 (bold)

^cCochran's Q test, where p<0.10 indicates presence of heterogeneity; I² values (0-40%: low heterogeneity, 41-60%: moderate heterogeneity, 61-74%: substantial heterogeneity, 75-100%: considerable heterogeneity)

This current review is first to gather evidence specifically on factors of cigarette smoking initiation among children. Overall completeness of the evidence in this review demonstrates both substantial strengths and notable limitations. The analysis encompasses 27 included studies and represents a robust sample size for meta-analysis, though the relatively small number of risk ratio studies suggests some limitations in the comprehensiveness of effect measures. This review examined multiple domains, including social influences, environmental influences, psychological and personal factors, parental factors, and behavioural factors, hence provides a comprehensive framework for understanding smoking initiation risk factors among children.

Conclusion

The findings suggest that prevention programs should focus on peer influence resistance skills while incorporating family-based interventions that target parental smoking and monitoring behaviours.

References

1. The World Bank. Curbing the epidemic: governments and the economics of tobacco control. (1999). *Tob Control* [Internet], 8(2):196 LP - 201. Available from: <http://tobaccocontrol.bmj.com/content/8/2/196.abstrac>
2. Elders MJ, Perry CL, Eriksen MP, et al. The report of the Surgeon General: preventing tobacco use among young people. *Am J Public Health*. 1994; 84(4):543-7.
3. Institute of Medicine (US) Committee on Preventing Nicotine Addiction in Children and Youths. (1994). Growing up Tobacco Free: Preventing Nicotine Addiction in Children and Youths [Internet]. Lynch B, Bonnie R, editors. Washington (DC): National Academies Press (US). Available from: <https://www.ncbi.nlm.nih.gov/books/NBK236769/>
4. Pokhrel P, Ing C, Kawamoto CT, et al. Social media's influence on e-cigarette use onset and escalation among young adults: What beliefs mediate the effects? *Addict Behav*. 2021;112:106617.
5. Satpathy N, Jena PK, Epari V, et al. Access to cigarettes among the youths in seven South-East Asian countries. *Tob Prev Cessat*. 2021;7(25).

OESHPP22 / 249

Antibiotic Use Among Children Under Five Years with Cough or Fever in Malaysia: A National Representative Study

Chan Yee Mang¹, Khaw Wan-Fei¹

¹Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia.

Corresponding author's email: chanyeemang@moh.gov.my

Summary

This study utilized data from the Malaysian National Health and Morbidity Survey: Maternal Child Health 2022 (NHMS:MCH 2022) to comprehensively assess the prevalence and determinants of antibiotic usage among children under five years of age presenting with cough or fever. The analysis revealed significant associations between antibiotic use and various socio-demographic and healthcare access factors, including age, parental employment status, ethnicity, and hospital admission status. These findings underscore the necessity for targeted interventions to optimize antibiotic prescribing practices and mitigate the growing threat of antimicrobial resistance in this vulnerable population.

Keywords

Antibiotic, fever, cough, children under five, Malaysia

Introduction

Cough and fever are common symptoms among young children, frequently prompting parental concern and healthcare consultations¹. Many cases are viral and self-limiting, but concerns about bacterial complications often prompt antibiotic use. The inappropriate and excessive use of antibiotics, particularly in pediatric populations, is a major driver of antimicrobial resistance (AMR), a global public health crisis². AMR poses a significant threat to the efficacy of current and future antibiotic therapies, potentially leading to increased morbidity, mortality, and healthcare costs³. In Malaysia, national data on antibiotic use in young children with cough and fever are limited. This study aims to determine the prevalence and determinants of antibiotic use in children under five with cough or fever in Malaysia.

Materials and Methods

A secondary data analysis was conducted using a subset of data from the NHMS:MCH 2022. The NHMS:MCH 2022 is a population-based, nationally representative cross-sectional survey. Trained research assistants conducted face-to-face interviews using tablet devices with a standardised questionnaire system application. The questionnaire was adapted from the WHO Multiple Indicator Cluster Survey and included questions on socio-demographic characteristics and history of admission to various healthcare facilities. Cough, fever and antibiotic use were reported by mother or caretaker in the last two weeks. Data analyses were conducted using SPSS Statistics 25.0 (IBM Corp., Armonk, NY, U.S.) taking into consideration the complex survey design.

Results and Discussion

The prevalence of antibiotic use was 54.0% (95% CI: 49.9 - 58.0). Children aged 12-35 months (aOR 2.20; 95%CI 1.61 - 2.99) and 36-59 months (aOR 1.95; 95%CI 1.42 - 2.67) showed significantly higher antibiotic use compared to 0-11 months. This could be attributed to increased exposure to infections as older children become more mobile, as well as reduced passive immunity after weaning. Children of employed guardians (aOR 0.62; 95%CI 0.44 - 0.88) were less likely to receive antibiotics. Employment often correlates with higher education levels, which in turn lead to better health literacy and improved healthcare access⁴. However, antibiotic use among children under five with fever and cough shows no association with household income likely because access to antibiotics is relatively equal across income groups, especially in settings with subsidised or universal healthcare. Admission to a hospital was significantly associated with antibiotic use (aOR 9.96; 95%CI 5.60 - 17.72), highlighting the potential for increased exposure to antibiotics in inpatient settings. Utilisation of private healthcare facilities (aOR 2.88; 95%CI 1.62 - 5.14) was associated with a higher likelihood of antibiotic use, possibly reflecting differences in prescribing practices or patient expectations.

Conclusion

This survey examines antibiotic use in Malaysian children under five with cough or fever. Socio-demographic and healthcare access factors influence antibiotic prescribing. Interventions aimed at enhancing parental health literacy, providing evidence-based guidelines for healthcare providers, and strengthening surveillance systems to monitor antibiotic utilisation and resistance patterns are needed.

Table 1. Prevalence of fever or cough in Children less than five years of age

Variables	Count (n)	Weighted Percentage, % (95% CI)
Age (months)		
0-11	477	13.4 (11.7-15.3)
12-35	1548	48.2 (44.4-51.9)
36-59	1320	38.4 (34.8-42.2)
Sex		
Male	1730	52.0 (48.8-55.1)
Female	1615	48.0 (44.9-51.2)
Ethnicity		
Malay	2645	63.0 (57.6-68.0)
Chinese	127	10.4 (7.9-13.7)
Indian	151	5.1 (3.7-7.0)
Others	422	21.5 (16.8-27.0)
Location		
Urban	2378	71.9 (68.3-75.3)
Rural	967	28.1 (24.7-31.7)
Guardian's age (years)		
<30	932	29.8 (26.0-34.0)
≥30	2413	70.2 (66.0-74.0)
Guardian's education level		

≤Primary	241	10.0 (7.9-12.6)
≥Secondary	3104	90.0 (87.4-92.1)
Guardian's occupation		
Employed	1869	59.8 (55.6-63.8)
Unemployed	1476	40.2 (36.2-44.4)
Household income		
<RM3000	1740	47.6 (43.4-51.8)
≥RM3000	1605	52.4 (48.2-56.6)
Guardian's sex		
Male	700	26.9 (23.1-31.0)
Female	2645	73.1 (69.0-76.9)

Table 2. Factors associated with antibiotic use in children under five years with cough or fever

Variables	Unadjusted analysis		Adjusted Analysis	
	OR (95% CI)	p-value	aOR (95% CI)	p-value
Age (months) (ref: 0-11)				
12-35	1.77 (1.27-2.46)	0.001	2.20 (1.61-2.99)	<0.001
36-59	1.55 (1.14, 2.11)	0.005	1.95 (1.42-2.67)	<0.001
Sex				
Male (ref: female)	1.03 (0.77-1.38)	0.820	0.99 (0.78-1.26)	0.949
Location				
Urban (ref: rural)	1.05 (0.76-1.45)	0.775	0.89 (0.64-1.23)	0.469
Guardian's age (ref: <30)				
≥30	0.79 (0.53-1.19)	0.093	0.74 (0.50-1.09)	0.127
Guardian's education level (ref: ≥Secondary)				
≤Primary	1.06 (0.64-1.77)	0.814	1.44 (0.82-2.55)	0.205
Guardian's occupation (ref: unemployed)				
Employed	0.67 (0.50-0.89)	0.006	0.62 (0.44-0.88)	0.008
Household income (ref: <RM3000)				
≥RM3000	0.79 (0.54-1.15)	0.218	1.12 (0.81-1.53)	0.499
Guardian's sex (ref: female)				
Male	1.03 (0.77-1.38)	0.820	1.13 (0.74-1.71)	0.573
Ethnicity (ref: Malay)				
Chinese	0.67 (0.38-1.19)	0.171	0.53 (0.28-0.99)	0.047
Indian	1.34 (0.85-2.13)	0.206	1.35 (0.81-2.25)	0.246
Others	0.75 (0.41-1.34)	0.328	0.72 (0.40-1.31)	0.282
Admission to hospital	7.02 (4.19-11.78)	<0.001	9.96 (5.60-17.72)	<0.001
Attended private healthcare facility	1.93 (1.47-2.53)	<0.001	2.88 (1.62-5.14)	<0.001
Attended public healthcare facility	0.78 (0.58-1.04)	0.087	1.40 (0.76-2.55)	0.278
Other source of treatment	0.29 (0.17-0.49)	<0.001	0.51 (0.24-1.12)	0.094

References

1. Hay AD, Heron J, Ness A. The prevalence of symptoms and consultations in pre-school children in the Avon Longitudinal Study of Parents and Children (ALSPAC): a prospective cohort study. *Family practice*. 2005;**22**(4):367-74.
2. Tang KWK, Millar BC, Moore JE. Antimicrobial resistance (AMR). *British journal of biomedical science*. 2023;**80**:11387.
3. Ahmed SK, Hussein S, Qurbani K, et al. Antimicrobial resistance: Impacts, challenges, and future prospects. *Journal of Medicine, Surgery, and Public Health*. 2024;**2**:100081.
4. Chan G, Tang S. Parental knowledge, attitudes and antibiotic use for acute upper respiratory tract infection in children attending a primary healthcare clinic in Malaysia. *Singapore medical journal*. 2006;**47**(4):266-70.

OESHPP23 / 254

Pufferfish Pandemonium: Public Perception and Awareness of Pufferfish in Kota Marudu, Sabah

Ahmad Syukri Radzran¹, Mohamad Zulfikri Rusdi ¹, Mohd Helmi Abdul Hamid ¹, Sheila Miriam Mujin ¹

¹ Kudat Area Health Office

Corresponding author's email: ahmadsyukri88@moh.gov.my

Summary

Pufferfishes were known to cause poisoning upon consumption but were still consumed in many parts of the world including Sabah. This study aimed to determine and assess public perception and awareness regarding pufferfish in Kota Marudu, Sabah. A mixed-method design with a quantitative survey and followed by qualitative interviews was used in this study. Survey findings revealed high awareness among respondents but cultural heritage, perceived rarity of poisoning events, and trust in local preparation methods contribute to continued consumption despite known dangers. Future public health strategies should integrate cultural sensitivity with education to reduce risk without alienating traditional practices.

Keywords

pufferfish, poisoning, perception, Sabah

Introduction

Pufferfish, also known as fugu in Japanese cuisine, are well-documented for containing tetrodotoxin (TTX), a potent neurotoxin that can lead to severe poisoning and death when ingested¹. Despite the dangers, pufferfish continue to be consumed as traditional delicacies in various parts of the world, including Sabah, Malaysia. In recent years, Sabah has seen several cases of pufferfish-related poisoning, including a notable incident in Kota Marudu where four individuals suffered serious complications². Given this, it becomes crucial to explore how the local population perceives and understands the risks associated with consuming pufferfish and hence this study aimed to determine and assess the public's perception and awareness of pufferfish consumption and poisoning in Kota Marudu, Sabah.

Materials and Methods

This is a mixed-method design beginning with a quantitative survey and followed by qualitative interviews. A total of 373 participants were recruited using convenience sampling from visitors to fish markets in Kota Marudu. The survey questionnaire was developed and validated using Fuzzy Delphi Method by a consensus of 14 panels. The survey questionnaires consist of 6 questions designed to assess participants' knowledge and awareness of pufferfish were used in this study. The qualitative study was conducted following the survey, in which selected participants underwent semi-structured interviews to gain deeper insights into cultural and personal attitudes. The interviews were discontinued once data saturation was reached, as some participants began reiterating information already expressed in previous interviews. These interviews were transcribed verbatim and analysed using thematic analysis by

colour coding the similar ideas into the same colour to identify common patterns and themes from the interviews.

Results and Discussion

Survey findings revealed high awareness among respondents: 97.59% knew pufferfish were poisonous, and 95.17% understood the potential outcomes, including paralysis and death. Interestingly, 93.56% regarded pufferfish as a traditional delicacy, and 90.61% expressed willingness to continue consuming it despite understanding the health risks. The qualitative part of the study identified three primary themes: 1. traditional dishes, 2. familiarity of pufferfish and 3. low perceived possibility. The findings suggest a cognitive dissonance between knowledge and behaviour. Cultural heritage, perceived rarity of poisoning events, and trust in local preparation methods contribute to continued consumption despite known dangers. This phenomenon is not unique to Sabah; similar patterns have been observed in other regions where risky food practices persist due to cultural value and familiarity³. Public health efforts must account for these cultural dynamics to design effective education and prevention strategies.

Table 1: Descriptive distribution of participants according to age, gender and answer to the surveys

Variables	Frequency (%)	Mean (SD)
Age		24.651(6.927)
Gender		
Male	178(47.72%)	
Female	195(52.28%)	
Question 1: Did you know what a pufferfish is?		
Yes	367(98.39%)	
No	6(1.61%)	
Question 2: Have you ever eaten pufferfish?		
Yes	342(91.69%)	
No	31(8.31%)	
Question 3: Did you think pufferfish are dangerous to eat?		
Yes	364(97.59%)	
No	9(2.41%)	
Question 4: Did you know eating pufferfish can lead to death?		
Yes	355(95.17%)	
No	18(4.83%)	
Question 5: Do you think eating pufferfish is cultural?		
Yes	349(93.56%)	
No	24(6.44%)	
Question 6:		

Would you eat or still eat pufferfish now?		
Yes	338(90.61%)	
No	35(9.32%)	

Table 2: Themes and quotes extracted from the interviews

Themes	Quote from interviews
Traditional dishes	“I have eaten ‘sinagol buntal’(dish made from pufferfish) for a very long time since I was young and currently, I made it for my family as well” ID-03, 43 years old, female
Familiarity of pufferfish	“Me and my family have eaten pufferfish for generations; we know which kind and which types dangerous and which types are not” ID-01, 37 years old, male
Low perceived possibility	“I have eaten pufferfish for many years and so frequently and I have never got sick from it” ID-08, 57 years old, female

Conclusion

Despite known dangers of pufferfish consumption, it remains as culturally valued food and continue its consumption. The recent poisoning cases serve as a reminder and potential cue to action. Future public health strategies should integrate cultural sensitivity with education to reduce risk without alienating traditional practices.

References

1. Kotipoyina HR, Kong EL, Warrington SJ. Tetrodotoxin toxicity. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2021
2. The Star. Four Sabahans hospitalised after eating pufferfish. 2025.
3. Zhou M, Zhang N, Zhang M, et al. Culture, eating behavior, and infectious disease control and prevention. *J Ethnic Foods*. 2020;7(1):40.

OESHPP24 / 262

Emergency Department (ED) Overcrowding in MOH hospitals: Workload Disparities and Contributing Factors

Jabrullah Ab Hamid¹, Adilius Manual¹, Nur Elina Abdul Mutalib¹, Iqbal Ab Rahim¹, Devi Shantini Rata Mohan¹, Suhana Jawahir¹, Sarah Nurain Mohd Noh¹ & Awatef Amer Nordin¹

¹Centre for Health Equity Research, Institute for Health Systems Research, National Institutes of Health, Ministry of Health Malaysia, Malaysia

Corresponding author's email: jabrullah.ah@moh.gov.my

Summary

Workload disparities across Emergency Departments (ED) in Ministry of Health (MOH) hospitals resulted in varying care quality and access. This study analysed ED workload using the patient-to-physician ratio per hour (PPH) across 137 hospitals. Findings revealed significant disparities, with 26% of hospitals exceeding the overcrowding threshold (PPH ≥ 3.3). High workload was attributable to hospital type, geographic location, poverty, and demographic factors. Rural and non-specialist hospitals experienced greater strain. Addressing workforce imbalances and optimising resource allocation is crucial for equitable healthcare access, which is essential to enhance efficiency in emergency care delivery.

Keywords

Emergency department, overcrowding, workload, inequalities, Malaysia

Introduction

Overcrowding in Emergency department (ED) is a persistent issue worldwide, with detrimental impacts on care quality, treatment delays, and worsening patient outcomes¹. In Malaysia, rising ED attendance and congestion in MOH hospitals have reignited concerns², prompting calls for urgent action. Although ED congestion is widespread, ED workload is not uniformly distributed, reflecting systemic disparities in healthcare demand and resource availability. Some facilities face excessive strain while others appear underutilised, pointing inefficiencies in resource distribution. The growing patient load requires staff to manage both new arrivals and those awaiting admission or transfer, compounding pressure on already stretched resources. This increases the risk of staff burnout and undermines care quality. Continuous monitoring of ED workload is critical to addressing these imbalances and supporting Sustainable Development Goal 3.8.1 on equitable healthcare access. This study assesses ED workload across MOH hospitals, highlighting inequalities and their associated factors.

Materials and Methods

This cross-sectional study analysed ED workload across 137 MOH hospitals (excluding special medical institutions) using 2023 data. Workload was measured using the patient-to-physician ratio per hour (PPH), calculated by dividing daily ED attendance by full-time equivalent (FTE) ED physicians (refers as Medical Officers, MOs), adjusted for three shifts and a physician-FTE ratio of 1.24 to account for non-clinical tasks³. A PPH threshold of ≥ 3.3 , based on global estimates [4], indicated potential

overcrowding. Descriptive statistics were computed, and inequality was assessed using the Gini coefficient. Multiple linear regression identified hospital and population factors associated with PPH. Hospitals were categorised into three workload levels and visualised on a map overlaid with population characteristics, highlighting areas with high poverty rates and youth populations.

Results and Discussion

The median PPH across MOH hospitals was 1.4, ranging from 0.3 to 6.9, with 26% of hospitals having a ratio above 3.3, indicating overcrowding. Workload discrepancies were evident across geographical and hospital types (Figure 1), supported by a Gini coefficient of 0.414 ($p < 0.001$). Among states, Negeri Sembilan, Perak, and Sabah recorded the highest PPH. Rural and non-specialist MOH hospitals experienced significantly higher workloads (Figure 1). Regression analysis (Table 1) identified factors associated with high PPH ($p < 0.05$), including location in Borneo ($\beta = 1.68$; CI: 0.91–2.45), non-specialist hospitals ($\beta = 1.75$; CI: 1.29–2.22), larger proportion of youth population under 15 ($\beta = 0.09$; CI: 0.03–0.15), and higher poverty rates ($\beta = 0.04$; CI: 0.01–0.08). These findings suggest that ED workload is shaped by both system- and population-related factors. Higher PPH in Borneo (Figure 2) and in non-specialists likely reflects staff shortages [5], limited care options, and greater reliance on public services. The link with poverty suggests many people may be turning to EDs because they cannot afford care elsewhere, while the association with the youth population could reflect different health-seeking behaviours or service availability. These results underscore systemic disparities in resource distribution, especially in underserved regions. Although the regression identifies significant associations, the cross-sectional design limits causal inference, and unmeasured factors such as patient acuity or case mix may affect workload. Nonetheless, the results have important implications for policy and workforce planning. Prioritising equitable distribution of healthcare personnel, particularly in high-need areas, is essential to reduce ED congestion, improve service quality, and support universal health coverage.

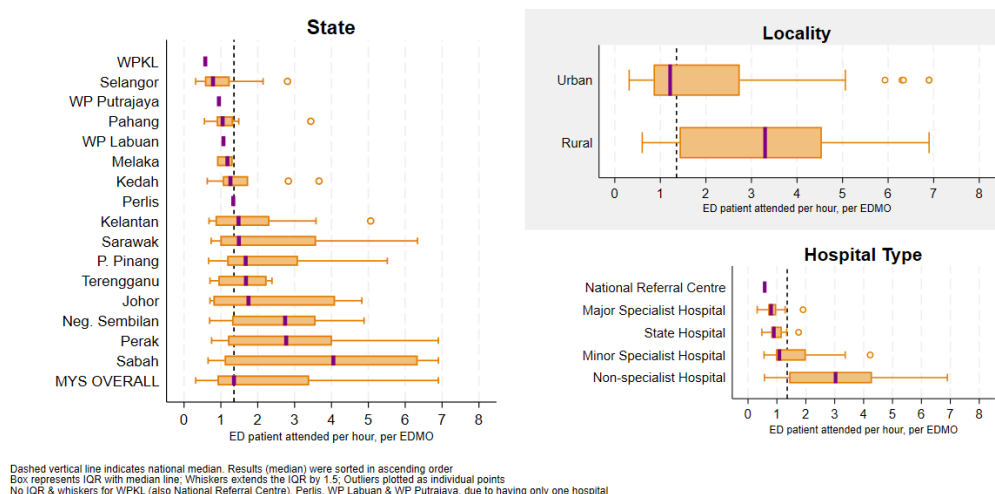


Figure 1: Descriptive statistics of patient-to-physician ratio per hour (PPH)

Conclusion

This study reinforces that ED overcrowding and workload inequalities exist across MOH hospitals in Malaysia. High workload is linked to hospital type, location, poverty, and patient demographics. Addressing workforce imbalances and optimising resource distribution are key to ensuring equitable healthcare access and reducing regional disparities in emergency care.

Table 1: Multiple linear regression analysis (n=137)

Characteristic ¹	β-coefficient	95% CI		p-value
		Lower	Upper	
Region				
Northern	1.51	0.79	2.24	<0.001
Central	1.25	0.46	2.04	0.002
Southern	1.56	0.67	2.46	0.001
East Coast	Ref			
Borneo	1.68	0.91	2.45	<0.001
Hospital type				
Specialist hospital	Ref			
Non-specialist	1.75	1.29	2.22	<0.001
Population characteristics ²				
% Youth Population aged <15	0.09	0.03	0.15	0.005
% Poverty	0.04	0.01	0.08	0.023

Notes:

1. The analysis included additional variables: locality, % of yellow and red cases, % of Bumiputera population, dependency ratio, sex ratio, % elderly population aged 65+, population density, and median household income. However, only the variables retained in the final model, selected through manual and purposeful variable selection methods, are presented in this table.
2. Aggregated population data was based on the year 2023, sourced from the DOSM Subnational Statistics of State Legislative Assembly (SLA) 2024 report, which is publicly available at <https://newss.statistics.gov.my>.
3. Adjusted R² = 0.520; no multicollinearity detected (VIF <5).

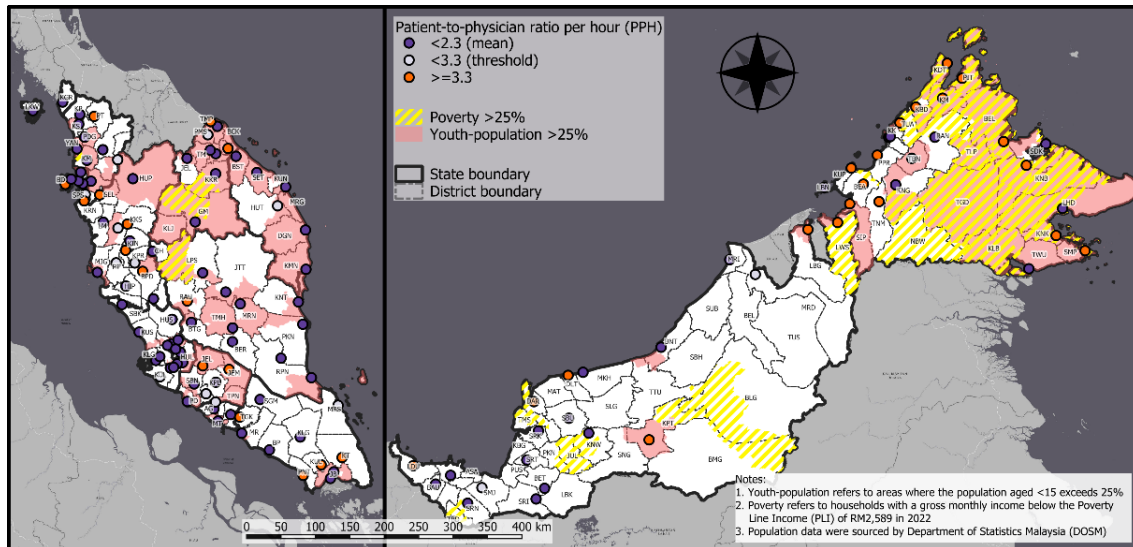


Figure 2: Mapping of patient-to-physician ratio per hour (PPH) in MOH hospitals

Acknowledgement

We would like to thank the MOH (Health Informatics Centre and Human Resources Division) and the Department of Statistics Malaysia (DOSM) for data provision, particularly on ED attendance and health workforce data and population data.

References

1. Pearce S, Marchand T, Shannon T, et al. Emergency department crowding: an overview of reviews describing measures, causes, and harms. *Intern. Emerg. Med.* 2023;**18**(4):1137-58.
2. Ministry of Health Malaysia. Pelan Tindakan Isu Kesusakan Jabatan Kecemasan. Health Minister Media Statement 22 January 2023. Accessed on 10 May, 2024. https://www.moh.gov.my/index.php/database_stores/store_view_page/57/2269. 2023.
3. Counselman FL, Marco CA, Patrick VC, et al. A study of the workforce in emergency medicine: 2007. *American Journal of Emergency Medicine.* 2009;**27**.
4. Schreyer KE, Kuhn D, Norton V. Physician Productivity and Supervision. *Western Journal of Emergency Medicine.* 2023;**24**.
5. Ministry of Health (MOH). Malaysia Health indicators 2024. Putrajaya: MOH Malaysia, 2024.

OESHPP25 / 267

Prevalence and Predictors of Depression Among Healthcare Workers in a Rural District Health Office in Terengganu

Norhafizah Mohd Noor¹, Syahrul Faiz Zakaria¹, Nadhirah Ramli¹, Mohamad Zen Zakaria¹

¹ Setiu District Health Office, Ministry of Health Malaysia

Corresponding author's email: dr_norhafizah@moh.gov.my

Summary

This cross-sectional study aimed to determine the prevalence and predictors of depression among 206 healthcare workers (HCWs) in the Setiu District Health Office (DHO), Terengganu. Data were collected using a validated self-administered online questionnaire. The prevalence of depression was 24.8% using Patient Health Questionnaire-9 (PHQ-9). Significant predictors of depression included lifetime workplace violence (aOR = 8.661), coworker conflict (aOR = 3.489), and unclear work roles (aOR = 2.660). These findings highlight the need for targeted organisational-level interventions to address depression among HCWs in Setiu DHO.

Keywords

Depression, healthcare workers, district health office, rural, PHQ-9

Introduction

Healthcare workers face unique stressors that contribute to poor mental health, particularly in rural areas with limited resources and access to mental health services. Depression can impair job performance, interpersonal relationships, and patient care. This study aims to determine the prevalence and predictors of depression among HCWs in Setiu District Health Office in Terengganu.

Materials and Methods

A cross-sectional study design was conducted using proportionate stratified random sampling by job category. A total of 206 HCWs participated. HCWs were divided into eight strata: doctors, pharmacists, nurses, assistant medical officers, public health personnel (assistant environmental health officers, public health assistants), administrative staff (clerks, MySTEP officers, drivers), healthcare assistants, and others (laboratory personnel, physiotherapists, nutritionists, and counsellor). This method was chosen to ensure proportional representation due to the heterogeneity of roles. The required number of participants from each stratum was calculated based on their proportion in the total HCW population, and respondents were selected using simple random sampling via Microsoft Excel. Data were collected through a validated self-administered online questionnaire covering individual, interpersonal, organisational, and environmental domains. Depression was screened using the Malay version of the PHQ-9, developed by Azah et al. (2005), with an optimal cut-off score of ≥ 5 , sensitivity of 69%, and specificity of 60.5%. Based on a

pretest conducted among 30 HCWs in Setiu, the PHQ-9 demonstrated acceptable internal consistency (Cronbach's $\alpha = 0.741$). Data analysis included descriptive statistics, simple logistic regression, and multiple logistic regression using SPSS Version 26.

Results and Discussion

The prevalence of depression in this study was 24.8%, defined as a PHQ-9 score of ≥ 5 (Table 1). This is comparable to findings from Hulu Langat DHO, which reported a prevalence of 22.7% using the same PHQ-9 cut-off¹. However, it is lower than the 38% prevalence reported among primary HCWs in Kuala Lumpur and Selangor, which utilised a PHQ-9 score ≥ 10 ².

From 27 independent variables tested in simple logistic regression, 12 variables with p-values < 0.25 were included in the multiple logistic regression using the forward LR method. The final model identified three significant predictors (Table 2).

Respondents who had experienced lifetime workplace violence were 8.7 more likely to have depression (aOR = 8.661; 95% CI = 3.092-24.260; $p < 0.001$). This findings align with previous study demonstrates that both verbal and physical violence from patient increase likelihood to have depression among HCWs³. In our context, public health personnel frequently reported incidents of verbal abuse and threats during field enforcement activities, such as issuing health notices or conducting legal actions. Such events may contribute to psychological distress, demoralisation, and feelings of helplessness.

Respondents with coworkers' conflict were 3.5 times more likely to have depression (aOR = 3.489; 95% CI: 1.479, 8.230; $p = 0.004$). This findings is consistent with previous study confirm interpersonal conflict at work has direct positive effect on depressive symptoms⁴. Conflict among colleagues often stemmed from unresolved interpersonal issues, poor communication, lack of support and role of ambiguity⁴. In the district health office setting, where multidisciplinary collaboration is critical, interpersonal tension may disrupt teamwork, increase emotional strain, and leads to depression.

Respondents with unclear work role were 2.7 times more likely to have depression. (aOR = 2.660; 95% CI = 1.086-6.514; $p = 0.032$). This finding underscores the impact of inadequate task delegation, insufficient training, and ambiguous job expectations. Junior and newly appointed staff may be particularly susceptible due to limited orientation and guidance. Role ambiguity has been associated with increased occupational stress and mental fatigue, contributing to adverse psychological outcomes⁵.

Table 1: Prevalence of depression

Characteristics	Frequency (n)	Percentage (%)
Depression		
No (0-4)	155	75.2
Yes (≥ 5)	51	24.8

Table 2: Predictors of Depression using Multiple Logistic Regression (N=206)

Variable	Adjusted B	SE	Wald	p-value	aOR	95% CI of aOR	
						Lower	Upper
Intercept	-1.887	0.239					
Coworkers Conflict							
Low	Ref						
High	1.250	0.438	8.145	0.004*	3.489	1.479	8.230
Lifetime Workplace Violence							
No	Ref						
Yes	2.159	0.526	16.876	<0.001*	8.661	3.092	24.260
Unclear Work Role							
No	Ref						
Yes	0.978	0.457	4.582	0.032*	2.660	1.086	6.514

Note: *Significant at p-value <0.05, aOR is adjusted odd ratio, CI is confident interval. Forward LR was applied, no multicollinearity and no interaction terms. Hosmer and Lemeshow test (p-value= 0.827)-model fit, classification table (overall percentage: 81.6%-good). Cox and Snell R squared (0.179), Nagelkerke R squared (0.265), ROC=0.754.

Conclusion

Nearly one in four HCWs in Setiu DHO experienced depression. Interpersonal and organisational challenges were key contributors. Strengthening mental health support, clarifying job scopes, conflict resolution and implementing workplace violence policy are key strategies for reducing depression among HCWs in Setiu DHO.

References

1. Sapari H, Selamat MI, Mohamed S, et al. Depression among Healthcare Workers During COVID-19 Pandemic in Hulu Langat District, Selangor, Malaysia: A Cross-sectional Study. *J Ment Heal Soc Behav*. 2022;4(1):1-9.
2. Izzudin MPE, Bedri A Al, Subramaniam V, et al. Prevalence and Related Factors of Depression among Healthcare Personnel at Primary Healthcare Centers. *Malaysian J Med Heal Sci* (eISSN 2636-9346). 2018;14(7):32-6.
3. Zheng Y, Li X, Sun Y, et al. Association between workplace violence from patients and the mental health status of healthcare workers in Zhuhai China: a cross-sectional study. *Front Public Heal*. 2024;12(3).
4. Zhao T, Yan H, Wang H, et al. The chain mediating role of negative emotions at work and meaning in life between interpersonal conflict at work and depressive symptoms among nurses: a multicenter cross-sectional study. *BMC Nurs*. 2024;23(1).
5. Mwakyusa JRP, Mcharo EW. Role ambiguity and role conflict effects on employees' emotional exhaustion in healthcare services in Tanzania. *Cogent Bus Manag*. 2024;11(1).

OESHPP26 / 269

Mental Health Challenges of Healthcare Workers in Selangor Amid a National Health Crisis

Nadia Mohamad¹, Siti Sara Yaacob², Mohd Faiz Ibrahim¹, Imanul Hassan Abdul Shukor¹, Mohd Zulfinainie Mohamad³, Muhammad Farhan Mahmud³, Rohaida Ismail¹

¹ *Environmental Health Research Centre, Institute for Medical Research, National Institutes of Health, Ministry of Health Malaysia*

² *Department of Public Health Medicine, Faculty of Medicine, Universiti Teknologi MARA, Malaysia*

³ *Non-Communicable Disease Control Sector, Selangor State Health Department, Ministry of Health Malaysia*

Corresponding author's email: nadia@moh.gov.my

Summary

National health crises can significantly impact the mental health of healthcare workers (HCWs). This study explores the mental health effects on HCWs in Selangor during such a crisis. A cross-sectional study was conducted using secondary data from the Mental Health and Psychosocial Support Services during the initial phase of the COVID-19 pandemic. Among 4,524 HCWs who completed the Depression, Anxiety, and Stress Scale (DASS), a higher prevalence of symptoms was observed among younger HCWs and those working in health offices. Professional roles and non-Malay ethnicity were significantly associated with stress and depression ($p < 0.05$). Although these findings suggest potential disparities, additional adjusted analyses are needed to verify the independent effects and inform targeted interventions to support the mental well-being of HCWs during national health emergencies.

Keywords

Stress, anxiety, depression, DASS-21, COVID-19

Introduction

A national health crisis is a public health emergency within a country that significantly impacts the community and overwhelms the healthcare system. Such crises include disease outbreaks, natural disasters, and other humanitarian crisis (1). The recent COVID-19 pandemic increased the demands on healthcare systems, resulting in heavier workloads for healthcare workers (HCWs) and greater exposure to the virus (2). While several studies have examined mental health during the COVID-19 pandemic (3), there is limited data on HCWs across three types of healthcare facilities (hospitals, clinics, and health offices) or that include support staff such as technicians, medical assistants, administrative personnel, and other non-clinical workers. Understanding mental health outcomes during such crises is crucial to enhance mental preparedness in future public health emergencies. This study aimed to explore the mental health challenges faced by HCWs during a national health crisis.

Materials and Methods

Mental health screening data from March to August 2020 were obtained from the Selangor Mental Health and Psychosocial Support Services (MHPSS) team. The screening was conducted using an online, self-administered questionnaire that included the Depression, Anxiety, and Stress Scale (DASS-21), distributed to all HCWs during the initial phase of the Movement Control Order (MCO), which was implemented to mitigate the spread of COVID-19. The extracted data were anonymized and included only gender, age, ethnicity, type of healthcare facility, job category, involvement in outbreak management, and DASS-21 scores. Data were analysed using SPSS version 28.0 for descriptive statistics. Chi-square tests were performed to examine associations, with statistical significance set at $p < 0.05$.

This study was approved by the Ministry of Health Medical Research and Ethics Committee (MREC) (KKM/NIHSEC/P20-1532(4)).

Results and Discussion

A total of 4,524 records were included in the analysis. The majority of respondents were female (75.7%), of Malay ethnicity (81.1%), worked in hospitals (59.1%), belonged to the mid-level support group (52.1%), and were involved in outbreak management (71.4%). The mid-level support group comprised healthcare workers such as nurses, medical assistants, technicians, occupational therapists, and assistant pharmacists, typically holding job classifications equivalent to grades 29 to 40 in the Malaysian civil service. In contrast, the low-level support group included HCWs in roles classified as grade 28 and below, generally involving more basic clinical or administrative support functions.

Table 1: Stress, Anxiety, and Depression Status of Healthcare Workers During the Outbreak in Selangor

Variables	Stress			Anxiety			Depression		
	Yes n, %	No n, %	P- value	Yes n, %	No n, %	P- value	Yes n, %	No n, %	P- value
Gender									
Male	138(12.4)	972(87.6)	0.027	314(28.3)	796(71.7)	0.073	221(19.9)	889(80.1)	0.243
Female	516(15.1)	2898(84.9)		1063(31.1)	2351(68.9)		736(21.6)	2678(78.4)	
Age									
≤30	297(18.3)	1329(81.7)	<0.001	591(36.3)	1035(63.7)	<0.001	431(36.5)	1195(73.5)	<0.001
31-40	2283(13.4)	1828(86.6)		595(28.2)	1516(71.8)		407(19.3)	1704(80.7)	
>40	74(9.4)	713(90.6)		191(24.3)	596(75.7)		119(15.1)	668(84.9)	
Ethnicity									
Malay	494 (13.5)	3174(86.5)	<0.001	1107(30.2)	2561(69.8)	0.435	741(20.2)	2927(79.8)	0.001
Non-Malay	160(18.7)	696(81.3)		270(31.5)	586(68.5)		216(25.2)	640(74.8)	
Healthcare facilities									
Hospital	449(16.8)	2225(83.2)	<0.001	912(34.1)	1762(65.9)	<0.001	662(24.8)	2012(75.2)	<0.001
Clinics	157(10.0)	1419(90.0)		362(23.0)	1214(77.0)		223(14.1)	1353(85.9)	
Health office	48(17.5)	226(82.5)		103(37.6)	171(62.4)		72(26.3)	202(73.7)	
Job category									
Support 1	71(8.8)	739(91.2)	<0.001	219(27.0)	591(73.0)	0.061	121(14.9)	689(85.1)	<0.001
Support 2	326(13.8)	2031(86.2)		741(31.4)	1616(68.6)		470(19.9)	1887(80.1)	
Professional	257(18.9)	1100(81.1)		417(30.7)	940(69.3)		366(27.0)	991(73.0)	
Involved with outbreak									
Yes	479(14.8)	2750(85.2)	0.254	981(30.4)	2248(69.6)	0.896	692(21.4)	2537(78.6)	0.471
No	175(13.5)	1120(86.5)		396(30.6)	899(69.4)		265(20.5)	1030(79.5)	

*notes: Support 1 = low-level support group; support 2 = mid-level support group

Chi-square test analysis was performed, and Table 1 presents significant findings on factors associated with stress, anxiety, and depression among HCWs. There were significant differences in all mental health outcomes across age groups and types of healthcare facilities ($p < 0.05$). Non-Malay ethnicity showed significantly higher levels of stress and depression compared to Malay respondents, while female gender was significantly associated with higher stress levels. No significant differences were found in relation to HCWs' direct involvement in outbreak management.

In the analyses female HCWs may be more susceptible to stress due to increased workloads and heightened caregiving responsibilities, particularly as access to schools and childcare services was restricted during the MCO (4). Younger age group and those working in health offices were found to be more affected in terms of mental health. This may be because younger workers are less experienced and potentially less equipped to handle crisis-related stress (5). Additionally, HCWs in district health offices may have received less training in managing infectious diseases compared to their counterparts in hospitals or clinics. The added pressure of working closely within communities may also have contributed to these mental health outcomes.

A limitation of this analysis is that the associations observed should be interpreted cautiously, as bivariate analysis does not account for underlying sociodemographic or occupational factors. These variables were not adjusted for in this study, and future research with multivariate analyses is needed to better understand the independent effects on healthcare workers' mental health.

Conclusion

This study found that younger age groups and those working in health offices were more vulnerable to mental health challenges. These findings are part of analytical component for informing the development of prevention and support programmes targeting vulnerable HCWs, to safeguard their mental health and well-being, especially in preparation for future national health crises.

References

1. WHO. WHO - List of emergencies [Internet]. 2025 [cited 2025 Apr 9]. Available from: <https://www.who.int/emergencies/situations>
2. Prasad K, McLoughlin C, Stillman M, Poplau S, Goelz E, Taylor S, et al. Prevalence and correlates of stress and burnout among U.S. healthcare workers during the COVID-19 pandemic: A national cross-sectional survey study. *EClinicalMedicine*. 2021 May 1;35:100879.
3. Mohamad N, Ismail R, Ibrahim MF, Abdul Shukor IH, Mohamad MZ, Mahmud MF, et al. Assessing Mental Health Outcomes in Quarantine Centres: A Cross-Sectional Study during COVID-19 in Malaysia. *Healthcare*. 2023 Jan;11(16):2339.
4. Jones Y, Durand V, Morton K, Ottolini M, Shaughnessy E, Spector ND, et al. Collateral Damage: How COVID-19 Is Adversely Impacting Women Physicians. *Journal of Hospital Medicine*. 2020;15(8):507-9.
5. Buch-Vicente B, Acosta-Rodriguez JM, Sanchez-Sanchez ME, González-García N, Garcia-Ullan LL, de la Iglesia-Larrad JL, et al. Coping strategies used by health-care workers during the SARS-COV2 crisis. A real-world analysis. *Psychiatry Research*. 2022 Nov 1;317:114915.

OESHPP27 / 273

Title: Urban-Rural Perspectives on Socioeconomic Inequalities in Oral Healthcare Utilisation in Malaysia: Insights from a National Survey

Sarah Nurain Mohd Noh¹, Suhana Jawahir¹, Devi Shantini Rata Mohan¹, Iqbal Ab Rahim¹, Adilius Manual¹, Nur Elina Abdul Mutalib¹, Jabrullah Ab Hamid¹, Awatef Amer Nordin¹

¹Centre for Health Equity Research, Institute for Health Systems Research, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: sarahnurain.mn@moh.gov.my

Summary

Oral health is an important component of general well-being; while Malaysia has made progress in expanding access, disparities in access to oral healthcare services persist. This study assessed socioeconomic inequality in oral healthcare utilisation in Malaysia, with a comparison between urban and rural areas, using data from a national survey. While public oral healthcare services are equitably utilised, findings showed pro-rich inequality in private oral utilisation in both localities. Identifying these disparities are pertinent to address the inequality gaps of oral healthcare access in Malaysia, facilitating policymakers for evidence-based strategic intervention to strengthen public-private healthcare collaborations.

Keywords

Oral health utilisation, socioeconomic inequality, urban-rural disparities, access, national survey

Introduction

Health inequalities describe measurable gaps in health outcomes across different population groups¹. Oral health is vital for overall well-being, yet inequalities in access to oral healthcare persist in Malaysia². Socioeconomic factors such as urban-rural locality significantly influence service utilisation patterns³. Malaysia operates a dual healthcare system for oral health services, comprised of a highly subsidised public sector and a fee-for-service private sector; offering alternatives in terms of availability and responsiveness, especially in urban areas. Despite ongoing efforts to expand public sector coverage to ensure universal health access, whether physically or digitally; disparities remain², contributing to inequality in access and poor oral health outcomes. This study aims to assess the socioeconomic inequality in oral healthcare utilisation in Malaysia, focusing on the effect of urban and rural localities, based on a national survey data.

Materials and Methods

This cross-sectional study analysed data from the National Health and Morbidity Survey (NHMS) 2023, a nationwide survey using a two-stage stratified random sampling design. Adults aged 18 years and above were included. Oral healthcare utilisation was defined as visit to any dental provider within the last 12 months. Descriptive statistics and inequalities analyses were conducted using STATA v18, with sampling weights applied. Inequalities were assessed using the Lorenz Curves and Concentration Indices (CI), measuring the distribution of oral care utilisation by socioeconomic status (SES), by locality. Greater the deviation from the equality line

indicates larger degree of inequality. The CI ranges from -1 to +1, where 0 suggests no inequality. SES derived from monthly household income adjusted for the total number of adults and children in the household using the consumption per adult equivalents approach, ranked from poorest to richest.

Results and Discussion

Figure 1 shows the public-private composition of oral healthcare utilisation in Malaysia. Overall, 42.9% of visits were to public facilities and 57.1% to private. Utilisation patterns differed by locality. Rural respondents relied more on public services (62.9%) compared to urban (38.1%) reflecting underlying differences in service availability. Private dental clinics are predominantly located in urban centres, where infrastructure, higher demand, and profitability support their operation⁴. In contrast, rural areas often have limited access to private care, making public dental services the primary source of oral healthcare⁵. Malaysia's public sector plays a critical role in ensuring more equitable access, striving to serve both urban and rural populations through a network of government clinics and mobile outreach programmes². Figure 2 illustrates socioeconomic inequality in oral healthcare utilisation, by locality. Public facility revealed no socioeconomic inequality for both localities. Private facility utilisation showed pro-rich inequality, with greater disparity observed in rural areas (CI 0.247, $p < 0.001$) compared to urban (CI 0.186, $p < 0.001$). These results underscore access barriers such as affordability of private care among rural and lower-income populations. This pattern reflects the structure of Malaysia's public oral healthcare system, where services are highly subsidised for all. In contrast, the private sector provide care on a fee-for-service basis, making them more accessible to those who can afford it, i.e. higher-income groups⁴. The larger pro-rich disparity among rural population compared to urban found in this study may be attributed to factors such as longer travel distances and higher associated costs⁶, which pose additional barriers for the rural population.

Conclusion

Socioeconomic inequalities persist in oral healthcare utilisation in Malaysia. While public healthcare is relatively equitable, private healthcare is more accessible to the higher-income groups. Broadening the scope of health initiatives—such as the MADANI health initiatives to involve a collaborative effort of both public and private sector could enhance access and reduce inequalities.

Acknowledgement

Authors wish to thank the Director-General of Health Malaysia for his permission to publish this study.

References

1. World Health Organization (WHO). Health inequality monitoring: harnessing data to advance health equity. Geneva: WHO; 2024. Accessed 8 April, 2025. <https://www.who.int/data/inequality-monitor/tools-resources>.
2. Peres MA, Macpherson LMD, Weyant RJ, et al. Oral diseases: a global public health challenge. *Lancet*. 2019;**394**(10194):249-260.

3. Patrick DL, Lee RSY, Nucci M, et al. Reducing oral health disparities: a focus on social and cultural determinants. *BMC Oral Health*. 2006;**6**(Suppl 1):S4.
4. Ministry of Health Malaysia. *Oral Health Programme Annual Report 2022*. Accessed 15 April, 2025.
https://www.moh.gov.my/moh/resources/Penerbitan/Penerbitan%20Utama/2._MOH_Annual_Report_2022-compressed_.pdf
5. Masood M et al. Barriers to and facilitators of oral health care in Malaysian adults. *Community Dent Health*. 2013;**30**(4):231-7.
6. Cattaneo A, Nelson A, McMenomy T. Global mapping of urban-rural catchment areas reveals unequal access to services. *Proc Natl Acad Sci U S A*. 2021;**118**(2):e2011990118. doi:10.1073/pnas.2011990118
- 7.

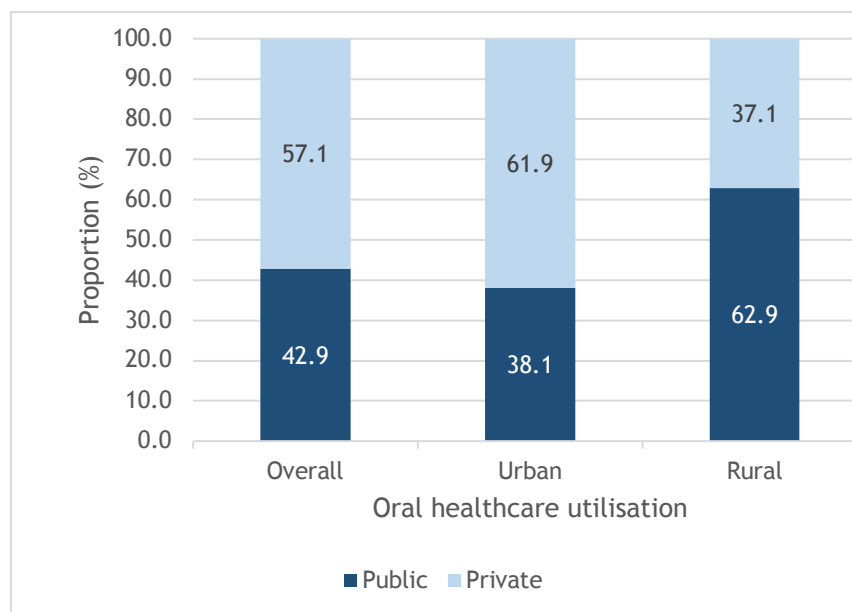
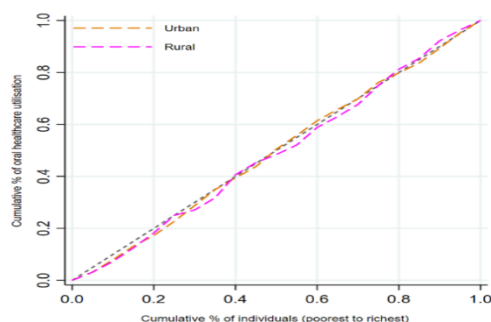


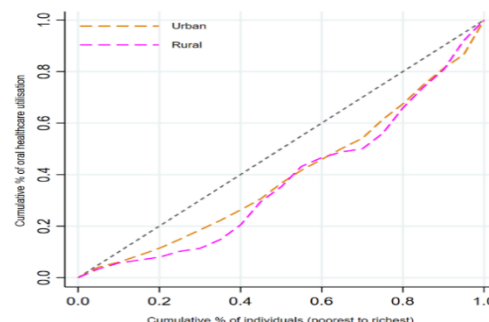
Figure 1: Public-private composition of oral healthcare utilisation; overall and stratified by locality.

a) Public facility



CI Urban	-0.085; p=0.078
CI Rural	0.037; p=0.474

b) Private facility



CI Urban	0.186; p<0.001
CI Rural	0.247; p<0.001

Figure 2: Concentration curves and CI for the public-private oral healthcare utilisation, by locality.

OESHPP28 / 279

From Policy to Practice: Uncovering Gaps in Virtual Consultation Implementation in Malaysian Public Health Clinics

Yea Lu Tay¹, Zalilah Abdullah¹, Min Fui Wong¹, Nur Hidayati Abdul Halim¹, Noor Hasidah Ab Rahman¹, Nur Khairah Badaruddin², Nurul Iman Jamalul-lail³

¹ *Institute for Health Systems Research, National Institutes of Health, Ministry of Health Malaysia*

² *Institute for Health Management, National Institutes of Health, Ministry of Health Malaysia*

³ *Casemix Unit, Hospital Sungai Buloh, Ministry of Health Malaysia*

Corresponding author's email: tay.yl@moh.gov.my

Summary

Virtual consultations (VC) were introduced in Malaysian public primary care in 2019 to improve access and reduce congestion. This study explores gaps between VC policies and their implementation in public health clinics using a qualitative approach, including document review, focus group discussions and in-depth interviews. Key misalignments were identified at individual, organisational, and policy levels, particularly in infrastructure and resources, provider training, and regulatory enforcement. Bridging these gaps requires targeted investments, capacity building, infrastructure enhancement, and strengthened policy enforcement to ensure effective, equitable, and sustainable VC implementation nationwide.

Keywords

Virtual consultation, policy implementation, public health clinics, policy gaps, Malaysia

Introduction

Since the introduction of the Telemedicine Blueprint in 1997, Malaysia has actively pursued digital health initiatives. However, the widespread adoption of telemedicine has been slow¹. In 2019, the Ministry of Health (MOH) piloted virtual clinics in public primary care settings to improve access and reduce congestion. These services were extended to 40 clinics during the COVID-19 pandemic, ensuring continuity of care despite movement restrictions². By 2022, the initiative was rebranded as virtual consultation (VC) services and scaled up to 230 clinics nationwide, aligning with MOH's Digital Health Strategy³. While global evidence highlights the benefits of VC in improving healthcare access, efficiency, and timeliness, implementation continues to face significant challenges, especially in resource-constrained environments⁴. In Malaysia, evidence on the VC implementation in public health clinics remains limited. This study seeks to explore potential gaps between national VC policies and the realities of implementation within public health clinics.

Materials and Methods

This exploratory qualitative study involved document reviews, focus group discussions (FGDs), and in-depth interviews (IDIs). Documents, including policies,

guidelines, and strategic plans related to VC implementation in Malaysia, were sourced from the MOH website and through engagement with program managers. 75 healthcare professionals involved in VC planning, implementation, and monitoring were purposely selected and recruited from six states and MOH headquarters. The sample size was determined pragmatically based on participant availability. Recruitment stopped when no new information emerged, with data saturation observed during transcript reviews and confirmed through iterative thematic analysis. FGDs and IDIs were conducted between March and October 2023, audio-recorded, and transcribed verbatim. For FGDs, participants of similar rank were grouped to promote balanced participation. Thematic analysis was conducted using NVivo 12 Plus, guided by the social-ecological model. Findings from documents and interviews were triangulated to explore the policy-implementation gap in VC service delivery.

Results and Discussion

The study findings, structured using the Social-Ecological Model, highlight critical misalignments between VC policies and their implementation in public health clinics, with gaps identified at the individual, organisational, and policy levels. At the individual level, two key themes emerged: competency gaps and workload-related burden. While current policies offer basic training on VC platform navigation and data entry, they fall short in developing essential skills, such as effective virtual communication and remote clinical assessment. Furthermore, the expectation that existing clinical staff manage both in-person and virtual services, despite ongoing staffing shortages, places additional strain on individual healthcare workers, leading to stress, fatigue, and ultimately, the de-prioritisation of VC in routine clinical practice.

At the organisational level, resource and infrastructure limitations hinder effective implementation. Clinics received only one laptop dedicated for VC, restricting concurrent sessions and reducing service efficiency. The mandated use of fixed Local Area Network (LAN) connections further limits flexibility by requiring designated consultation spaces. Although policy documents reference IT support, many clinics lack on-site technical personnel, causing delays in troubleshooting and placing additional burdens on healthcare workers.

At the policy level, existing guidelines detailed medico-legal requirements, such as informed consent, data protection, adherence to SOPs and Clinical Practice Guidelines (CPGs), and professional conduct. These are supported by the Public Officers (Conduct and Discipline) Regulations 1993 and the Malaysian Medical Council (MMC) Guideline on Telemedicine. However, the absence of an enforceable legal provision remains a critical gap. Although the Telemedicine Act 1997 was introduced, it remains unenforced, leaving no active legal framework for regulatory oversight and accountability.

Overall, these findings highlight challenges in translating digital health policies into practice, particularly in resource-constrained settings. While purposive and site-based sampling may introduce selection bias, participants were recruited from diverse geographic locations and facility types to enhance the credibility and reduce potential bias.

Conclusion

The study highlights critical gaps between VC policies and implementation at the individual (skills and workload), organisational (infrastructure and resources), and policy (regulatory enforcement) levels. Addressing these gaps through targeted investments, workforce capacity building, and policy refinement is vital to strengthen VC implementation and improve healthcare delivery.

Acknowledgments

The authors would like to thank the Director General of Health, Malaysia for his permission to publish this extended abstract. Appreciation is also extended to the study respondents for their kind cooperation and participation.

References

1. Wahab SN, Singh J, Subramaniam N. Telemedicine implementation framework for Malaysia: An integrated SWOT-MCDM approach. *Health Policy and Technology* 2023;12(4):100818.
2. Bahagian Pembangunan Kesihatan Keluarga KKM. Garis panduan perkhidmatan konsultasi secara maya (virtual consultation services) di klinik kesihatan. Putrajaya, Malaysia: Ministry of Health Malaysia; 2022.
3. Kementerian Kesihatan Malaysia. Pelan strategik pendigitalan Kementerian Kesihatan Malaysia 2021-2025. In: Maklumat BP, editor. Putrajaya, Malaysia: Kementerian Kesihatan Malaysia; 2022.
4. Mbunge E, Muchemwa B, Batani J. Are we there yet? Unbundling the potential adoption and integration of telemedicine to improve virtual healthcare services in African health systems. *Sensors International* 2022;3:100152.

OESHPP30 / 283

Low birth weight among children below 5 years and its associated factors: Findings from a nationwide study

Ruhaya Salleh¹, Sulhariza Husni Zain¹, Shubash Shander Ganapathy¹, Mohamad Aznuddin Abd Razak¹, Nurzaime Zulaily¹

¹ Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia, 40170 Bandar Setia Alam, Selangor, Malaysia

Corresponding author email: ruhaya.s@moh.gov.my

Summary

This study examined the prevalence and determinants of low birth weight (LBW) using data from the 2022 Maternal and Child Health Survey (NHMS). Descriptive statistics and multivariate logistic regression was performed using IBM SPSS version 26.0. The overall prevalence was 10.9%. Multivariate logistic regression revealed that LBW was significantly associated with being female, B40 income group, Other Bumiputera ethnicity, preterm birth, and non-citizenship or permanent resident status. Conversely, children from other ethnic groups had 86% lower odds of LBW. These findings underscore the need for focused public health interventions to reduce LBW, especially among vulnerable populations.

Keywords: low birth weight, NHMS, children, Malaysia

Introduction

Low birth weight (LBW), defined as a newborn weighing less than 2,500 g, remains a significant global public health issue due to its immediate and long-term health risks. LBW often results from preterm birth, intrauterine growth restriction, or both, and may occur in both term and preterm infants. Globally, 15-20% of all live births are classified as LBW. The World Health Organization (WHO) aims to reduce this rate by 30% by 2025¹. In Malaysia, LBW prevalence reflects a complex interaction of maternal health, socioeconomic status, and healthcare access, all of which influence child health outcomes. Addressing LBW is a priority worldwide due to its substantial burden². This study examined the prevalence and associated risk factors of LBW using data from the 2022 National Health and Morbidity Survey (NHMS).

Materials and Methods

This cross-sectional study used data from the National Health and Morbidity Survey Maternal and Child Health Survey (NHMS 2022). A multistage stratified random sampling method was applied to select mothers with their most recent birth within two years. Data on childbirth weight, gestational age, and household sociodemographic characteristics were collected through structured questionnaires. Descriptive statistics were used to summarise the characteristics of the study population. To identify independent predictors of low birth weight, complex sampling multivariate logistic regression was performed using IBM SPSS version 26.0. Significance was set at $p < 0.05$.

Results and Discussion

Table 1 describes the characteristics of the 1,759 children identified with low birth weight (LBW). The overall prevalence of low birth weight was 10.9% (95% CI: 10.2%

to 11.6%). Low birth weight children were observed among female infants (12.6%), Other Bumiputera ethnicity (15.0%), residing in rural areas (11.7%), from the B40 household income group(11.7%), Malaysian citizens(11.2%) and those born preterm gestational age less than 37 weeks (58.9%). Table 2 shows factors associated with low birth weight. Multivariate logistic regression found a significant association between sex, ethnicity, household income, citizenship, and gestational age. Female infants had significantly higher odds of LBW than males (aOR = 1.61, 95% CI: 1.38-1.87). These findings aligned with a Taiwan [3] study showing higher rates among females. Other Bumiputera ethnicities (aOR: 1.37, 95%CI: 1.12,1.68) and the B40 income group (aOR: 1.77, 95%CI: 1.16,2.70) were more likely to have low birth weight. Permanent residents or non-citizens (aOR: 3.67, 95% CI: 1.50-8.99) were also found to be at significantly higher risk. Citizenship status may limit access to nutritious food and healthcare services, which in turn can result in poor maternal nutrition and inadequate antenatal care, which were known risk factors for low birth weight. Infants born preterm (less than 37 weeks) have a 21.18 times higher risk of low birth weight. These findings confirmed the study by Eliza et. al showing higher rates of low birth weight due to inadequate gestational weight gain⁴.

Characteristic		cOR	95% CI		p-value	aOR	95% CI		p-value
			Lower	Upper			Lower	Upper	
Sex	Female	1.43	1.24	1.65	<0.001	1.61	1.38	1.87	<0.001*
	Male	1.00				1.00			
	Malay	1.00				1.00			
Ethnicity	Chinese	1.11	0.82	1.50	0.507	1.34	0.96	1.86	0.08
	Indian	1.20	0.90	1.59	0.217	1.09	0.80	1.48	0.58
	Other Bumiputera	1.50	1.24	1.82	<0.001	1.37	1.12	1.68	0.002*
	Others	0.44	0.25	0.77	0.005	0.14	0.06	0.31	<0.001*
Strata	Rural	1.12	0.96	1.30	0.136	1.08	0.92	1.27	0.337
	Urban	1.00							
	B40	1.96	1.31	3.04	<0.001	1.77	1.16	2.70	0.008*
Household income	M40	1.40	0.89	2.21	0.150	1.19	0.77	1.86	0.43
	T20	1.00				1.00			
	Malaysian citizen	1.00				1.00			
Children citizenship	Permanent resident/ non citizen	0.45	0.25	0.80	0.007	3.67	1.50	8.99	<0.001*
	Pre -term	20.33	16.96	24.38	<0.001	21.18	17.71	25.33	<0.001*
Gestational age	Full-term	1.00				1.00			

Table 1: Sociodemographic characteristics of low birth weight children in the Maternal and Child Health Survey 2022, (n=1,759)

Characteristic		n	%	95%CI	
				Lower	Upper
Overall		1759	10.9	10.2	11.6
Sex	Female	968	12.6	11.6	13.7
	Male	791	9.2	8.3	10.1
Ethnicity	Malay	1322	10.5	9.8	11.2
	Chinese	77	11.5	8.9	14.8
	Indian	79	12.3	9.6	15.6
	Other Bumiputera	247	15.0	12.8	17.5
	Others	1322	4.9	2.8	8.3
Strata	Rural	545	11.7	10.5	13.0
	Urban	1214	10.5	9.7	11.4
Household income	B40	1446	11.7	10.9	12.5
	M40	266	8.5	7.1	11.2
	T20	44	6.2	4.2	9.1
Children citizenship	Malaysian citizen	1724	11.2	10.6	11.9
	Permanent resident	35	5.4	3.1	9.2
	/non-citizen				
Gestational age	Pre-term	755	58.9	55.2	62.5
	Full-term	1004	6.6	6.0	7.2

Table 2: Factor associated with Low birth weight children in the Maternal and Child Health Survey 2022, (n=1,759)

cOR: Crude odd ratio, aOR: Adjusted odd ratio,*Significant at p-value at $p < 0.05$

Conclusion

These findings underscore the influence of both biological and socioeconomic determinants of LBW. To address this issue effectively, it is crucial to strengthen maternal care services by improving equity in healthcare accessibility, especially for disadvantaged populations.

References

1. WHO. Global Nutrition Targets 2025: Low birth weight policy brief. Geneva: World Health Organization; 2014 Available from: http://www.who.int/nutrition/publications/globaltargets2025policybrief_lbwt/en/Word. Accessed 3 April 2025.
2. Ratnam S. Maternal Risk Factors Associated with Term Low Birth Weight Infants: A Case-Control Study. *Ann Community Med Public Health*. 2021;1(1):1003.
3. Lee MS, Huang LY, Chang YH, et al. Lower birth weight and diet in Taiwanese girls more than boys predicts learning impediments. *Research in developmental disabilities*. 2012;33(6):2203-12.
4. Mansor E, Ahmad N, Mohd Zulkefli NA, et al Incidence and determinants of low birth weight in Peninsular Malaysia: A multicentre prospective cohort study. *Plos one*. 2024;19(7):e0306387.

OESHPP31 / 297

Predicting Adolescent Obesity from Meal Patterns using Machine Learning

Nur Liana Ab Majid¹, Syahid Anuar², Kimberly Wong³

¹ Sector for Biostatistics and Data Repository, National Institutes of Health, Ministry of Health Malaysia

² Faculty of AI, Universiti Teknologi Malaysia

³ Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: dr.liana@moh.gov.my

Summary

This study explored using machine learning to predict adolescent overweight and obesity from meal pattern data of 19,560 adolescents. Dietary intake and BMI-for-age z-scores were analyzed. Machine Learning models (MLP, Logistic Regression, Decision Tree, Gaussian NB, KNN) were built using dietary features and balanced with ADASYN. KNN showed the best performance (accuracy: 71.6%, F1-score: 69.7%). Age, breakfast, and dinner frequency were key predictors. Machine learning can effectively predict adolescent nutritional status, potentially identifying at-risk individuals for targeted interventions.

Keywords

Adolescent Health, Obesity, Meal Pattern, Dietary Patterns, Machine Learning

Introduction

Adolescent overweight and obesity are major public health concerns with substantial negative health and psychological impacts, both immediately and long-term. Dietary patterns are a key modifiable risk factor. Early identification of their nutritional status could enable the implementation of more effective and personalized prevention strategies. Machine learning offers a promising approach to analyze complex dietary data and identify adolescents at risk of developing these conditions. Therefore, this study aims to leverage machine learning algorithms to predict adolescent overweight and obesity status specifically based on their meal patterns.

Materials and Methods

The study analyzed data from 19,560 adolescents. Dietary intake was assessed using food frequency questionnaires (FFQ) from the Adolescent Health Nutritional Survey (AHS) 2017 Dataset. Participants were classified into three categories based on Body Mass Index-for-age z-scores (BAZ score): normal, overweight, and obese. Predictive models were developed using sociodemographic data, meal frequency, dietary intake patterns, specific meal consumption, and dietary habits and food choices as features. The dataset was balanced using the Adaptive Synthetic Sampling Technique (ADASYN) and then split into training (70%) and testing (30%) sets. Models were built using ML algorithms such as Multi-Layer Perceptron (MLP) Classifier, Logistic Regression (LR), Decision Tree (DT) Classifier, Gaussian Naïve Bayes (NB), and k-Nearest Neighbors (KNN) Classifier. Feature importance for the KNN model was assessed using Permutation Feature Importance. The prediction model performance was evaluated using accuracy, F1-score, precision, and recall. Data preprocessing,

prediction model development and evaluation were conducted using Python. The complex sampling design of the AHS dataset was not incorporated in the modelling.

Results and Discussion

The KNN Classifier outperformed other machine learning models, achieving the highest accuracy (71.6%), F1-score (69.7%), precision (72.5%), and recall (71.6%). Feature importance identified age (0.234), breakfast frequency (0.193), and dinner frequency (0.167) as major key predictors. While Permutation Feature Importance analysis using the KNN model identified these as key predictors of adolescent obesity, this method does not indicate the direction of its association. However, other research has suggested similar association between these features with obesity risk. KNN modelling classification effectively predicts adolescent overweight and obesity from meal patterns, likely capturing non-linear relationships better than linear models like Logistic Regression and Gaussian NB algorithm. The moderate performance of the Decision Tree and MLP indicates the complexity of the relationship. These findings highlight the potential of KNN for identifying at-risk adolescents based on dietary habits.

Table 1 Performance evaluation of Machine Learning algorithm to predict obesity using meal pattern data

Algorithm	Accuracy	F1-score	Precision	Recall
MLP	48.6	48.6	48.7	48.6
Logistic Regression	43.1	42.4	42.6	43.1
Decision tree	61.4	61.5	61.5	61.4
Gaussian NB	41.3	40.4	40.8	41.3
KNN	71.6	69.7	72.5	71.6

Conclusion

Machine learning algorithms can effectively predict adolescent nutritional status from meal patterns, identifying at-risk individuals. Age and meal frequencies are key predictors, highlighting the need for tailored interventions. These models offer a valuable tool for public health initiatives, enabling targeted preventive strategies and early interventions to mitigate the long-term health consequences of adolescent obesity. Further investigation will focus on elucidating the direction and nature of the relationships between these important features with the risk of overweight and obesity. The impact of incorporating survey weights and design effects should also be considered.

References

1. Kansra AR, Lakkunarajah S, Jay MS. Childhood and adolescent obesity: a review. *Frontiers in pediatrics*. 2021;8:581461.
2. Kupek E, Liberali R. Food patterns associated with overweight in 7-11-year old children: machine-learning approach. *Ciência & Saúde Coletiva*. 2024;29:e14712022.
3. Siddiqui H, Rattani A, Woods NK, et al. A survey on machine and deep learning models for childhood and adolescent obesity. *IEEE Access*. 2021;9:157337-60.

4. Saltaouras G, Kyrkili A, Bathrellou E, et al. Associations between Meal Patterns and Risk of Overweight/Obesity in Children and Adolescents in Western Countries: A Systematic Review of Longitudinal Studies and Randomised Controlled Trials. *Children*. 2024;11(9):1100.

OESHPP32 / 300

Comparative Performance of Machine Learning Algorithms for Possible Sarcopenia Screening in Older Malaysian Adults

Kee Chee Cheong¹, Ng Chai Chen², Tay Chai Li³, Kong Sie Zin⁴, Ding Ai Lee⁵, Nor Faizah Ghazali⁶, Kiew Lee Boon⁷, Lorna Chin Kin Tze⁸, Thenmoli Palaniyappan⁹, Srinevasarao Ramanaidu¹⁰, Khalilati Barizah Binti Md Salimun¹¹, Zaleha binti Jusoh¹²

¹ National Institutes of Health, Ministry of Health Malaysia.

² Hospital Sultan Ismail, Ministry of Health Malaysia

³ Klinik Kesihatan Simpang, Ministry of Health Malaysia

⁴ Klinik Kesihatan Sarikei, Ministry of Health Malaysia

⁵ Klinik Kesihatan Senawang, Ministry of Health Malaysia

⁶ Universiti Sains Islam Malaysia, Ministry of Higher Education Malaysia

⁷ Klinik Kesihatan Tudan, Ministry of Health Malaysia

⁸ Klinik Kesihatan Batu Niah, Ministry of Health Malaysia

⁹ Klinik Kesihatan Kuala Kangsar, Ministry of Health Malaysia

¹⁰ Klinik Kesihatan Labis, Ministry of Health Malaysia

¹¹ Klinik Kesihatan Segamat, Ministry of Health Malaysia

¹² Klinik Kesihatan Batu Rakit, Ministry of Health Malaysia

Corresponding author's email: kee@moh.gov.my

Summary

Sarcopenia is the age-related loss of muscle mass, strength, and physical performance, leading to adverse health outcomes. This study aimed to identify key risk factors and evaluate machine learning (ML) models as a statistical tool to assess for possible sarcopenia risk detection among 514 Malaysian older adults aged ≥ 60 years. The Naïve Bayes model achieved the highest accuracy (62.0%) and Area Under the Curve (AUC) (63.9%), making it the best-performing model overall. Key predictors included comorbidities, frailty, dietary habits, and cognitive status. Findings support ML as a promising screening tool in primary care, emphasizing the need for further refinement and validation in diverse populations for improved clinical application.

Keywords

Possible Sarcopenia, aging population, Machine learning, risk factors, older adults

Introduction

Malaysia's aging population is increasing, with those aged 65 and above projected to reach 7.14 million (17.4%) by 2050, classifying the nation as "aged" ¹. With this shift, sarcopenia, the age-related loss of muscle mass and function, is becoming a major concern, leading to functional decline, higher healthcare costs, and reduced quality of life. Risk factors include poor nutrition, low physical activity, chronic diseases, and frailty ²⁻⁴. The Asian Working Group for Sarcopenia (AWGS) 2019 recommends screening tools like the Strength, Assistance with Walking, Rising from a Chair, Climbing Stairs, and Falls (SARC-F) questionnaire, calf circumference, and handgrip strength tests for early detection ⁵, yet Malaysia lacks national data on "possible

sarcopenia." This study aims to determine its prevalence, identify associated risk factors, and evaluate ML models for early screening and detection. Findings may help develop timely interventions to prevent or delay sarcopenia, ultimately improving health outcomes in Malaysia's aging population. **Materials and Methods**

This cross-sectional study was conducted from January to November 2024 across 11 primary care clinics in Malaysia, involving older adults aged 60 and above. Comprehensive data collection covered sociodemographic, clinical characteristics, frailty status, Activities of Daily Living (ADL), anthropometric measurements, biochemical markers, malnutrition assessment, and dietary intake, focusing on factors relevant to sarcopenia risk. "Possible sarcopenia" was determined using AWGS 2019 guidelines, based on low handgrip strength (<28 kg for men, <18 kg for women), measured with a Jamar dynamometer⁵. For predictive modelling, machine learning algorithms were applied using RapidMiner, an automated data science platform. Various classification models were trained and evaluated based on accuracy, AUC, precision, sensitivity, specificity, and F-measure to identify the most effective approach for sarcopenia screening.

Results and Discussion

The study analyzed 514 Malaysian older adults (mean age 71.6 ± 6.1 years), with a possible sarcopenia prevalence of 51.2%. Most participants were female (54.3%), Malay (54.9%), married (71.4%), and unemployed or retired (89.7%). The Naïve Bayes (NB) model achieved the highest accuracy (62.0%) and AUC (63.9%), making it the best-performing algorithm overall. It showed balanced precision (58.3%), sensitivity (63.1%), and F-measure (60.1%), with a classification error of 38%. Logistic Regression (LR) had a similar AUC (63.9%) but slightly lower sensitivity (57.4%) and accuracy (59.2%). Other models, such as Decision Tree (DT) and Random Forest (RF), exhibited high sensitivity (81.3% and 96.7%) but poor specificity (27.4% and 3.0%), leading to many false positives. Gradient Boosted Trees (GBT) and Support Vector Machine (SVM) had moderate performance, with accuracy scores of 56.5% and 54.1%, respectively. Among all models, NB provided the best balance between sensitivity and specificity, making it a suitable choice for sarcopenia screening.

Key predictors in the NB model included ADL status, total protein levels, cognitive status, history of cancer, stroke or transient ischemic attack, Clinical Frailty Scale, daily fruit and vegetable intake, and hypertension. These findings highlight the multifaceted nature of sarcopenia risk, emphasizing the importance of both clinical and lifestyle factors.

Given that early screening is crucial in sarcopenia management, an optimal model should balance sensitivity and specificity to minimize misclassification. While DT and RF excel in identifying sarcopenia cases, their low specificity could lead to excessive false positives and unnecessary follow-ups. The study suggests that NB is the most practical model for sarcopenia screening, though further refinement and validation using larger datasets are necessary to enhance its clinical applicability.

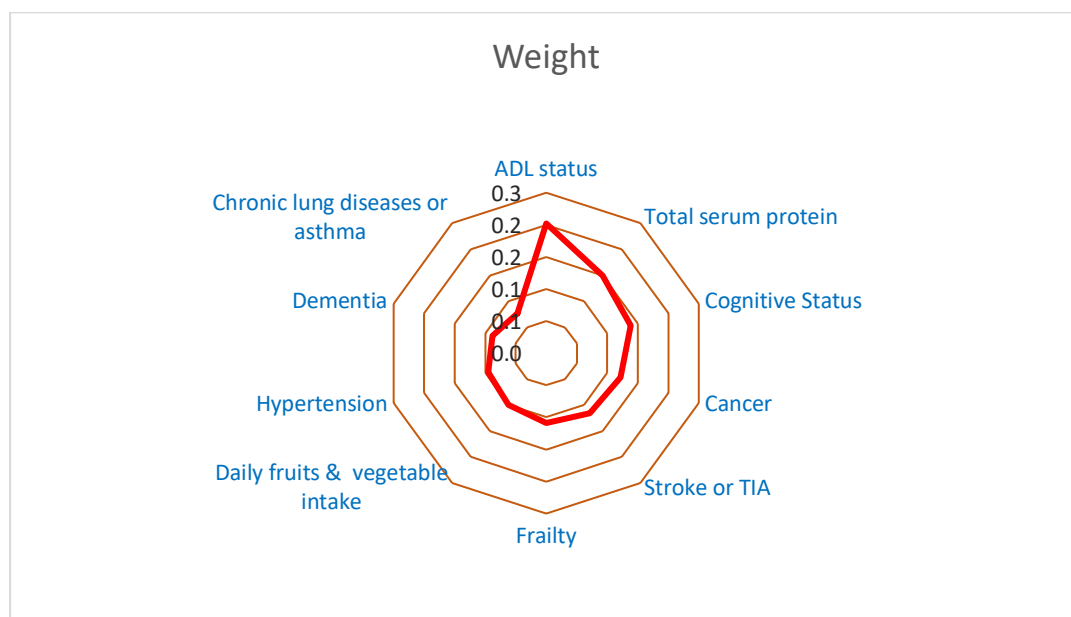
Table 1: Sociodemographic characteristics of the respondents (n=514)

Sociodemographic variables	Frequency (n)	Percentage (%)
Age, mean (SD)	71.6 (6.1)	
Sex		
Female	279	54.3
Male	235	45.7
Ethnicity		
Malay	282	54.9
Chinese	146	28.4
Indian	37	9.5
Others	49	7.2
Marital status		
Never married	8	1.6
Married	367	71.4
Divorced/ Widowed	139	27.0
Highest Education level		
No formal	69	13.4
Primary	232	45.1
Secondary	170	33.1
Tertiary	67	8.4
Working status		
Unemployed/retiree/ homemaker	461	89.7
Employed	53	10.3
Living status		
Living alone	43	8.4
Living with spouse	133	25.9
Living with family/children/relatives	338	65.7
Household monthly income		
< RM 4,850	515	95.2
≥RM 4,850	26	4.8

Table 2: Performance comparison of machine learning models for possible sarcopenia prediction in Malaysian older adults

Model	Accuracy (%)	Classification Error (%)	AUC (%)	Precision (%)	F-Measure (%)	Sn (%)	Sp (%)
NB	62.0	38.0	63.9	58.3	60.1	63.1	59.8
LR	59.2	40.8	63.9	57.0	58.5	61.7	57.4
DT	58.2	41.8	54.6	59.9	68.4	81.3	27.4
RF	50.6	49.4	57.8	49.8	65.2	96.7	3.0
GBT	56.5	43.5	62.9	53.2	62.1	77.7	36.2
SVM	54.1	45.9	59.6	53.4	61.2	75.1	33.4
NB: Naive Bayes, LR: Logistic Regression, DT: Decision Tree, RF: Random Forest, GBT: Gradient Boosted Trees, SVM: Support Vector Machine, Sn: sensitivity, Sp: Specificity							

Figure 1: The top 10 most important variables in the Naïve Bayes model



Conclusion

This study highlights the potential of ML in sarcopenia prediction, with NB emerging as the most effective model due to its balanced accuracy and AUC. While RF and DT showed higher sensitivity, their low specificity limits practical use. Further refinement and validation with larger populations are needed for clinical application.

References

1. United Nations Economic and Social Commission for Asia and the Pacific. (UNESCAP). Malaysia|Demographic Changes. Available online: <https://www.population-trends-asiapacific.org/data/MYS> (accessed on 2 August 2024).
2. Giglio J, Kamimura MA, Lamarca F, Rodrigues J, Santin F, Avesani CM. Association of Sarcopenia With Nutritional Parameters, Quality of Life, Hospitalization, and Mortality Rates of Elderly Patients on Hemodialysis. *J Ren Nutr*. 2018;28(3):197-207.
3. Beaudart, C.; Zaaria, M.; Pasleau, F.; Reginster, J.Y.; Bruyère, O. Health outcomes of sarcopenia: A systematic review and meta-analysis. *PLoS ONE* 2017, 12, e0169548.
4. Janssen, I.; Heymsfield, S.B.; Ross, R. Low relative skeletal muscle mass (sarcopenia) in older persons is associated with functional impairment and physical disability. *J. Am. Geriatr. Soc.* 2002, 50, 889-896.
5. Chen LK, Woo J, Assantachai P, Auyeung TW, Chou MY, Iijima K, et al. Asian Working Group for Sarcopenia: 2019 Consensus Update on Sarcopenia Diagnosis and Treatment. *J Am Med Dir Assoc*. 2020;21(3):300-7.e2.

OESHPP33 / 302

Urine Iodine Status in Malaysia: A National Study in Adults

Noor ul-Aziha Muhammad ¹, Ahmad Ali Zainuddin ¹, Lalitha Palaniveloo ¹, Ruhaya Salleh ¹, Filza Noor Asari ¹, Lim Kuang Kay ¹, Chan Yee Mang ¹

¹ Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: noorulaziha@moh.gov.my

Summary

Iodine deficiency may lead to hypothyroidism and goitre in all ages. This study aimed to assess the iodine status among adults in Malaysia through urinary iodine concentration (UIC). Data on UIC was obtained from 1,272 adults aged 18 years and above in Malaysia. The overall median UIC for Malaysia was 103 µg/L (25th, 75th percentile: 63, 163), but Sarawak is borderline inadequate. To effectively address iodine deficiency in the country, the government should emphasize prevention, awareness, monitoring and legislation with enforcement.

Keywords

Iodine deficiency, urine iodine concentration, iodised salt, public health problem

Introduction

Iodine deficiency is a public health problem for populations throughout the world. According to the World Health Organisation 2004 Global Database for Iodine Deficiency, almost 35% of the world's population has insufficient iodine intake ¹. During the 1970s and 1980s, the prevalence of endemic goitre in remote and rural areas in Malaysia was reported to range from 20% to over 90% ^{2, 3}. Since then, various multi-pronged strategies have been implemented to tackle the IDD problem in the country, including universal salt iodisation (USI). This study aimed to assess the iodine status among adults in Malaysia through UIC.

Materials and Methods

This study analysed data from the National Health and Morbidity Survey: Nutrition 2024 (NHMS 2024), a nationally representative cross-sectional survey with a complex sampling design. 1,272 24-hour urinary specimens of adults aged 18 years and above, excluding pregnant and lactating mothers, were collected and analysed at the four Public Health Laboratories in Sungai Buloh, Ipoh, Kota Bharu and Kota Kinabalu. UIC was determined using an in-house modified micro-method established by the Institute for Medical Research ⁴. A UIC of <20 µg/L was considered severe deficiency, 20-49 µg/L as moderate and 50-99 µg/L as mild based on WHO/UNICEF/ICCIDD 2007 ⁵. All data were analysed using SPSS version 22.0. The UIC was presented as a median since the data were not normally distributed. Non-parametric tests (Mann-Whitney and Kruskal-Wallis tests) were used to determine differences in median UIC between groups, while multiple logistic regression identified sociodemographic factors associated with iodine deficiency.

Results and Discussion

The overall median UIC in Malaysia was 103.0 µg/L (25th, 75th percentile: 63, 163), which is slightly above the WHO/UNICEF/ICCIDD recommended level of 100 µg/L ⁵, indicating borderline adequacy of iodine intake in the population. Among ethnic groups, Malays showed a highly significant difference in median UIC at 118.1 µg/L (25th, 75th percentile: 73, 171), $p < 0.001$ (Table 1).

Table 1: Median urinary iodine among adult population aged 18 years and above in Malaysia by socio-demographic characteristics (n=1,272)

Demographic characteristic	Unweighted count	Median urinary iodine (µg/L) (25 th , 75 th percentile)
MALAYSIA	1,272	103(63, 163)
Zone*		
Peninsular Malaysia	824	108(66, 166)
Sabah	204	104(61, 176)
Sarawak	228	95(51, 148)
Location		
Urban	626	98(59, 162)
1Rural	646	106(65, 168)
Sex*		
Male	557	109(66, 169)
Female	715	100(59, 159)
Ethnicity**		
Malay ^a	646	118(73, 171)
Chinese	197	74(48, 127)
Indian	64	83(49, 119)
Other Bumiputera	276	94(51, 161)
Others	89	113(73, 224)

^aMalay includes Orang Asli

Mann-Whitney or Kruskal-Wallis tests * $p < 0.05$; ** $p < 0.001$

The national prevalence of mild to severe iodine deficiency (UIC<100 µg/L) was 45.7% (95% CI: 40.6, 50.9) (Table 2). Sarawak had the highest prevalence of iodine deficiency (51.9%). Multivariable analysis revealed that ethnicity was the only significant determinant of iodine deficiency. Compared to Malays, Chinese (aOR = 0.309, $p < 0.001$), Indians (aOR = 0.362, $p < 0.001$), and Other Bumiputera (aOR = 0.533, $p < 0.05$) had significantly lower odds of iodine deficiency. These findings highlight ethnic disparities in iodine status, which may be attributed to differences in dietary habits, such as seafood intake and the usage of iodised salt.

Table 2: Urinary iodine status of adults aged 18 years and above in Malaysia by socio-demographic characteristics (n=1,272)

Demographic characteristic	Unweighted count	Population size	Prevalence of urinary iodine <100 µg/L (Severe or moderate or mild deficiency) [% (95% CI)]	aOR	95% CI	p Value
MALAYSIA	616	9,849,108	45.7(40.6, 50.9)			
Zone						
Peninsular Malaysia	381	7,827,492	45.2(39.0, 51.5)	Ref		
Sabah	98	1,075,159	44.2(33.3, 55.7)	1.198	0.756 - 1.899	0.441
Sarawak	124	890,386	51.9(44.6, 59.2)	0.821	0.567 -1.190	0.298
Location						
Urban	315	7,585,390	46.9(40.4, 53.6)	Ref		
Rural	301	2,263,718	42.1(36.6, 47.8)	0.858	0.675 - 1.091	0.211
Sex						
Male	259	5,381,018	46.1(38.9, 53.4)	Ref		
Female	357	4,468,090	45.3(39.2, 51.4)	0.818	0.650 - 1.030	0.087
Ethnicity						
Malay ^a	259	4,317,884	38.8(34.5, 43.4)	Ref		
Chinese	131	2,973,752	67.7(56.7, 77.1)	0.309	0.217 - 0.439	<0.001
Indian	40	857,840	63.4(48.4, 76.2)	0.362	0.210 - 0.626	<0.001
Other Bumiputera	151	1,281,292	52.6(44.9, 60.3)	0.533	0.343 - 0.830	<0.05
Others	35	790,936	37.3(18.8, 60.5)	0.949	0.581 - 1.549	0.834

^aMalay includes Orang Asli

Conclusion

This study highlights notable disparities in UIC and iodine deficiency among adults in Malaysia aged 18 years and above. These findings underscore the need for targeted public health strategies, including promoting the correct usage of iodised salt and enhancing nutrition education, particularly among high-risk groups such as urban populations, Sarawak residents and certain ethnic communities.

References

1. World Health Organization. Iodine status worldwide: WHO global database on iodine deficiency. Geneva: World Health Organization; 2004.
2. Chen PCY, Lim PPE. The prevalence of endemic goitre in the Tinjar Area, Sarawak. *Med J Malaysia* 1982; **37**(3):265-9.
3. Kiyu A, Zainab T, Yahaya A. Iodine deficiency disorders in Sarawak. *Asia Pac J Clin Nutr* 1998; **7**:256-61.
4. Husniza H, Wan Nazaimoon WM. A cost-effective modified micro method for measuring urine iodine. *Trop Biomed* 2006; **23**:109-15.
5. WHO, UNICEF, ICCIDD. Assessment of iodine deficiency disorders and monitoring their elimination: a guide for programme managers. 3rd ed. Geneva: World Health Organization; 2007.

OESHPP34 / 305

Lost in Translation: How Coding Errors in Ophthalmology Undermine MyDRG-Based Hospital Reimbursement

Jin Ziang Tok¹, Deying Yu¹, Maznah Dahlui¹, Nazirah Hasnan¹, Tengku Ain Fathlun Tengku Kamalden¹, Amirah Azzeri^{1,2}, Mohd Hafiz Jaafar^{1,2}

¹ Universiti Malaya Medical Centre, Universiti Malaya, Kuala Lumpur, 59100, Malaysia.

² Public Health Unit, Department of Primary Care, Faculty of Medicine and Health Sciences, Universiti Sains Islam Malaysia, Negeri Sembilan, 71800, Malaysia.

Corresponding author's email: jinziang@ummc.edu.my

Summary

A retrospective audit of 225 ophthalmology inpatients at UMMC (January–April 2024) revealed substantial under-coding: diagnostic codes increased by 52% and procedural codes by 46% after clinician re-coding. Unique DRG assignments rose from 17 to 19, and severity levels II–III doubled, exposing complexity underrepresentation. Financial analysis estimated an average loss of RM 1,506.78 per patient per month, totaling RM 84,756.25 over four months, with March 2024 showing a 33.6% underpayment.

Keywords

MyDRG; Casemix System; Clinical coding accuracy; DRG classification; Revenue loss

Introduction

The Malaysian Diagnosis-Related Groups (MyDRG®) system is a casemix tool for standardized inpatient reimbursement and resource allocation in Malaysian hospitals. Accurate clinical coding underpins valid DRG assignment and equitable funding, yet audits frequently uncover high error rates, with up to 89.4% of records miscoded in Malaysian teaching hospitals (1). In ophthalmology, nuanced diagnoses and procedures further challenge coders, risking under-representation of case complexity and financial leakage.

Materials and Methods

A retrospective audit was performed on 328 ophthalmology admissions at UMMC from January to April 2024. Based on predefined inclusion criteria, 225 in-ward cases were selected for analysis. The ophthalmology ward was chosen as part of the hospital's casemix audit process. One ophthalmology medical officer—who had undergone ICD training and was certified—re-coded the diagnoses (ICD-10) and procedures (ICD-9-CM), blinded to the original codes. To mitigate the risk of individual bias or error, all reassignments were reviewed and validated by an experienced casemix coder. Re-grouping was conducted using the MyDRG® grouper to assign DRG categories and severity levels. Discrepancies between the original and re-coded data were then quantified to assess coding accuracy and data integrity (1,2).

Results and Discussion

Post-audit, the mean number of diagnosis codes per patient rose from 2.96 to 6.17 (52% increase), and procedure codes from 1.48 to 2.74 (46% increase). Total diagnostic codes grew from 499 to 1,042 and procedural codes from 249 to 462.

Unique DRG assignments increased from 17 to 19, reflecting greater case diversity. Severity levels II and III increased from 6 to 10, indicating under-looked complexity in initial coding.

These findings align with systematic reviews reporting median diagnostic accuracy of around 80% and procedure accuracy of 84% in routine hospital data (2). Under-coding has been shown to translate directly into revenue loss; our study's RM 1,506.78 average monthly shortfall per patient echoes the RM 654,303.91 potential loss observed during MyDRG® implementation audits (1). Over four months, the estimated cumulative financial loss due to inaccurate coding amounted to RM84,756.25. The highest monthly shortfall occurred in March 2024, with an estimated loss of RM2,905.37 per patient, representing a 33.6% underpayment. Moreover, comparative analyses in other DRG systems reveal similar under-payment rates when coding errors prevail (3). These findings support the need for clinician engagement in coding audits and sustained coder training to ensure data quality, cost recovery, and effective resource use (4,5).

Conclusion

Regular coding audits, targeted clinician training, and performance monitoring are essential to enhance MyDRG® implementation, minimize financial leakage, and ensure equitable resource distribution.

References

1. Zafirah SA, Muhammad Nur A, Wan Puteh SE, Aljunid SM. Potential loss of revenue due to errors in clinical coding during the implementation of the Malaysia Diagnosis Related Group (MY-DRG®) Casemix system in a teaching hospital in Malaysia. *BMC Health Serv Res*. 2018;18(1):38. doi:10.1186/s12913-018-2843-1
2. Burns EM, Rigby E, Mamidanna R, et al. Systematic review of discharge coding accuracy. *J Public Health (Oxf)*. 2012;34(1):138-148.
3. Kim SJ, Choi BY, Lee KH, et al. Assessing the performance of a method for case-mix adjustment in the Korean Diagnosis-Related Groups (KDRG) system and its policy implications. *Health Res Policy Syst*. 2021;19:98.
4. Dong X, et al. Automating the overburdened clinical coding system. *NPJ Digit Med*. 2023;6:78.
5. Goldfield N. The evolution of Diagnosis-Related Groups (DRGs): from its beginnings in case-mix and resource use theory, to its implementation for payment and now for its current utilization for quality within and outside the hospital. *Med Care Res Rev*. 2009;66(3):325-343.

OESHPP35 / 309

Leveraging AI in Evaluation of Community Outreach Program for Detection of Prevalence and Causes of Abnormal Chest Radiography in Rural Areas of Sarawak

Melvin Chung Hsien Liang¹, Lai Kah Sheng¹, Nurul Amirah Masani¹, Teo Jia Chi¹,
Rawa Anak Bau¹

¹ Bintulu Health Clinic, Ministry of Health Malaysia

Corresponding author's email: laikahsheng@moh.gov.my

Summary

This study evaluated an AI-assisted chest X-ray (CXR) outreach screening program in rural Sarawak. Between January and December 2024, 350 adults underwent digital radiography analyzed by Lunit INSIGHT CXR. Abnormalities were detected in 101 participants (28.9%), with tuberculosis (TB)-related changes being identified the most (nodules: 15.7%, consolidation: 14.3%). Males had nearly double the prevalence of abnormalities compared to females (19.7% vs. 9.1%). These findings highlight the utility of AI-supported outreach programs in improving early detection of respiratory diseases, particularly TB, in underserved rural communities.

Keywords

Chest X-ray, outreach screening, artificial intelligence, tuberculosis, rural health

Introduction

Early detection of tuberculosis (TB) and respiratory diseases is critical in rural regions with limited healthcare access. In Malaysia, mobile outreach programs aim to bridge diagnostic gaps, particularly for TB, which remains a public health priority¹. Chest X-ray (CXR) is a sensitive tool for detecting pulmonary abnormalities, but its effectiveness relies on skilled interpretation, which is often unavailable in resource-limited settings². Artificial intelligence (AI) has emerged as a solution, enhancing diagnostic accuracy and scalability³. This study evaluates an AI-assisted CXR outreach program in rural Sarawak, focusing on its ability to detect abnormalities, prioritize high-risk groups, and facilitate timely referrals. By integrating portable radiography and AI analysis, the program addresses geographic and socioeconomic barriers to healthcare, aligning with Malaysia's national TB control strategies.

Materials and Methods

A retrospective cross-sectional study was conducted among 350 adults attending mobile outreach screening camps in Bintulu, Tatau, and Sebauh districts from January to December 2024. All participants aged 18 and above who are not pregnant were provided verbal informed consent before undergoing digital chest X-ray using portable radiography units. Images were analyzed on-site with Lunit AI V3.1.4.12 software, which flags ten thoracic abnormalities, including TB-related changes, consolidation, and fibrosis. Demographic data, TB risk factors, and symptom history were collected through structured interviews. Individuals with

abnormal findings were referred to district health clinics for confirmatory testing and clinical management, following national TB guidelines. Program effectiveness was assessed by the proportion of abnormal CXRs detected, demographic coverage, and referral outcomes. The study was approved by the relevant institutional ethics committee.

Results and Discussion

Among 350 participants screened, the majority were aged 36-50 years (39.1%), and of the Iban ethnic group (63.1%). AI-assisted analysis identified 101 (28.9%) abnormal CXRs with the most prevalent abnormalities being TB-related changes (nodules (15.7%) and consolidation (14.3%). Pulmonary tuberculosis had a screening yield of 2.3%, which aligns with targeted community screening⁴. The other diagnosis revealed were pneumonia at 6.0%, and chronic lung disease at 6.5%. These results highlight the utility of AI-assisted CXR screening in detecting both active and chronic respiratory conditions in underserved populations. However, challenges included logistical constraints, participant follow-up, and ensuring continuity of care after referral. Strengthening community engagement with local health services is essential for maximizing the impact of such programs⁵. Overall, the outreach model demonstrated feasibility and effectiveness in increasing early detection and treatment for respiratory diseases in rural Sarawak.

Table 1: Demographics (n = 350)

Variable	n (%)
Age	
18-35	95 (27.1)
36-50	137 (39.1)
51-65	90 (25.7)
> 65-year-old	28 (8.0)
Gender	
Male	202 (57.7)
Female	148 (42.3)
Ethnicity	
Malay	37 (10.6)
Iban	221 (63.1)
Chinese	35 (10.0)
Kenyah	40 (11.4)
Melanau	10 (2.9)
Foreigners	7 (2.0)

Table 2: CXR Abnormalities Detected by AI

Abnormalities	n (%)
Nodules	55 (15.7%)
Consolidation	50 (14.3%)
Fibrosis	28 (8.0%)
Calcification	25 (7.1)
Atelectasis	12 (3.4%)
Pleural Effusion	8 (2.3)
Cardiomegaly	5 (1.4)

Pneumothorax	1 (0.3)
Widening mediastinum	1 (0.3)
Pneumoperitoneum	0 (0.0)

Table 3: Diagnosis

Finding Type	Diagnosis	n (%)
No abnormality detected	Normal	297 (84.9)
Abnormal	Pneumonia	21 (6.0)
	Pulmonary tuberculosis	8 (2.3)
	Chronic lung disease	23 (6.5)
	Non tuberculous mycobacterium	1 (0.3)
Total		350 (100.0)

Conclusion

The AI-assisted outreach screening program effectively identified chest X-ray abnormalities and facilitated early intervention for TB in rural Sarawak. Mobile digital radiography, combined with AI analysis, offers a scalable solution for enhancing respiratory disease detection and bridging healthcare gaps in underserved Malaysian communities.

References

1. Ministry of Health Malaysia. National Strategic Plan to End TB (2021-2030). Putrajaya: Disease Control Division (TB/Leprosy Sector), Ministry of Health Malaysia; 2021 [cited 2025 Apr 24]. Available from: https://www.moh.gov.my/moh/resources/Penerbitan/Penerbitan%20Utama/Buku_Garis_Panduan_NSPTB_2021-2023.pdf
2. Abraham Y, Manyazewal T, Amdemariam Z, Petros H, Ayenadis F, Mekonen H, et al. Facilitators and barriers to implementing chest radiography in tuberculosis systematic screening of clinically high-risk groups in Ethiopia: a qualitative study. *SAGE Open Med.* 2024; 12:1-10. doi: 10.1177/20503121241233232.
3. Miyoshi N. Use of AI in Diagnostic Imaging and Future Prospects. *JMA J.* 2025;8(1):198-203. doi: 10.31662/jmaj.2024-0169.
4. Zawedde-Muyanja S, Katende J, Lukyamuzi D, Twinomugisha F, Nakanwagi A, Kirenga B, et al. Comparative yield of different active TB case finding interventions in a large urban TB project in central Uganda: a descriptive study. *PLoS One.* 2022;17(2):e0263165.
5. Kubota S, Elsey E, Oudomphone P, Phommavong K, Phongluxa L, Xaysomphet VS, et al. Community engagement and local governance for health equity through trust: lessons from developing the CONNECT Initiative in the Lao People's Democratic Republic. *BMJ Glob Health.* 2024;9(9):e015409.

OESHPP36 / 314

Potential and Feasibility of Red Blood Cells Spectra for the Detection of Blood Disorders: A Proof-of-Concept Study (MOSTHA@POC)

William Kian Boon Law¹, Royan Hian Lee Ong², Nurul Atiqah Zulazmi¹, Lai Hui Pang¹, Siew Lian Chong³, Kar Ying Yong⁴

¹ *Institute for Clinical Research, National Institutes of Health, Ministry of Health Malaysia*

² *ProvenPac Sdn. Bhd.*

³ *Ampang Hospital, Ministry of Health Malaysia*

⁴ *Miri Hospital, Ministry of Health Malaysia*

Corresponding author's email: kblaw@crc.moh.gov.my

Summary

Effective and viable point-of-care (POC) testing is crucial for reducing the incidence of blood disorders such as thalassemia via population screening. This study looked at the feasibility, correlation and reliability of using spectrophotometric features of red blood cells (RBC) from PBF samples for rapid identification of blood disorders such as anaemia, thalassemia and iron deficiency anaemia. We develop a proprietary spectrophotometer that can detect light activities of RBC, which show moderate to excellent ICC (1, k) and ICC (3, k) and significant correlations to important blood parameters such as haemoglobin (HB), haematocrit (HCT) and RBC.

Keywords

Spectra, Red blood cells, thalassemia, Intraclass correlation coefficient, reliability

Introduction

More than 300 000 infants are born every year with severe inherited HB disorders, and mostly remain undiagnosed, untreated, or undertreated¹. In Malaysia, about 6.8% of its population is affected by thalassemia². Early identification of thalassemia carriers is crucial in mitigating the disease burden, enabling rapid intervention, genetic counselling, and treatment³. However, widespread population screening for thalassemia was found to be logistically non-viable on an on-going basis due to inadequate manpower, resources and competing demands from other health services. Spectrophotometry features the absorption and emission of light radiation by matters. Infrared (IR) spectroscopy, in which the individual vibrations of chemical groups are recorded, has been used to enhance screening and identification of different blood disorders⁴. This study aims to assess the feasibility and reliability of using RBC spectrophotometry to detect different blood disorders.

Materials and Methods

This study started with a cross-sectional investigation on correlation and reliability of using a proprietary fixed-wavelength spectrophotometer designed and developed by the research team. The research prototype can detect remaining light activities of a PBF blood sample easily. Four wavelengths were selected ($w_1 < w_2 < w_3 < w_4$). A total of 75 PBF samples from anaemic subjects (85.3%) and normal subjects (14.7%)

were used to assess Pearson's product moment correlation coefficient (r) with HB, HCT and RBC level, and intra-class correlation coefficient (ICC) for agreement and consistency between two independent operators. Each operator was required to analyze the PBF samples two times with a slight change in position and a 3-minute interval. Correlation coefficient (r) and ICC were calculated using R version 4.3.1.

Results and Discussion

The remaining light activities of PBF samples differed according to different light sources. Light sources with shorter wavelengths were less likely to be absorbed by blood as compared to light sources with longer wavelengths (Figure 1). All light sources presented significantly medium to strong correlation ($p < 0.05$) with HB and HCT, which are important parameters for screening blood disorders, except for RBC with low correlation (Table 1). Higher levels of HB, HCT and RBC showed more absorptivity, therefore less remaining light activities. Moderate to excellent ICC (1, k) results indicated that this technology was reproducible and consistent. However, moderate to good ICC (3, k) results indicated that the test might be operator-dependent, which requires a process standardization to reduce the operator dependency.

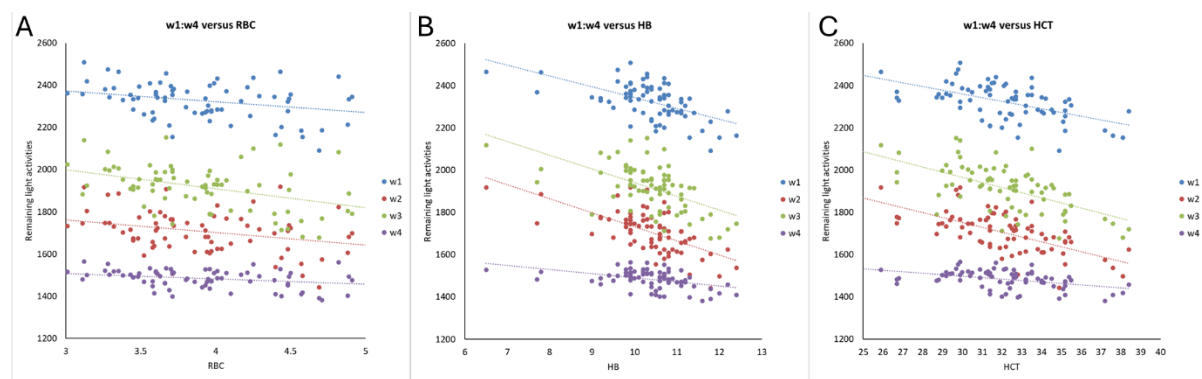


Figure 1: (A) Distribution of remaining light activities (y-axis) across a range of (A) RBC, (B) HB, and (C) HCT.

Table 1: Correlation between spectrophotometric features and blood parameters

Wavelength (nm)	HB	p	RBC	p	HCT	p
w1	-0.564	<0.001	-0.313	0.006	-0.570	<0.001
w2	-0.642	<0.001	-0.319	0.005	-0.657	<0.001
w3	-0.561	<0.001	-0.432	<0.001	-0.618	<0.001
w4	-0.429	<0.001	-0.311	0.007	-0.447	<0.001

Criteria for interpretation: Very low: 0 - 0.19; Low: 0.20 - 0.39; Medium: 0.40 - 0.59; Strong: 0.60 - 0.79; Very Strong: 0.80 - 1.00.

Table 2: Single operator with repeated measures with slightly different position.

Operator	ICC Model	ICC values	95% CI	Interpretation
Operator A				
w1	ICC (1, k)	0.648	[0.483, 0.767]	Moderate
w2	ICC (1, k)	0.518	[0.292, 0.681]	Moderate
w3	ICC (1, k)	0.724	[0.594, 0.817]	Moderate
w4	ICC (1, k)	0.659	[0.498, 0.774]	Moderate
Operator B				
w1	ICC (1, k)	0.937	[0.899, 0.960]	Excellent
w2	ICC (1, k)	0.908	[0.853, 0.942]	Excellent
w3	ICC (1, k)	0.940	[0.904, 0.962]	Excellent
w4	ICC (1, k)	0.957	[0.932, 0.973]	Excellent

w=wavelength

Interpretation thresholds: Poor: <0.5, Moderate: 0.5-0.75, Good: 0.75-0.9, Excellent: ≥0.9.

Table 2: Agreement between two operators.

ICC type	Model	ICC values	95% CI	Interpretation
ICC (3, k)				
365nm	ICC (3, k)	0.555	[0.291, 0.721]	Moderate
405nm	ICC (3, k)	0.742	[0.590, 0.838]	Moderate
530nm	ICC (3, k)	0.816	[0.706, 0.884]	Good
576nm	ICC (3, k)	0.772	[0.636, 0.857]	Good

ICC (3, k): Two-way mixed effects, whereby operators are fixed (not randomly selected), and same operator evaluates all subjects.

Interpretation thresholds: Poor: <0.5, Moderate: 0.5-0.75, Good: 0.75-0.9, Excellent: ≥0.9.

Conclusion

Medium to strong correlation between spectrophotometric features and important blood parameters, and moderate to excellent reliability support the feasibility of using RBC spectrophotometry as a POC test for detecting blood disorders such as iron deficiency anaemia and thalassemia.

References

1. Angastiniotis, M. & Modell, B. Global Epidemiology of Hemoglobin Disorders. *Ann. N. Y. Acad Sci* 1998; **850**:251-269.
2. Ngim, C. F., Ibrahim, H., Lai, N. M. & Ng, C. S. A single centre study on birth of children with transfusion-dependent thalassaemia in Malaysia and reasons for ineffective prevention. *Prenat. Diagn* 2015; **35**:51-59.
3. Cohen, A. R., Galanello, R., Pennell, D. J., Cunningham, M. J. & Vichinsky, E. Thalassemia. *Hematology* 2004, 14-34.
4. Petrich, W. et al. Disease pattern recognition in infrared spectra of human sera with diabetes mellitus as an example. *Appl. Opt* 2000; **39**:3372-3379.

OESHPP37 / 332

Designing and Developing a Game-based Learning Intervention Program (VAPGAMO) to Prevent Vaping Intention among Adolescent

Muhamad Zulhilmie Saruddin^{1*}, Rosliza Abdul Manaf¹, Ahmad Zaid Fattah Azman¹, Farah Nadia Azman²

¹ Department of Community Health, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, 43400, Serdang, Malaysia.

² Department of Interactive Media, Faculty of Information and Communication Technology, Universiti Teknikal Malaysia Melaka, Hang Tuah Jaya, 76100, Durian Tunggal, Melaka, Malaysia

Correspondence: drzulhilmie@moh.gov.my

Summary

The rising usage of vape has raised serious concerns on early nicotine exposure and potential addiction among adolescents. Traditional approaches often lack engagement to this age group. Given the popularity of digital games, this study explores using a videogame to prevent vaping intention by integrating behavioral theory with interactive gameplay. Using Design and Development Research (DDR) approach and guided by the Theory of Planned Behavior (TPB), Vaping Prevention Gaming Module (VAPGAMO) features a teenage avatar who battles vape-like monsters (Vapesters) to build awareness, critical thinking, and refusal skills. The game promotes active learning, peer interaction, and includes a physical activity component to encourage healthy habits. Interventional studies are recommended to validate its effectiveness and acceptance among various age groups.

Keywords

Adolescent, videogame, vaping, electronic cigarette, gamification

Introduction

Vaping are becoming increasingly common among adolescents. Its potential for adolescents' early exposure to nicotine addiction and long-term health risks has become growing public health concerns (1). Traditional health education methods often struggle to engage this age group effectively, calling for more innovative and interactive approaches. As digital games continue to be a dominant form of entertainment among adolescents, there is a unique opportunity to harness their potential for health education (2). This paper reports on the design and development stage of a videogame aimed at preventing vaping intention among adolescents by combining behavioral theory with interactive gameplay.

Materials and Methods

This study adopts the DDR approach which includes need assessment, design and development. In Phase 1, need assessment through extensive review of relevant literature, provide insights and guides the game design. In phase 2, the study team undertook a multi-step process to design and develop the game, including engaging with the end users and consultation with a multi-disciplinary team consisting of public health physicians, educators, health education officers, game designers and

graphic artists. The VAPGAMO is a personal computer (PC)-based videogame designed to help adolescents avoid having intention to vape and develop refusal skills to vape initiation.

Results and Discussion

Phase 1 provides a comprehensive synthesis of current study on predictors of vaping intention addressing the problem. The phase 2 led to final design of VAPGAMO informed by adoption of theoretical frameworks (TPB) and several game mechanics designed to increase user engagement and retention. VAPGAMO users maintain as a young teenage boy that serves as a virtual avatar for the users' progress engaging in combat with the Vape-like monster (Vapester), collect valuable items to enhance their abilities, knowledge and unlock educational-driven cutscenes that deepen their understanding of the dangers of vaping. With limited resources, they must carefully plan their moves, using critical thinking and strategy to overcome obstacles. Research supports the use of serious games as effective health interventions due to their engaging, fun, and educational nature (3). By blending entertainment with evidence-based content, such games can influence behavior positively across different age groups. The videogame format offers unique advantages, such as promoting active learning, peer interaction and increased motivation, focusing on increasing awareness, building knowledge, and developing self-efficacy to refuse vaping. The game's physical activity component builds on prior findings that active games improve knowledge and encourage healthier habits (4).

Conclusion and Recommendation

VAPGAMO is a theory-based educational game developed from research on vaping predictors, designed to engage adolescents through interactive gameplay while building knowledge, motivation, and refusal skills to prevent vaping. Interventional study is recommended to confirm the potential of this video game in preventing vaping intention among adolescents. Moving forward, we are going to assess the validity and acceptance of the game in various age groups.

References

1. Jane Ling MY, Abdul Halim AFN, Ahmad D, et al. Prevalence and associated factors of e-cigarette use among adolescents in Southeast Asia: a systematic review. *Int J Environ Res Public Health* 2023; **20**(5):3883.
2. Holzmann SL, Dischl F, Schäfer H, et al. Digital gaming for nutritional education: a survey on preferences, motives, and needs of children and adolescents. *JMIR Form Res* 2019; **3**(1):e10284.
3. Nyman J, Salanterä S, Pasanen M, Parisod H. Effectiveness of a digital health game intervention on early adolescent smoking refusal self-efficacy. *Health Educ Behav* 2024; **0**(0):10901981241237788.
4. Suleiman-Martos N, García-Lara RA, Martos-Cabrera MB, et al. Gamification for the improvement of diet, nutritional habits, and body composition in children and adolescents: a systematic review and meta-analysis. *Nutrients* 2021; **13**(7):2478.

OESHPP38 / 335

Digital Lifelines: A Public Health Lens on Tech-Driven Disaster Response - A Narrative Review

Muhammad Zulhilmie Saruddin^{1,2}, Muhammad Izmanuddin Fitri Abdul Razak^{1,2}, Khadijahtul Qubra Amizah Hamzah^{1,2}, Syafiq Ameerul Ibtisyam Zulkiflee^{1,2}, Aidalina Mahmud¹

¹ Department of Community Health, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, 43400, Serdang, Malaysia

² Ministry of Health Malaysia, 62000, Putrajaya, Wilayah Persekutuan Putrajaya, Malaysia

Corresponding author's email: drzulhilmie@moh.gov.my

Summary

This narrative review explores how modern technologies are reshaping public health disaster response. Once reliant on manual methods, disaster management has advanced through tools like Geospatial Information System (GIS), drones, Artificial Intelligence (AI), telehealth, and mobile platforms—enabling early warnings, faster decision-making, and coordinated efforts across agencies. These innovations have strengthened key public health areas such as water quality monitoring, disease surveillance, nutrition, and immunisation, ultimately improving health outcomes during crises. Despite their promise, challenges persist, including high costs, system vulnerabilities, data security concerns, and the need for skilled personnel and standardized protocols. The review calls for strategic investment and collaboration to fully leverage technology for effective and equitable disaster preparedness and response.

Keywords

Disaster Management, Advanced Technologies, Public Health, Strategic Planning, Adaptive Response

Introduction

Disasters, whether natural, man-made, or technological, pose severe threats to human life and infrastructure, demanding coordinated responses guided by the disaster management cycle—mitigation, preparedness, response, and recovery phase¹. With disasters becoming more frequent, unpredictable, and complex, modern public health must evolve leveraging advanced technologies to improve response speed, resource allocation, and situational awareness². These technologies ranging from GIS, drones to AI, telehealth and mobile platforms, enabled early warnings, real-time decision-making, and facilitated better inter-agency coordination. Public health plays a crucial role throughout this cycle by maintaining essential services and preventing disease outbreaks^{2,3}. Recent global events, including the COVID-19 pandemic and rising disaster-related deaths and economic losses, underscore the urgent need to strengthen disaster response systems. This review highlights the critical function of technology in enhancing public health capabilities during disasters, ultimately aiming to save lives, protect infrastructure, and reduce health risks.

Materials and Methods

This narrative review synthesizes existing literature to examine how technology has enhanced public health disaster response, with primary focus on the disaster response phase. Search of academic databases including PubMed, EBSCOHost, Scopus, and Google Scholar, were performed using keywords such as "disaster response technology," "public health," "disaster management," "early warning systems," and "situational awareness." In this reviewed of 19 articles, several current applications of technologies in disaster response were identified. We categorised the advanced technologies application across public health functions in disaster response phase such as water quality monitoring, disease surveillance, resource allocation, nutrition, and immunization. The search was limited to publications from 2001 to 2024 to capture the evolution and recent advancements in the field. Inclusion criteria were peer-reviewed articles, reviews, conference proceedings, grey literature, and official reports that discuss the application of technology in disaster response from a public health perspective.

Results and Discussion

A total of 19 articles were reviewed. The articles were screened based on their relevance to public health functions with a particular emphasis on the use of advanced technologies in the response phase. The synthesis of findings categorizes technological applications based on how they support and enhance public health functions specifically during the disaster response phase (Table 1). This review underscores the transformative role of technology in disaster response from a public health perspective, tracing its evolution from traditional, manual approaches to sophisticated, data-driven systems. Historically, disaster management relied on limited communication and manual assessments, often resulting in delayed and fragmented responses. Today, technological innovations such as satellite remote sensing, drones, GIS mapping, social media analytics, AI, and telehealth have revolutionised how disasters are detected, monitored, and managed. These tools enable early warnings, efficient search and rescue efforts, real-time damage assessments, resource tracking, and targeted public communication. Public health outcomes have significantly improved through the integration of digital health platforms, blockchain-supported logistics, and AI-driven situational awareness.

Technological interventions have further strengthened core disaster response domains such as water and sanitation, disease surveillance, communicable disease control, resource allocation, nutrition, and immunization. Internet of Things (IoT)-enabled water monitoring, mobile health apps, drones for food and vaccine delivery, and AI-supported outbreak predictions have all contributed to more efficient, equitable, and resilient public health responses during disasters.

However, despite their potential, these technologies come with notable challenges. Over-reliance on tech-based systems can be detrimental during infrastructure failures or power outages. Issues related to safety, data accuracy, privacy, cybersecurity, and interoperability persist, especially in low-resource settings². High implementation costs and maintenance needs create access barriers, while gaps in workforce training and standardisation limit effective utilisation. Addressing these challenges requires strategic investment, cross-sector collaboration, robust training

programs, and the establishment of universal data protocols to fully realise the potential of technology in strengthening public health disaster preparedness and response.

Conclusion

The integration of technologies such as AI, drones, GIS, telehealth, and remote sensing has significantly transformed disaster response from a public health perspective by improving situational awareness, resource coordination, and continuity of care. As disasters become more frequent and complex, the reliance on these tools will continue to grow. However, the effectiveness of such technology hinges on trained human resources and timely intervention. Therefore, while continued investment in technological innovation is essential, equal emphasis must be placed on capacity building, training, and strategic planning. Only through a synergistic approach, where advanced technologies are supported by skilled human input, thus can strengthen disaster preparedness and build more resilient public health systems.

References

1. United Nations Office for Disaster Risk Reduction (UNDRR), (2024). Monitoring the Sendai Framework. Retrieved from <https://www.undrr.org/monitoring-sendai-framework/snapshot>
2. United Nations Development Programme (UNDP), (2023). Innovation in disaster management: Leveraging technology to save more lives. Retrieved from <https://www.undp.org/policy-centre/istanbul/publications/innovation-disaster-management-leveraging-technology-save-more-lives>
3. Leider JP, DeBruin D, Reynolds N, et al. Ethical guidance for disaster response, specifically around crisis standards of care: a systematic review. *Am J Public Health* 2017; **107**(9):e1-e9.

OESHPP39 / 336

Prevalence and Factors Associated with Children Who Have Never Attended a Dental Clinic: Findings from a National Survey

Nur Faraeein Zainal Abidin¹, Khaw Wan-Fei¹, Hasimah Ismail¹, Shubash Shander¹

¹ Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: faraeein@moh.gov.my

Summary

This study explores the prevalence of children under five years old who have never been examined or treated at a dental clinic, and identifies associated factors using data from the National Health and Morbidity Survey (NHMS) 2022. Sociodemographic characteristics and oral hygiene behaviours were examined to determine their association with dental clinic visits. Logistic regression results showed significant associations with the child's age, caregiver's age and education level, ethnicity, living area, guardian-supervised tooth brushing, and guardian's perception of the appropriate timing for the first dental visit. These findings highlight the need for early and targeted early dental visits among children.

Keywords

Oral health, dental health services, toothbrushing, dental care for children, oral hygiene

Introduction

Dental caries among children in Malaysia remains a significant public health problem, with approximately 63% of children reported to have untreated caries¹. This high burden of untreated dental disease leads to a range of adverse outcomes, such as difficulty eating, disturbed sleep, pain, early tooth loss and negatively affects quality of life. Recognising the importance of early intervention, the National Oral Health Strategic Plan (NOHSP) 2022-2030 recommends early oral health assessments². However, the uptake of early dental visits remains low. Socioeconomic status, parental perceptions, and accessibility of dental services have been reported as associated factors³. This study aimed to examine the prevalence and associated sociodemographic and caregiver practices and perceptions related to child oral health among children who have never examined or treated at a dental clinic.

Materials and Methods

An analysis of data from the National Health and Morbidity Survey (NHMS) 2022 was conducted, focusing on children under five years of age. This cross-sectional survey utilized a two-stage stratified random sampling design, and data collection was carried out across various regions in Malaysia. The main outcome was the child had never been examined or treated at a dental clinic. Independent variables included the child's age, caregiver's age, ethnicity, urban/rural strata, caregiver's education level, and guardian-supervised toothbrushing frequency, and guardian's perceived

appropriate age for the first dental visit. Descriptive and complex sample logistic regression analyses were performed using SPSS Complex Samples to adjust for design effects. Adjusted odds ratios (aOR) with 95% confidence intervals were calculated, and a *p*-value of less than 0.05 was considered statistically significant. Ethical approval was obtained and all personal identifiers were removed to maintain confidentiality.

Results and Discussion

A total of 14,844 children under five years old were included. The overall prevalence of children who had never attended a dental clinic was 62.6% (95% CI: 60.7-64.4). Most children were below three years old (70.0%), and most caregivers were Malay (70.0%), younger than 30 years (67.9%), had completed only primary education (78.1%), and lived in urban areas (65.7%). Regarding oral health practices, most caregivers supervised their children to brush their teeth less than twice daily (77.4%) and believed that the first dental visit should occur after one year of age (68.4%). In multivariate logistic regression analysis, caregivers who supervised toothbrushing less than twice daily were 2.24 times more likely to have children who never attended dental clinics compared to those who supervised brushing twice daily or more. Caregivers who perceived that the first dental visit should occur after one year of age were 4.32 times more likely to delay attending dental clinic compared to those caregivers perceived age for first dental check less than one year (aOR = 4.32, 95% CI: 3.56-5.25). The probability of children not attend dental clinic was higher among caregiver had completed primary education (aOR = 2.21, 95% CI: 1.71-2.85) compared to those with tertiary education. Living in urban areas, younger caregiver age, and Malay ethnicity were also significant factors. Similar findings have been reported from other countries, showing comparable or higher prevalence rates of no dental visits (4, 5). This high prevalence might be due to socioeconomic barriers, limited access to dental services, and low parental awareness (3). These findings highlight a critical need to promote early dental check-ups, address social determinants of health, and strengthen preventive oral health programs targeting children and their caregivers.

Table 1: Prevalence of children who have never been examined or treated at dental clinic

Characteristics		Prevalence (%)	95% CI		Unweighted Count
			LL	UL	
Overall		62.6	60.7	64.4	8303
Strata	Rural	54.8	51.0	58.5	2182
	Urban	65.7	63.6	67.9	6121
Age of Child (years)	<3	70.0	67.8	72.1	5068
	3-4	53.8	51.5	56.2	3235
Age of Caregiver (years)	<30	67.9	65.0	70.7	2401
	≥30	60.6	58.6	62.6	5902
Ethnicity	Malay	70.0	66.6	73.1	2235

	Others	57.9	56.0	59.9	6068
Education level of Caregiver	Primary	78.1	73.7	82.0	848
	Secondary	63.2	60.7	65.6	4386
	Tertiary	56.9	54.5	59.3	3069
Caregiver supervised tooth brushing	Once daily or less	77.4	74.6	79.9	2107
	Two time or more daily	57.9	55.8	60.0	6196
Age at caregiver's perception on first dental visit	Less than 1 years old	33.9	29.7	38.2	912
	1 year old and above	68.4	66.5	70.3	7391

CI Confidence Interval, Others Chinese and Indian

Table 2: Factors associated with children who have never been examined or treated at dental clinic

Characteristics		Crude Odds Ratio (OR)	95% CI		P value	Adjusted OR	95% CI		P value
			LL	UL			LL	UL	
Strata	Urban	1.58	1.32	1.89	<0.001	1.59	1.34	1.89	<0.001
	Rural	1.00	-	-	-	1.00	-	-	-
Age of Child (years)	<3	2.00	1.79	2.23	<0.001	2.05	1.83	2.30	<0.001
	3-4	1.00	-	-	-	1.00	-	-	-
Age of Caregiver (years)	<30	1.00	-	-	-	1.00	-	-	-
	≥30	1.38	1.21	1.57	<0.001	1.25	1.08	1.44	0.003
Ethnicity	Malay	1.69	1.43	2.00	<0.001	1.34	1.14	1.58	<0.001
	Others	1.00	-	-	-	1.00	-	-	-
Education level of Caregiver	Primary	2.70	2.08	3.50	<0.001	2.21	1.71	2.85	<0.001
	Secondary	1.30	1.14	1.48	<0.001	1.24	1.09	1.41	0.001
	Tertiary	1.00	-	-	-	1.00	-	-	-
Caregiver supervised tooth brushing	Once daily or less	2.48	2.12	2.91	<0.001	2.24	1.91	2.63	<0.001
	Two time or more daily	1.00	-	-	-	1.00	-	-	-

Age at caregiver's perception on first dental visit	Less than 1 years old	1.00	-	-	-	1.00	-	-	-
	1 year old and above	4.23	3.45	5.20	<0.001	4.32	3.56	5.25	<0.001

CI Confidence Interval, LL Lower Limit, UL Upper Limit

Conclusion

Children's oral healthcare utilization in Malaysian is low among caregivers with lower education, younger age, and infrequent supervised tooth brushing. Educating caregivers on early hygiene habits and preventive dental care is essential. Promoting regular dental visits for young children is essential to improve long-term oral health outcomes across all regions.

References

1. Lee ZL, Gan WY, Lim PY, et al. Associations of nutritional status, sugar and second-hand smoke exposure with dental caries among 3-to 6-year-old Malaysian pre-schoolers: a cross-sectional study. *BMC Oral Health* 2020; **20**:1-9.
2. Ministry of Health Malaysia. *National Oral Health Strategic Plan 2022-2030*. Putrajaya: Ministry of Health Malaysia; 2024.
3. Berat P-J, de Andrade V, Regnault N, et al. Model to explain dental visit for children aged 0 to 5: scoping review of birth cohorts. *PLoS One* 2025; **20**(1):e0313922.
4. Kasemkhun P, Jirarattanasopha V, Lertsooksawat W. Characteristics and influencing factors of the first dental visit among children in Bangkok, Thailand: a cross-sectional study. *BMC Oral Health* 2024; **24**(1):11.
5. Alshahrani NF, Alshahrani ANA, Alahmari MA, et al. First dental visit: age, reason, and experiences of Saudi children. *Eur J Dent* 2018; **12**(4):579-84.

OESHPP40 / 351

What Drives the Public to Seek Care at the Emergency Department's Green Zone? A Cross-Sectional Study at Hospital Tengku Ampuan Rahimah Klang

Norbaidurah Ithnain¹, Saiful Adli Suhaimi¹, Evi Diana Omar², Hasnah Mat²
Manimaran Krishnan¹

¹ Institute for Health Behavioural Research, National Institutes of Health, Ministry of Health Malaysia

² Sector for Biostatistics & Data Repository, National Institutes of Health, Ministry of Health Malaysia

Summary

This study examines the reasons influencing the utilization of the Emergency Department's (ED) Green Zone at Hospital Tengku Ampuan Rahimah (HTAR) in Selangor, Malaysia. Key drivers include the perceived severity of illness, convenience of 24-hour access, affordability, and lack of recovery from prior treatments. A lack of confidence in managing health issues and social influences, such as family habits and advice, also contributes to ED attendance. The findings suggest that improving health literacy, enhancing primary care access, and addressing healthcare-seeking behaviors are essential for reducing unnecessary ED visits and optimizing healthcare resources.

Keywords

Reasons, Utilization, Emergency Department, Green Zone, Public

Introduction

The growing demand for emergency and urgent care services is well documented, with notable consequences such as emergency department (ED) crowding, increased healthcare costs, longer waiting times, and increased strain on healthcare systems^{1,2}. Several factors have been suggested to contribute to this trend, including an aging population³, a higher prevalence of chronic conditions⁴, and changes in healthcare-seeking behavior⁵. A particular concern in many Malaysian public hospitals is the ED Green Zone's overutilization, designated for non-critical cases. This inappropriate use contributes to unnecessary ED congestion and diverts resources from true emergencies. In this context, the present study aims to identify the reasons influencing public attendance at the Green Zone of the Emergency Department at Hospital Tengku Ampuan Rahimah (HTAR) in Selangor, with the goal of better understanding the drivers behind its continued high utilization.

Materials and Methods

This cross-sectional study was conducted at the Emergency Department (ED) Green Zone of Hospital Tengku Ampuan Rahimah (HTAR), Klang, Selangor, using a convenience sampling method. The study population comprised individuals visiting the Green Zone. The required sample size was calculated using the population proportion formula, assuming a 50% awareness level of ED functions, with a population size of 53,360 and a 5% margin of error, yielding 381. Inclusion criteria

encompassed Malaysian citizens aged 18 and above—patients, caregivers, friends, or employers—while foreigners and visitors attending antenatal care at the Patient Admission Centre were excluded. Data were collected using a self-administered questionnaire adapted from previous validated studies and reviewed by content experts. Descriptive analysis was employed using SPSS version 22.0.

Results and Discussion

The findings of this study reveal several reasons influencing the utilization of ED services in HTAR's Green Zone. The most frequently cited reasons for attending the ED were the convenience of 24-hour access (94.5%) and the affordability of treatment (91.6%). These reasons underscore the ED's role as an accessible, cost-effective option compared to primary care or private clinics. Respondents expressed confidence in care quality (87.1%), perceived severity of illness (81.9%), and high satisfaction with the ED services (75.6%), likely contributing to continued high ED utilization. The convenience of not requiring a referral or appointment (75.3%) also contributes to the utilization, as it reduces barriers to care.

Another significant factor was the lack of confidence in managing health issues (68.8%), suggesting a gap in health literacy or the complexity of health conditions. This points to improved education and self-management support in non-emergency care settings to reduce unnecessary ED visits. A notable driver was the high percentage of respondents (64.3%) seeking treatment after not recovering from previous care, indicating that patients often turn to the ED when they feel their health issues remain unaddressed in other settings. This finding aligns with previous studies, which suggest that patients bypass primary care when they perceive their condition requires urgent attention. Finally, social factors also played a role, with over half of the respondents (52.8%) reporting that seeking ED care was a family habit, and 56.2% being influenced by family and friends' advice.

Conclusion

This study identifies key reasons driving utilization of the ED's Green Zone at HTAR, including perceived severity, convenience, affordability, and lack of recovery from prior treatments. Addressing gaps in health literacy, improving primary care access, and changing healthcare-seeking behaviors are crucial for reducing unnecessary ED visits and optimizing resources.

References

1. Michal C, Adirah SN, Praneetha P, et al. Redirection of non-critical patients in the Emergency Department of Hospital Tuaran to the Primary Care Unit (Klinik Kesihatan). *Borneo J Med Sci* 2023; **10**:47-59.
2. Selasawati HG, Naing L, Wa WA, et al. Inappropriate utilization of emergency department services in Universiti Sains Malaysia hospital. *Med J Malaysia* 2004; **59**:26-33.
3. Mokhtar MAM, Pin TM, Zakaria MI, et al. Utilization of the emergency department by older residents in Kuala Lumpur, Malaysia. *Geriatr Gerontol Int* 2015; **15**:944-50.
4. Xia T, Enticott J, Pearce C, et al. Predictors of ED attendance in older patients with chronic disease: a data linkage study. *Aust Health Rev* 2020; **44**:550-6.

5. Coster J, Turner J, Bradbury D, et al. Why do people choose emergency and urgent care services? A rapid review utilizing a systematic literature search and narrative synthesis. *Acad Emerg Med* 2017; **24**:1137-49.

OESHPP41 / 361

Bridging the Gaps: Factors of Eye Care Utilisation Among Malaysia's Low-Income Groups Using Andersen Behavioural's Model

Nur Suhailah Alias¹, Noor Halilah Buari¹, Sabrina Subri¹

¹*Centre for Optometry Studies, Faculty of Health Science, Universiti Teknologi MARA Selangor, Malaysia*

Corresponding author's email: suhailahalias99@gmail.com

Summary

This study investigates factors influencing eye care service utilisation among low-income populations using Andersen's Behavioural Model. Our survey identified four significant variables out of sixteen assessed. Notably, head of household status, geographic location, health insurance coverage, and presenting distance visual status were critical predictors. Awareness of ocular disorders did not significantly influence utilisation. These findings highlight structural, socioeconomic, and visual health-related barriers, informing targeted interventions and policies to improve healthcare equity and accessibility for low-income groups in Malaysia.

Keywords

Eye Care Services, Low-Income, Andersen Behavioural Model, Healthcare Utilisation, Visual Health

Introduction

Eye health disparities significantly impact quality of life and socioeconomic opportunities, especially among low-income groups¹. Despite numerous efforts, the utilisation of eye care services remains suboptimal in disadvantaged communities, exacerbating visual impairments and inequalities. Using Andersen's Behavioural Model, the factors influencing eye care service uptake are systematically examined, offering a structured understanding of healthcare utilisation². This study aims to address existing gaps by identifying factors influencing access to care, thereby contributing to the development of effective public health strategies that promote equity and improve visual health among vulnerable populations in Malaysia

Materials and Methods

This cross-sectional study surveyed low-income adults in Selangor, using a structured questionnaire guided by Anderson's Behavioural Model. The sampling frame was based on the Department of Statistic Malaysia's total B40 populations in Selangor, representing 9% of households. A sample size of 280 participants including both urban and rural areas was determined using the Arifin's sample size calculator, ensuring 95% confidence interval and 5% margin of error³. A simple random sampling technique was used to select Petaling Jaya (urban) and Sabak Bernam (rural) as study sites. Within these areas, purposive sampling was applied to recruit eligible participants aged 18 years and above, permanently residing in the selected districts, and classified as B40. The questionnaire was distributed through both physical

(posters in community spaces) and digital (WhatsApp groups, Facebook community pages) channels to maximize reach and inclusivity. Participants also underwent visual acuity assessments. Analyses used SPSS 21.0 with chi-square tests. Ethical standards ensured informed consent and confidentiality.

Results and Discussion

Only 83 out of 300 respondents utilised eye care services, with a slightly higher utilisation rate among the urban population (16.5%) than the rural population (9.8%). According to Andersen's Behavioural Model, healthcare utilisation is shaped by three categories of factors: predisposing, enabling, and need factors². Among predisposing factors, head of household status significantly associated with service uptake ($\chi^2(1) = 5.45$, $p = 0.02$), suggesting that household leaders prioritize health more actively, aligning with finding that social roles and family responsibilities influence health-seeking behaviors⁴. Awareness of ocular disorders had no significant effect, implying that mere awareness does not necessarily translate to service uptake, underlining the complexity of behavioural change in healthcare utilisation. Regarding enabling factors, geographic location ($\chi^2(1) = 8.46$, $p = 0.004$), and insurance coverage ($\chi^2(1) = 7.71$, $p = 0.005$) were significant emerged as key barriers or facilitators. These findings align with Andersen's model emphasis on structural and financial accessibility⁵, which highlights how environmental and economic conditions shape health service utilization. Regarding need-based factors, presenting distance visual status was significantly associated with utilisation ($\chi^2(1) = 5.03$, $p = 0.025$). Individuals with normal vision may either be benefiting from regular eye care visits or are more proactive in preserving their vision, highlighting the need for outreach targeting those with undetected or untreated vision loss⁴. In summary, the findings reinforce the Andersen Behavioral Model's relevance in understanding eye care service use among Malaysia's low-income groups. Targeted interventions that address enabling barriers, such as rural accessibility and insurance coverage, are crucial for advancing healthcare equity⁵.

Table 1: Factors associated with eye care utilisation among low-income group.

Characteristics	Utilise, n (%)	Not utilise, n (%)	p values
Predisposing factors			
Head of household			
Yes	69 (23.0)	165 (55.0)	0.020*
No	10 (3.3)	56 (18.7)	
Size of household			
<5	35 (11.7)	86 (28.7)	0.402
5 and more	44 (14.7)	135 (45.0)	
Genders			
Male	48 (16.0)	136 (45.3)	0.903
Female	31 (10.3)	85 (28.3)	
Age			
20-39	19 (6.3)	64 (21.3)	0.831
40-59	44 (14.7)	95 (31.7)	
60+	16 (5.3)	62 (20.7)	
Marital status			

Married	67 (22.3)	184 (61.3)	0.749
Divorced	6 (2.0)	11 (3.7)	
Widow	6 (2.0)	26 (8.7)	
Education			
No formal education	1 (0.3)	6 (2.0)	0.749
Primary education	6 (2.0)	15 (5.0)	
Secondary education	60 (20.0)	163 (54.3)	
Tertiary education	12 (4.0)	37 (12.3)	
Awareness ocular problem			
Aware	56 (18.7)	162 (54.0)	0.679
Not aware	23 (7.7)	59 (19.7)	
Enabling factors			
Geographic area			
Urban	51 (17.0)	101 (33.7)	0.004*
Rural	28 (9.3)	120 (40.0)	
Socioeconomic status			
B1 (<RM2,560)	55 (18.3)	153 (51.0)	0.965
B2 (RM 2,560-RM 3,439)	16 (5.3)	46 (15.3)	
B3 (RM 3,440-RM 4,309)	6 (2.0)	17 (5.7)	
B4 (RM 4,310- RM 5,249)	2 (0.7)	5 (1.7)	
Government aid			
Receive	56 (18.7)	134 (44.7)	0.105
Not receive	23 (7.7)	87 (29.0)	
Health insurance			
Yes	23 (7.7)	33 (11.0)	0.005*
No	56 (18.7)	188 (62.7)	
Need factors			
Systemic health			
Yes	35 (11.7)	124 (41.3)	0.071
No	44 (14.7)	97 (32.3)	
Ocular disorder			
Yes	65 (21.7)	172 (57.3)	0.405
No	12 (4.0)	49 (16.3)	
Presenting visual acuity distance			
6/9 or better	47 (15.7)	99 (33.0)	0.025*
Less than 6/9	32 (10.7)	122 (40.7)	
Presenting visual acuity near			
N10 or better	65 (21.7)	195 (65.0)	0.181
Lesser than N10	14 (4.7)	26 (8.7)	

*p < 0.05 indicates statistical significance.

Conclusion

Significant socio-demographic, economic, and visual health determinants affect eye care service utilisation. These findings support targeted interventions aligned with Malaysia's 12th Plan (RMK-12) and Sustainable Development Goals (SDGs), promoting inclusive, accessible eye care through equitable policies and outreach to reduce health disparities in underserved populations.

Acknowledgement

The Malaysian Ministry of Higher Education, through the Fundamental Research Grant Scheme (FRGS/1/2023/SKK04/UITM/02/2) funded this study.

References

1. McCormick I, Kim MJ, Hydera A, et al. Socioeconomic position and eye health outcomes: identifying inequality in rapid population-based surveys. *BMJ Open* 2023; **13**(3).
2. Andersen R, Newman JF. Societal and individual determinants of medical care utilization in the United States. *Milbank Q* 1973; **51**(1):95-124.
3. Arifin WN. *Sample size calculator* [Internet]. 2025 [cited 2025 May 9]. Available from: <https://wnarifin.github.io/ssc/ss1mean.html>
4. Song Y, Liu J, Yan S, et al. Factors influencing health service utilization among 19,869 of China's migrant population: an empirical study based on the Andersen behavioral model. *Front Public Health* 2025; **13**.
5. Xin Y, Ren X. Determinants of province-based health service utilization according to Andersen's behavioral model: a population-based spatial panel modeling study. *BMC Public Health* 2023; **23**(1).

OESHPP42 / 367

Knowledge of Rational Use of Medicines Among Know Your Medicine (KYM) Ambassadors in Malaysia: A National Cross-Sectional Study

Nurashma Juatan¹, Noorhayati Kassim¹, Rosnani Kassim¹, Nadia Amirudin¹, Siti Nurhanim Mohamed Aiman¹, Nursyazwani Jabir¹, Munira Muhammad², Maisara Abd Rahman², Atika Mahfuza Mahbub², Mohd Shahiri Abd Ghapar²

¹ *Institute for Health Behavioural Research, National Institutes of Health, Ministry of Health Malaysia*

² *Pharmacy Practice & Development Division, Pharmaceutical Services Programme, Ministry of Health Malaysia*

Corresponding author's email: nurashma@moh.gov.my

Summary

The Know Your Medicine (KYM) Programme in Malaysia empowers consumers with knowledge for informed medication use, aligning with the national QUM-C strategy and SDG 3¹. KYM Ambassadors are key in promoting informed medication use to reduce medication-related risks by empowering consumers. This study, the first to assess knowledge about rational use of medicine among KYM ambassadors, aimed to identify their level of understanding, which directly influences the effectiveness of their outreach and the program's success in fostering responsible medication behaviours within the community, ultimately contributing to improved public health outcomes.

Keywords

Rational use of medicines, medicines awareness, Know Your Medicine (KYM), ambassador, health education

Introduction

Ensuring appropriate medication use for optimal health outcomes is the primary goal of programs like Know Your Medicine (KYM), which emphasizes the "5 Rights": the right patient, the right medicine, the right dose, the right route, and the right time². Recognizing the impact of medication adherence and health literacy on public health, KYM employs ambassadors to educate communities on rational medicine use. These ambassadors undergo comprehensive training to promote informed decision-making regarding medication. This study was aimed to identify the level of knowledge about the rational use of medicines among KYM ambassadors, as their understanding directly influences the effectiveness of their outreach and the program's success in fostering responsible medication behaviours within the community, ultimately contributing to improved public health outcomes.

Materials and Methods

This cross-sectional study employed a complex multistage cluster sampling design to ensure a nationally representative assessment of knowledge regarding rational medicine use among Know Your Medicine (KYM) ambassadors. The initial stage

involved main geographical regions across Malaysia, followed by the random selection of six representative states (Selangor, Melaka, Pulau Pinang, Kelantan, Sabah, and Sarawak). In the final stage, specific districts within these selected states were purposefully identified and KYM ambassadors registered by 2023 with completed structured and comprehensive training of trainers (n=1807) were selected proportionally to population size. The tool was adopted and adapted from a previous study³, with refinement based on study objectives and input from subject matter experts (Pharmaceutical Services Programme). Complex study design was applied and data was collected in February until June 2024 through self-administered with minimal guidance. Data was analysed using IBM SPSS Statistics 26 software to determine the frequency and percentage.

Results and Discussion

The findings of this study demonstrate a generally good level of knowledge concerning the rational use of medicines among the Know Your Medicine (KYM) ambassadors in Malaysia. Notably, 99.6% were aware of the mandatory registration of all medicines with the Ministry of Health, underscores a foundational understanding of regulatory oversight crucial for ensuring medication safety. A strong understanding of appropriate medicine acquisition was also evident, with 85.7% recognizing the need for prescriptions and 98.9% identifying authorized premises for purchase, indicating that the ambassadors are well-equipped to advise the public on safe and legitimate sources of medication. Furthermore, 99.5% demonstrated awareness of medicine label details. Regarding medicine consumption, 78.9% understood the timing of post-meal medication, and 95.6% knew not to double doses after a missed one, highlighting the ambassadors' capacity to provide guidance and minimizing potential risks associated with improper usage. Importantly, all ambassadors (100%) recognized the necessity of adhering to prescribed regimens for efficacy, underscores a core principle of rational medicine use that the ambassadors are well-positioned to advocate. Awareness of proper medicine storage was also high, with 92.8% knowing not all medicines require refrigeration and 94.0% understanding the need to avoid hot storage. Overall, a significant majority of KYM ambassadors (91.3%) possessed a high level of knowledge align with other findings⁴. Although baseline knowledge levels prior to the training were not assessed in this study, the consistently high levels of awareness observed among the KYM ambassadors may be associated with the structured content of the KYM program and their educational background. Future research should incorporate these factors to better understand their influence⁵. Nevertheless, this robust knowledge base positions the KYM ambassadors as a key community in promoting informed medication practices and contributing to better health outcomes in Malaysia.

Conclusion

Know Your Medicine ambassadors in Malaysia demonstrated a high level of knowledge regarding rational medicine use, likely attributable to their comprehensive training. These findings underscore the strong knowledge base of

KYM ambassadors, positioning them as effective advocates for promoting rational medicine use within Malaysian communities.

References

1. Ministry of Health Malaysia. *Quality use of medicines-consumers: a national strategy for safer medicine use*. Putrajaya: Pharmaceutical Services Programme; 2020.
2. Ministry of Health. *Know your medicine program* [Internet]. [cited 2022 Dec 5]. Available from: <https://knowyourmedicine.gov.my/en/program-kenali-ubat-anda>
3. Din WM, Abidin NA. Knowledge and practice towards quality use of medicine among undergraduate students. *Malays J Public Health Med* 2020; **20**(3):49-56.
4. Nasaruddin KA, Othman HY, Yaacob NC, Robinson F. Knowledge of quality use of medicine among rural communities involved in KPT Prihatin Komuniti Sejahtera (KRIS) health clinic: a pilot study. *Malays J Pharm* 2024; **10**(1):2-10.
5. Simons MR, Zurynski Y, Cullis J, et al. Does evidence-based medicine training improve doctors' knowledge, practice and patient outcomes? A systematic review of the evidence. *Med Teach* 2019; **41**(5):532-8.

OESHPP43 / 369

Prevalence of Caregivers' Disciplinary Practices Among Malaysian Children Aged 12 to 59 Months: Findings from the National Health and Morbidity Survey 2022

Nurul Haniyah Rosslan¹, Shubash Shander Ganapathy¹, Muhammad Hanafi Bakri¹, Norzawati Yeop¹

¹ *Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia*
Corresponding author's email: haniyah@moh.gov.my

Summary

This study used data from NHMS 2022 to examine disciplinary practices among caregivers of children aged 12-59 months in Malaysia. Nearly one-third of caregivers used only non-violent methods, while many still practiced physical or psychological discipline, often in combination with non-violent strategies. These findings reflect inconsistent caregiving approaches and underscore the need for culturally tailored interventions to encourage safer, more positive caregiving practices.

Keywords

Physical Punishment, Discipline, Caregivers, NHMS, Malaysia.

Introduction

Disciplinary practices during early childhood play a crucial role in shaping children's emotional, behavioural, and cognitive development¹. While some approaches foster healthy development, practices such as physical punishment and psychological aggression have been associated with adverse outcomes, including anxiety, depression, poor self-regulation, and increased risk of substance abuse². In Malaysia, caregivers' disciplinary methods are influenced by cultural norms and parenting beliefs. However, nationally representative data on how these practices are implemented among young children remain limited.

Despite growing efforts to promote positive parenting, evidence suggests that violent discipline remains common³. Understanding the prevalence and patterns of these practices is essential to inform public health strategies aimed at improving child well-being. This study aims to determine the prevalence of methods used in caregivers' disciplinary practices among Malaysian children aged 12 to 59 months, using data from the National Health and Morbidity Survey (NHMS) 2022.

Materials and Methods

Data were obtained from the Malaysian National Health and Morbidity Survey (NHMS) 2022, a cross-sectional study using a two-stage stratified random sampling design. Questions on disciplinary practices were adapted from the Multiple Indicator Cluster Survey (MICS) questionnaire and categorized into three non-violent questions (e.g., time out, reasoning), two psychological aggression questions (e.g., shouting, threatening), and five physical punishment questions (e.g., hitting, slapping)⁴. Data collection was conducted through face-to-face interviews with primary caregivers using mobile devices. Descriptive statistical analyses were conducted using complex

sample analysis to determine the prevalence of each disciplinary method. All analysis was performed using SPSS version 29.0.

Results and Discussion

Findings from the National Health and Morbidity Survey (NHMS) 2022 provide a comprehensive overview of disciplinary practices among Malaysian caregivers of children aged 12 to 59 months⁵. A notable 32.3% of children were disciplined using only non-violent methods, such as explaining inappropriate behaviour (93.1%) and redirecting attention (81.6%). This is an encouraging indication that nearly one-third of caregivers are adopting positive parenting strategies known to promote healthy child development.

However, majority of children over two-thirds were still subjected to violent disciplinary practices, either alone or in combination with non-violent approaches. This suggests that non-violent methods have not yet been fully embraced as the sole disciplinary strategy. The Venn diagram highlights a concerning pattern, 31.9% of children were exposed to a combination of non-violent discipline, psychological aggression, and physical punishment. Additionally, 25.4% experienced psychological aggression alongside non-violent methods, and 7.9% were subjected to both physical punishment and non-violent strategies.

Psychological aggression was widespread, with 58.2% of caregivers reporting “scolding with a harsh tone,” while more severe verbal insults were infrequent (1.0%). Physical punishment affected 40.7% of children, with spanking or hitting the bottom (26.5%) and hitting other body parts (24.9%) being most common. More severe actions such as hitting with an object (6.7%) and shaking (1.8%) were less common but remain a concern.

The co-occurrence of violent and non-violent strategies reflects inconsistencies in caregiving, possibly driven by ambivalent disciplinary beliefs or limited awareness of the harms associated with violent methods. These findings underscore the need for culturally sensitive interventions to promote consistent, non-violent caregiving and shift prevailing norms to better protect children’s well-being.

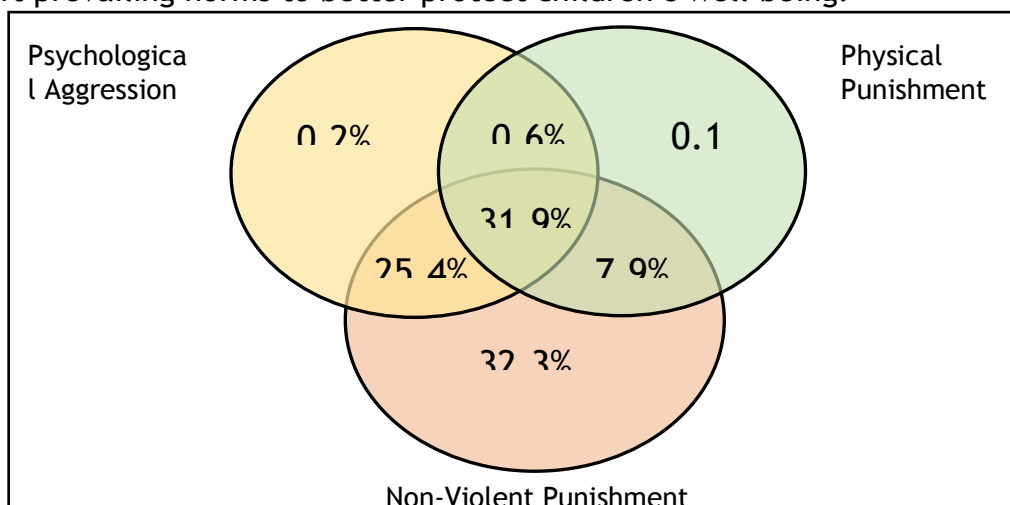


Figure 1: Prevalence of disciplinary method by disciplinary scales.

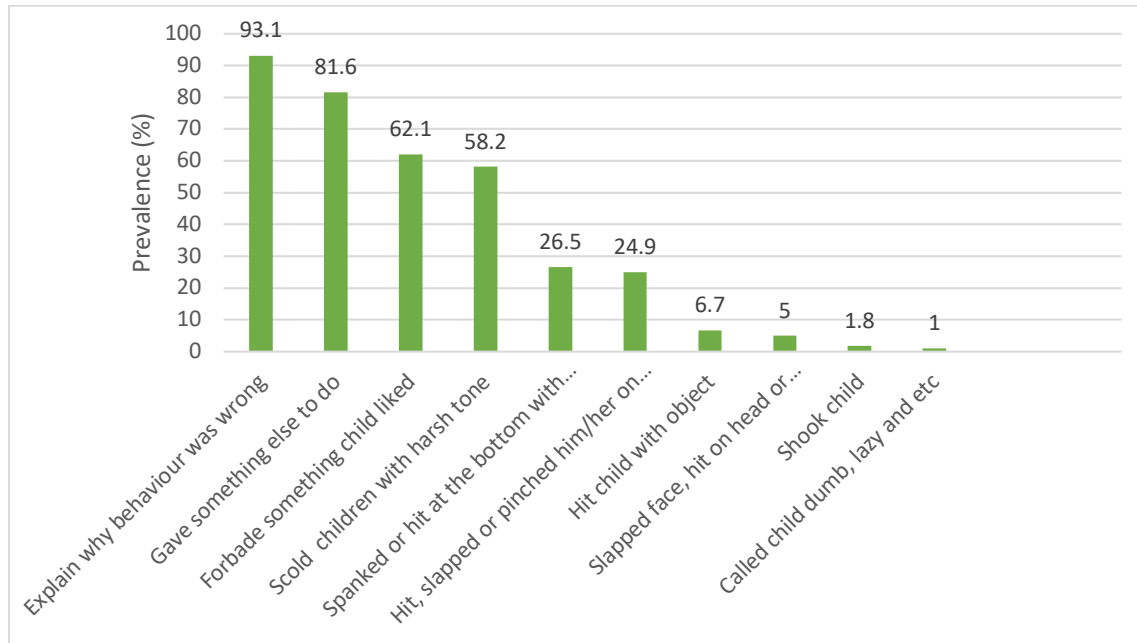


Figure 2: Prevalence of disciplinary practices among Malaysian caregivers.

Conclusion

Physical punishment and psychological aggression remain prevalent among Malaysian caregivers. To reduce these harmful practices, culturally appropriate educational initiatives, support for caregivers in managing stress, and promoting positive parenting practices are necessary. Strengthening child protection policies and legal frameworks is essential to ensure a safe, nurturing environment for their development.

References

1. World Health Organization. *Corporal punishment and health*. Geneva: World Health Organization; 2021.
2. Ganapathy SS, Sooryanarayana R, Mohammad NM, et al. Practice of disciplinary methods and factors associated with belief for physical punishment among Malaysian parents: findings from NHMS 2016. *Glob Pediatr Health* 2022; **9**:2333794X221113820.
3. United Nations Children's Fund (UNICEF). *A familiar face: violence in the lives of children and adolescents*. New York: UNICEF; 2017.
4. UNICEF. *Tools - UNICEF MICS* [Internet]. Available from: <https://mics.unicef.org/tools?round=mics6>
5. Ministry of Health Malaysia. *National Health and Morbidity Survey 2022: Volume II - Child Health*. Kuala Lumpur: Institute for Public Health; 2022.

OESHPP44 / 372

Harnessing Artificial Intelligence and Ultraportable X-ray for Chest Screening in rural Bintulu: Detection Rates and Locality Variation

Melvin Chung Hsien Liang¹, Nurul Amirah Masani¹, Lai Kah Sheng¹

¹Bintulu Health Clinic, Ministry of Health Malaysia

Corresponding author's email: nurulamirah1401@gmail.com

Summary

This study evaluated the use of ultraportable X-ray integrated with artificial intelligence (AI) during a mass health screening programme in rural Bintulu. A total of 1,216 residents were screened across nine localities, with 247 abnormal findings, yielding a 20.3% detection rate. Detection rates varied significantly across localities, ranging from 15.1% to 57.1% ($p < 0.001$). Common abnormalities included pulmonary infiltrates, nodular opacities and fibrotic lesions, which prompted clinical referrals and further diagnostic work-up. The use of ultraportable imaging, AI interpretation and cloud-based systems improved screening efficiency, data sharing and access to care. These findings support the potential of digital tools to strengthen healthcare delivery in underserved rural communities.

Keywords

AI-assisted diagnostics, Digital Health, Mass screening, Ultraportable Chest X-ray

Introduction

Rural healthcare faces persistent barriers, including limited access to medical facilities, inadequate infrastructure, and a shortage of skilled healthcare professionals. These barriers often lead to delays in diagnosis and treatment, leaving many communities underserved. Conventional models of healthcare delivery are not always equipped to meet the unique needs of these populations¹. Recently, digital innovations have begun to reshape the way healthcare is delivered in remote areas. Technologies such as ultraportable Chest X-ray devices, integrated with real-time artificial intelligence (AI) and cloud-based data systems, have improved diagnostic capabilities and streamline service delivery. These tools support faster decision-making, better coordination between teams, and more efficient use of limited resources². This study was conducted to determine the abnormality detection rate of AI-assisted Chest X-ray screenings across different localities in Bintulu and to identify high-yield areas for targeted follow-up and planning.

Materials and Methods

This cross-sectional study was conducted across nine localities in Bintulu Division, Sarawak, where mass screening events were held between April and November 2024. A universal sampling approach was applied, targeting all adults aged 18 years and above, irrespective of symptom status. Chest X-rays were obtained using an ultraportable X-ray device integrated with Lunit Insight CXR, a validated AI-based diagnostic tool³. Data from each event were uploaded to a cloud-based systems, facilitating real-time sharing among healthcare providers. All abnormal findings flagged by the AI were reviewed on-site by a medical officer and referred for further

evaluation and follow-up. Descriptive statistics were used to describe the abnormality detection rate and its variability across different localities in Bintulu. Chi-square test was conducted to analyse the statistical significance of differences in abnormality rates across localities.

Results and Discussion

Out of the 1,216 Chest X-rays (CXR) taken during the screening, 247 were found to have abnormalities, corresponding to an abnormalities detection rate of 20.3%. Detection rates varied significantly across localities, with the highest observed in Rh Mujah (57.14%) and the lowest in Bintulu Prison (15.10%). The most commonly identified abnormalities were pulmonary infiltrates, nodular opacities and fibrotic lesions. Individuals with abnormal findings were referred to nearby clinics or hospital for further evaluation and follow-up care. These findings highlight the value of AI-assisted CXR screening in community settings with limited access to diagnostic radiology services (3). By integrating digital systems, routine tasks were streamlined, allowing healthcare staff to focus more on complex patient care (4). Real-time data sharing between facilities also reduced the need for patients to travel long distances, one of the biggest hurdles to timely care in rural areas (5). The experience in Bintulu provides a scalable model for other regions facing similar challenges, underscoring the critical role of technology in transforming rural healthcare landscapes.

Table 1: Chest X-ray Screening and Abnormality Detection Rates (n = 1216)

Localities	Number of CXR done	Abnormal Cases	Abnormality Detection Rate (%)	Chi-square test
Rh Lampoh	46	12	26.09	12 (df)=90.96 (8), $p<.001$
PPR Bandaria Park	183	31	16.94	
Kampung Data Kakus	62	20	32.26	
Bintulu Prison	730	110	15.10	
Rh Irai, Sebauh	19	8	42.11	
Rh Kundai, Bintulu	40	8	20.00	
Rh Mujah	77	44	57.14	
Rh Jimun	30	8	26.67	
Uma Bading	29	6	20.70	
Total	1216	247	20.30	

Table 2: Types of Chest-Xray Abnormalities Detected (n=311)

Types of abnormalities	n (%)
Pulmonary infiltrates	85 (27.33)
Nodular opacities	60 (19.29)
Fibrotic lesions	55 (17.68)
Consolidation	18 (5.79)
Cardiomegaly	28 (9.00)
Atelectasis	18 (5.79)
Calcification	47 (15.11)

Note: Total exceeds number of abnormal cases due to overlapping findings in individual CXRs.

Conclusion

The AI-assisted chest X-ray screening programme in Bintulu demonstrated a 20.3% abnormality detection rate, with significant variation across localities. These findings highlight the effectiveness of digital screening tools in identifying potential cases and supporting targeted follow-up, particularly in rural and underserved areas.

References

1. Faugno E, Galbraith AA, Walsh K, Maglione PJ, Farmer JR, Ong MS. Experiences with diagnostic delay among underserved racial and ethnic patients: a systematic review of the qualitative literature. *BMJ Qual Saf* 2025; **34**(3):190-200. <https://doi.org/10.1136/bmjqs-2024-017506>
2. Maita KC, Maniaci MJ, Haider CR, et al. The impact of digital health solutions on bridging the health care gap in rural areas: a scoping review. *Perm J* 2024; **28**(3):130-43. <https://doi.org/10.7812/TPP/23.134>
3. Hwang EJ, Park S, Jin KN, et al. Development and validation of a deep learning-based automated detection algorithm for major thoracic diseases on chest radiographs. *JAMA Netw Open* 2019; **2**(3):e191095. <https://doi.org/10.1001/jamanetworkopen.2019.1095>
4. Zhang Y, Li J, Wang X, et al. The role of AI in hospitals and clinics: transforming healthcare in the digital era. *Front Digit Health* 2024; **6**:11047988.
5. Zhang L, Wang Y, Chen X, et al. The impact of digital governance on the health of rural residents. *Front Public Health* 2024; **12**:1419629.

OESHPP45 / 376

Urban-Rural Disparities in Inpatient Healthcare Utilisation in Malaysia: Insights from a National Survey

Noor Hasidah Ab Rahman ¹, Tay Yea Lu ¹, Nurul Salwana Abu Bakar ¹, Tan Yui Ping ¹, Mohd Shahri Bahari ¹

¹ Institute for Health Systems Research, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: Noorhasidah.ar@moh.gov.my

Summary

This study examined urban-rural disparities in inpatient healthcare utilisation between urban and rural populations in Malaysia using data from the National Health and Morbidity Survey (NHMS) 2023. Women, individuals with tertiary education, and those in the middle-wealth group were more likely to utilise inpatient services in urban areas. Meanwhile, rural areas recorded a higher prevalence of men and older population utilising inpatient services. Among those who used inpatient care, chi-square analyses revealed significant associations with sex, education, and wealth groups. These findings reflected that sociodemographic characteristics still pose a significant factor towards inpatient utilisation among the adults in Malaysia despite other accessibility issues. Targeted interventions through national policy and healthcare delivery may aid in improving equitable access to inpatient care across geographic and socioeconomic lines.

Keywords

Inpatient utilisation, urban-rural disparities, healthcare access, NHMS 2023, adults

Introduction

Inpatient services play a vital role in the healthcare systems. Inpatient utilisation reflects both healthcare needs and accessibility. Notably, findings from the NHMS series suggest a fluctuating yet overall downward pattern in national inpatient utilisation prevalence—from 6.9% in 2011 to 5.2% in 2019, with a slight increase to 5.8% in 2023¹. Studies also indicated urban and rural areas in Malaysia differ significantly in terms of healthcare infrastructure and challenges. This study aims to compare the prevalence of inpatient healthcare utilisation between urban and rural adult populations and identify the contributing factors.

Materials and Methods

A secondary data analysis was conducted involving adults aged 18 years and above from the National Health and Morbidity Survey (NHMS) 2023. The primary outcome was self-reported inpatient utilisation, defined as having admission to any healthcare facility within the previous 12 months. Individuals that were admitted and discharged on the same day, those admitted to daycare centres, outpatient

clinic visits, non-health-related treatments, and individuals accompanying patients were excluded. Responses from proxies also were excluded from this analysis. Descriptive statistics were conducted using STATA v18, with sampling weights applied accounting for the complex survey design. Pearson chi-square tests were used to study the association between urban and rural inpatient healthcare utilisations. Variable selection and results interpretation were guided by the Andersen Behavioural Model of Health Services Use². A $p < 0.05$ was considered statistically significant.

Results and Discussion

The analysis included 4,653 respondents, representing about 17 million adults in Malaysia, with 79.1% residing in urban areas and 20.9% in rural areas. The overall prevalence of inpatient utilisation among adults in Malaysia was 6.3% (95% CI: 5.3-7.5). Although overall inpatient use was similar in urban and rural settings—with overlapping confidence intervals suggesting no marked difference in crude prevalence—the patterns of who uses hospital services diverge by locality.

In urban areas, inpatient utilisation is disproportionately concentrated among females (8.0%, 95% CI 6.19-10.20), those with tertiary education (9.0%, 95% CI 5.89-13.59), and middle-wealth households (7.9%, 95% CI 5.90-10.47). These findings likely reflect greater health literacy, financial capacity, and availability of elective or specialist services in urban areas, where women may also pursue preventive or non-emergency admissions more readily.

By contrast, rural inpatient use skews toward male (6.9%, 95% CI 4.67-10.12) and those aged 60+ years (8.9%, 95% CI 5.91-13.12), suggesting that rural hospitalisations are driven more by acute or chronic conditions in vulnerable subgroups with more limited outpatient support. Chi square tests confirmed that sex ($\chi^2_1 = 5.08$, $p = 0.025$), education ($\chi^2_2 = 4.71$, $p = 0.011$) and wealth ($\chi^2_2 = 7.51$, $p < 0.001$) are each significantly associated with locality, whereas age, ethnicity, marital status, occupation and self-rated health did not differ by urban-rural status. Taken together, these disparities underscore the need for dual strategies: in urban areas, ensuring that those better-educated, middle-class groups, and women receive appropriate care without overutilisation; and in rural regions, bolstering community-based services and targeted outreach for older population and lower-income groups to prevent avoidable hospital admission.

Table 1: Prevalence of inpatient healthcare utilisation among adults in Malaysia, stratified by locality

Characteristics	OVERALL			LOCALITY		x ²	p
	Count	Estimated population	% Weighted (95% CI)	Urban	Rural		
				% Weighted (95% CI)	% Weighted (95% CI)		
OVERALL	337	1,078,738	6.3 (5.28-7.54)	6.2 (5.01-7.68)	6.7 (5.02-8.95)	-	-
Sex						5.084	0.025*
Male	124	400,205	4.9 (3.75-6.29)	4.3 (3.12-5.99)	6.9 (4.67-10.12)		
Female	213	678,533	7.7 (6.19-9.46)	8.0 (6.19-10.20)	6.6 (4.72-9.02)		
Age (years)						1.382	0.252
18-39	149	606,398	6.7 (5.19-8.59)	6.7 (4.96-8.86)	6.9 (4.14-11.18)		
40-59	105	293,841	5.2 (3.69-7.22)	5.2 (3.47-7.67)	5.2 (3.04-8.72)		
60+	83	178,499	7.6 (5.81-9.91)	7.1 (4.99-10.01)	8.9 (5.91-13.12)		
Ethnicity						1.183	0.277
Malay	231	568,983	6.5 (5.42-7.82)	6.3 (4.99-7.89)	7.1 (5.71-8.88)		
Non-Malay	106	509,755	6.1 (4.49-8.26)	6.1 (4.32-8.54)	6.1 (3.08-11.88)		
Marital Status						0.731	0.455
Single	38	180,828	3.8 (2.20-6.51)	3.9 (2.09-7.11)	3.4 (1.17-9.27)		
Married	259	818,364	7.5 (6.15-9.09)	7.4 (5.84-9.38)	7.7 (5.63-10.57)		
Widow/ widower	40	79,546	6.2 (4.28-8.84)	5.8 (3.75-8.98)	7.3 (3.79-13.68)		
Education Level						4.713	0.011*
No formal / primary education	59	172,154	5.8 (3.96-8.44)	6.1 (3.73-9.91)	5.3 (2.89-9.44)		
Secondary education	219	671,716	5.9 (4.87-7.18)	5.6 (4.37-7.05)	7.4 (5.55-9.82)		
Tertiary education	58	233,417	8.9 (5.95-13.16)	9.0 (5.89-13.59)	7.7 (2.29-23.10)		
Occupation						1.235	0.267

Working	173	634,882	6.0 (4.7-7.69)	6.0 (4.43-7.69)	6.3 (4.38-9.09)		
Not working	161	440,138	6.9 (5.66-8.44)	6.8 (5.35-8.67)	7.2 (5.10-10.12)		
Wealth Group[#]						7.508	0.011*
Bottom	157	422,685	5.6 (4.59-6.91)	5.2 (4.00-6.68)	6.7 (4.83-9.25)		
Middle	129	496,990	7.6 (5.84-9.75)	7.9 (5.90-10.47)	6.1 (3.67-9.92)		
Top	51	159,063	5.3 (3.10-8.84)	4.9 (2.74-8.73)	12.2 (5.38-25.48)		
Self-Rated Health						0.285	0.267
Excellent & good	264	862,822	5.9 (4.86-7.25)	5.8 (4.57-7.39)	6.4 (4.59-8.80)		
Fair, poor & very poor	73	215,916	8.5 (6.10-11.62)	8.3 (5.71-12.01)	9.0 (4.82-16.31)		

Wealth was calculated from total annual household expenditure, equivalised for household size and composition, and divided into quintiles (Q1 = poorest to Q5 = richest). Quintiles were then grouped into low (Q1-Q2), moderate (Q3-Q4), and high (Q5) categories.

Wealth was calculated from total annual household expenditure, equivalised for household size and composition, and divided into quintiles (Q1 = poorest to Q5 = richest). Quintiles were then grouped into low (Q1-Q2), moderate (Q3-Q4), and high (Q5) categories.

Conclusion

This study highlights differing inpatient utilisation patterns between urban and rural populations, shaped by sex, education, and wealth. Policies should strengthen rural health services for older, lower-income males while monitoring urban use among educated, middle-income females. Geospatial and behavioural research is essential to inform region-specific and equitable healthcare planning.

Acknowledgments

The authors extend their deepest appreciation to the Director General of Health, Malaysia, for permission to publish this extended abstract. Also, appreciation and sincere thanks to the study participants for their involvement in this research.

References

1. Institute for Public Health (IKU). *National Health and Morbidity Survey (NHMS) 2023: Non-communicable diseases and healthcare demand: Technical report*. Kuala Lumpur: Ministry of Health Malaysia; 2024.

2. Andersen RM. Revisiting the behavioural model and access to medical care: does it matter? *J Health Soc Behav* 1995; **36**(1):1-10. PMID: 7738325.
3. Health Informatics Centre, Planning Division. *MOH/S/RAN/202.21(AR)*. Kuala Lumpur: Ministry of Health Malaysia; Nov 2021.
4. World Health Organization, United Nations Children's Fund (UNICEF). *Primary health care measurement framework and indicators: monitoring health systems through a primary health care lens*. Geneva: WHO; 2022. Available from: <https://iris.who.int/handle/10665/352205>. License: CC BY-NC-SA 3.0 IGO.
5. Lim KK, Sivasampu S, Mahmud F. Equity in access to health care in a rural population in Malaysia: a cross-sectional study. *Aust J Rural Health* 2017; **25**(2):102-9. doi:10.1111/ajr.12298. PMID: 27377781.

OESHPP46 / 378

Prevalence and Predictors of Self-Harm among Adolescents in Malaysia

Rimah Melati Ab Ghani¹, Nor Asiah Muhamad¹, Suria Husin², Nur Hasnah Maamor¹, Izzah Athirah Rosli¹, Nik Athirah Farhana Nik Azhan¹, Tengku Puteri Nadiah Tengku Baharuddin Shah¹, Nor Hidayah Jamalluddin¹, Fatin Norhasny Leman¹, Norli Abdul Jabbar³, Ling Shiao Ling⁴, Normi Mustapha⁵, Norliza Chemi⁴, Norni Abdullah⁶, Nurashikin Ibrahim³

¹Sector for Evidence Based Healthcare, National Institutes of Health (NIH), Ministry of Health, Malaysia

²Hospital Raja Perempuan Zainab II, Ministry of Health, Malaysia

³National Centres of Excellence for Mental Health, Ministry of Health, Malaysia

⁴Hospital Kajang, Ministry of Health, Malaysia

⁵Faculty Science and Technology, Open University, Malaysia

⁶Hospital Tengku Ampuan Rahimah, Ministry of Health Malaysia, Malaysia

Corresponding author's email: rimahmelati@gmail.com

Summary

A cross-sectional study was conducted among adolescents referred to the Psychiatry and Mental Health Service at 14 state hospitals in Malaysia from September 2023 to April 2024. A total of 1,033 adolescents participated in this study. We identified the association between self-harm behaviours with sociodemographic and other independent variables. The results reported a prevalence of 71.3% for self-harm behaviour among adolescents. Factors such as being female, experiencing stressful life events, and being bullied were identified as significant predictors of deliberate self-harm among adolescents in Malaysia.

Keywords

Self-harm, young patients, adolescents, Self-hurt Inventory (SHI), Adverse Childhood Experiences International Questionnaire (ACE-IQ)

Introduction

The rising incidence of self-harm behaviours among adolescents is a serious public health concern in many countries, leading to physical harm and long-term psychological distress on both individuals and their families. Self-harm, defined as intentionally hurting oneself, is strongly linked to an increased risk of suicide^{1,2}. According to the World Health Organization (WHO), suicide was the fourth leading cause of death among adolescents in 2021³. In Malaysia, an alarming statistics from the National Population Survey reported the rate of attempted suicide among adolescents rose to 9.5% in 2022, up from 6.9% in 2012⁴. Various risk factors, including genetic, biological, psychological, social, and cultural influences have been linked to self-harming behaviours.⁵ However, there is little comprehensive data on the predictors of self-harm among adolescents in Malaysia. Therefore, a study aimed to determine the prevalence and risk factors associated with self-harm

behaviours among adolescents was conducted at all the state hospitals which have child and adolescent specialists with Psychiatry and Mental Health Services in Malaysia.

Materials and Methods

A multi-centred cross-sectional study was conducted from September 2023 to April 2024 among adolescents referred to psychiatry clinics at 14 state hospitals in Malaysia. In this study, we define self-harm as any act of deliberate self-poisoning or self-injury, irrespective of the underlying intent. Participants were recruited based on the following eligibility criteria:

- a) New referrals or cases to the Psychiatry and Mental Health Services at all state hospitals in Malaysia;
- b) Malaysian citizenship;
- c) Adolescents aged 10 to 24 years old; and
- d) Adolescents or their parents/guardians who are able to communicate and understand.

We excluded participants who presented with acute psychosis, acute medical or surgical conditions, having severe neurodevelopmental conditions such as severe autism disorder and severe intellectual disability.

Data were collected using a “data collection and assessment form” administered by a trained medical officer or psychiatrist. This form consisted of six sections:

- 1) Patient’s Profiles;
- 2) Risk factors questionnaires;
- 3) Protective factors questionnaires;
- 4) Self-harm act/ Self-hurt Inventory (SHI) questionnaires;
- 5) Adverse Childhood Experiences International Questionnaire (ACE-IQ); and
- 6) Data collector information.

Patients were recruited through walk-ins, referrals, and new cases from schools, colleges, universities or primary healthcare facilities. Those who met the eligibility criteria gave consent before recruitment. The investigator interviewed the adolescent or their parent/guardian and administered the form. If adolescents committed at least one type of self-harm, they were classified as having self-harmed. Further interviews were conducted to gather additional details of the self-harm. The investigator collected the completed data collection and assessment forms and informed consents. The data set did not include personal identifying information, such as the patient’s name and identification number. Instead, patient ID (e.g. HKJ001) was used in the dataset.

Results and Discussion

A total of 1,033 adolescents participated, of whom 71.3% reported engaging in self-harm within the past year. About 13.7% and 86.3% of adolescent boys and girls, respectively, had deliberate self-harm. The mean age of the study population was 18.37 (SD 3.88) years (Table 1).

Data analysis was performed using SPSS version 28. First, the data were cleaned and verified. Next, a descriptive analysis was conducted to determine prevalence of self-harm and profiles of self-harm. Multiple variable analysis was performed to determine the association between self-harm and risk factors. All calculated p-values are two-sided; p-values less than 0.05 were considered statistically significant.

The likelihood of deliberate self-harm was significant where female (OR=2.912 [95% CI: 1.896-4.474]; $p<0.001$), suffering stressful life events (OR=1.746 [95% CI: 1.123-2.713]; $p=0.013$), being bullied (OR=1.726 [95% CI: 1.166-2.556]; $p=0.006$), and witnessing community violence (OR=1.547 [95% CI: 1.018-2.352]; $p=0.041$) had significantly higher odds of deliberate self-harm. Those adolescents who can cope with stress (OR=0.378 [95% CI: 0.251-0.570]; $p<0.001$), and having a responsibility to children (OR=0.606 [95% CI: 0.405-0.906]; $p<0.015$) had significantly lower odds of deliberate self-harm (Table 2 & Table 3).

In summary, risk factors such as gender, having stressful life events, being bullied and witnessing community violence were identified as predictors of deliberate self-harm among adolescents in Malaysia. A study conducted by the Malaysian Adolescent Health Risk Behaviour (MyAHRB) in 2016 reported that females had a 7.6% higher likelihood of self-harming. Additionally, Ibrahim et al (2014) reported that individuals experiencing stressful life events were more likely to engage in self-harm. The National Health Morbidity Survey in 2017 reported that adolescents who were bullied faced a fourfold increased risk of suicide attempts. These findings suggest that early identification of the predictors and timely intervention might prevent deliberate self-harm among adolescents.

Conclusion

Early identification and intervention could help prevent self-harm behaviours. Strengthening the evidence will help inform the development of adequate measures to prevent self-harm such as 1) school-based mental health programs; 2) anti-bullying policies; 3) parental counselling programs; and 4) early mental health screening/ routine checkup.

References

- 1 Bilsen J. Suicide and youth: risk factors. *Front Psychiatry* 2018; **9**:540. Available from: <https://www.frontiersin.org/journals/psychiatry/articles/10.3389/fpsy.2018.00540/full>. doi:10.3389/fpsy.2018.00540
- 2 Terhaag S, Rioseco P. Self-injury among adolescents (Growing Up in Australia Snapshot Series) [Internet]. In: Rowland B, Evans-Whipp T, editors. Vol. 4. Canberra: Commonwealth of Australia; 2021 [cited 2025 Apr 21]. Available from: <https://aifs.gov.au/sites/default/files/2024-10/lzac-snapshot-4-self-injury.pdf>
- 3 World Health Organization. *Suicide: fact sheet* [Internet]. Geneva: World Health Organization; 2021 [cited 2025 Apr 21]. Available from: <https://www.who.int/news-room/fact-sheets/detail/suicide>
- 4 Institute for Public Health (IPH). *National Health and Morbidity Survey (NHMS) 2022: Adolescent Health Survey, Malaysia. Technical report* [Internet]. Kuala Lumpur: Ministry of Health Malaysia; 2022 [cited 2025 Apr 21]. Available from: https://iku.gov.my/images/nhms-2022/Report_Malaysia_nhms_ahs_2022.pdf
- 5 Hawton K, Bergen H, Kapur N, et al. Repetition of self-harm and suicide following self-harm in children and adolescents: findings from the Multicentre Study of Self-harm in England. *J Child Psychol Psychiatry* 2012; **53**(12):1212-9. doi:10.1111/j.1469-7610.2012.02559.x

OESHPP47 / 380

Factors Associated with Beliefs in Physical Punishment Towards Children Aged 12-59 Months Among Malaysian Caregivers: Findings from the National Health and Morbidity Survey 2022

Muhammad Hanafi Bakri¹, Dr Shubash Shander Ganapathy¹, Nurul Haniyah Rosslan¹, Norzawati Yeop¹

¹ *Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia*

Corresponding author's email: Hanafibakri@moh.gov.my

Summary

The belief in the necessity of physical punishment is a key predictor of its use in child discipline. This study examined factors associated with such beliefs among Malaysian caregivers of children aged 12 - 59 months, using data from the National Health and Morbidity Survey (NHMS) 2022, which involved 13,653 respondents. Respondents were asked if they believed a child must be physically punished to be properly raised. Findings revealed that 45.0% of caregivers supported this belief. To reduce reliance on physical discipline, parenting programmes should promote positive disciplinary strategies and equip caregivers with effective anger management skills to handle challenging situations without resorting to violence.

Keywords

Beliefs in Physical Punishment, Child Discipline, National Health and Morbidity Survey, Malaysian caregivers, Violence

Introduction

Caregivers beliefs about discipline significantly influence early childhood development. Despite increasing evidence of the harmful effects of physical punishment, it remains widely practiced and accepted in many countries, including Malaysia. Research links physical punishment to aggression, mental health issues, and weakened caregiver-child relationships¹. Both the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) have advocated for the elimination of corporal punishment and the promotion of nonviolent discipline through frameworks^{2,3}. In Malaysia, traditional cultural norms continue to shape caregiving practices. However, national-level data on caregivers' beliefs regarding physical punishment are limited. This study aimed to determine the prevalence and factors associated with beliefs in physical punishment among caregivers of children aged 12-59 months in Malaysia.

Materials and Methods

This study utilized data from the NHMS 2022, a nationwide cross-sectional study employing a two-stage stratified sampling technique. A total of 13,653 Malaysian adults were included. Face-to-face interviews were conducted in households with at least one child aged 12-59 months, with informed consent obtained from caregivers. Caregivers completed a questionnaire on disciplinary practices adapted from the UNICEF Multiple Indicator Cluster Surveys (MICS), translated into the Malay language. Descriptive statistics using frequency and percentage (%) via complex sample design analysis was used to estimate the prevalence of belief in physical punishment, while

multivariable logistic regression was employed to determine its associated factors. These analyses were carried out using SPSS version 28.0.

Results and Discussion

The prevalence of belief in physical punishment among caregivers was 45.0% (95% CI: 38.1-42.9). Several factors were significantly associated with this belief. Caregivers of children aged 36-47 months (aOR = 1.37, 95% CI: 1.15-1.63) and 48-59 months (aOR = 1.35, 95% CI: 1.15-1.59) were more likely to justify physical punishment compared to those with younger children. Boys were more often perceived as needing physical punishment than girls (aOR = 1.13, 95% CI: 1.01-1.28). Caregivers with no formal or primary education (aOR = 1.50, 95% CI: 1.03-2.16) and those with secondary education (aOR = 1.30, 95% CI: 1.11-1.52) were more likely to support physical punishment than those with tertiary education. Ethnic differences were also observed, with caregivers from the “Others” group more likely to endorse physical punishment than Malays (aOR = 1.39, 95% CI: 1.02-1.89). Additionally, other family members were less likely than mothers to support physical punishment (aOR = 0.82, 95% CI: 0.68-0.99), suggesting that mothers, often being the primary caregivers, may experience greater stress or pressure in managing child behaviour, which could influence their disciplinary beliefs.

These findings highlight key sociodemographic risk factors influencing disciplinary beliefs in Malaysia. While educational attainment and caregiver identity showed protective effects, beliefs were stronger among caregivers of older children and boys, reflecting possible cultural perceptions of age and gender roles. The cross-sectional nature of the study limits causal inferences. Additionally, as the data were self-reported, responses may have been influenced by social desirability bias, as documented in previous studies on disciplinary practices.

Table 1: Factors Associated with Belief in Physical Punishment Among Malaysian Caregivers of Children Aged 12-59 Months

Socio-demographic characteristic	Adjusted OR	95% Confidence Interval		p-value
		lower	upper	
Age				
12 - 23 months	1.00	-	-	-
24 - 35 months	1.21	1.00	1.47	0.050
36 - 47 months	1.37	1.15	1.63	<0.001
48 - 59 months	1.35	1.15	1.59	<0.001
Gender				
Girl	1.00	-	-	-
Boy	1.13	1.01	1.28	0.041
Education Level of Caregiver				
No Formal / Primary	1.50	1.03	2.16	0.032
Secondary	1.30	1.11	1.52	0.001
Tertiary	1.00	-	-	-
Marital Status of Caregiver				
Single / Divorced / Separated	1.00	-	-	-
Married / Co-habiting	0.89	0.67	1.19	0.438
Citizenship				

Permanent Resident / Non-citizen	1.00	-	-	-
Malaysian	1.00	0.60	1.69	0.989
Ethnicity				
Malay	1.00	-	-	-
Chinese	1.27	0.92	1.74	0.142
Indian	1.13	0.79	1.62	0.492
Others	1.39	1.02	1.89	0.035
Caregiver				
Mother	1.00	-	-	-
Other family members	0.82	0.68	0.99	0.043
Maid / Teacher / Others	0.91	0.72	1.16	0.470

Conclusion

Nearly half of caregivers support physical punishment, especially those with older children, boys, lower education, and from “Other” ethnic groups. Targeted education, community programs, and integrating parenting support into maternal and child health services such as during antenatal and postnatal care are essential to promote nonviolent, supportive caregiving practices nationwide.

References

1. Heilmann A, Mehay A, Watt RG, et al. Physical punishment and child outcomes: a narrative review. *Lancet* 2021; **398**(10297):355-64.
2. World Health Organization. *INSPIRE: seven strategies for ending violence against children*. Geneva: World Health Organization; 2023.
3. UNICEF Office of Research-Innocenti. *A familiar face: violence in the lives of children and adolescents*. Florence: UNICEF; 2023.

OESHPP48 / 387

Too Tight to Work Right: Back Pain in Data Entry Among Laboratory Workers

Imanul Hassan Abdul Shukor¹, Nurul Farehah Shahrir¹, Siew Wei Fern²

¹ Environmental Health Research Centre, Institute for Medical Research, National Institutes of Health, Ministry of Health Malaysia

² School of Public Health, Faculty of Medicine, IMU University

Corresponding author's email: imanul@moh.gov.my

Summary

Inadequate leg spaces in laboratory settings lead to laboratory workers performing tasks in awkward posture, thereby increasing the risk of low back pain (LBP). This study aimed to evaluate the ergonomic risks and its relationship with LBP among laboratory workers executing data entry tasks across various laboratory settings within a medical research institute in Malaysia. The findings suggest that workers with high-risk Rapid Office Strain Assessment (ROSA) scores had significantly higher odds of having LBP (adjusted odds ratio 3.12, 95% CI: 1.01-9.67) compared to medium-risk scores. This signals the importance of prevention of awkward posture in daily laboratory work tasks to prevent incidence of LBP.

Keywords

Occupational health, visual display unit, musculoskeletal disorders, ergonomic risk assessment, medical laboratories.

Introduction

Musculoskeletal disorders (MSD) are emerging as one of the highest reported occupational diseases in the world. Low back pain (LBP) is one of the subsets of MSD that impacts the productivity and quality of life of the affected person¹. Performing data entry tasks in congested laboratory settings expose these workers to awkward postures in prolonged hours that strain the musculoskeletal system². Due to the confined nature of a laboratory area, leg room for data entry is often compromised for other usage such as piling up excess laboratory consumables or reagents. Despite the critical role of laboratory staff in the healthcare sector and in research institutes, ergonomic conditions in these settings are not well understood. This study aims to explore the association of LBP with ergonomic scores among laboratory workers engaged in data entry involving any visual display unit (VDU) such as desktop computers in laboratory working spaces.

Materials and Methods

This cross-sectional study encompasses medical laboratory workers in a medical research institute in Malaysia. Participation in the study was determined via census sampling, with only workers involved in data entry tasks in the laboratory settings were included, with a minimum of 1 year working experience in performing the data entry tasks. Socio-demographic profile and years of working in the specific data entry role were collected via a survey form. Participants were consented prior to

participating in the study, and their working posture during data entry process were evaluated for quantifying the magnitude of ergonomic risks using the Rapid Office Strain Assessment (ROSA) tool³. Scores of 1-2 indicates low-risk, 3-4 were medium-risk, 5-7 were high-risk, and 8-10 were very high-risk. Presence of LBP occurrence within the past 12 months were extracted via Extended Nordic Musculoskeletal Questionnaire (NMQ-E)⁴. The predictors of LBP were analysed using univariate regression analysis, and possible predictors and confounders were included in the final multivariate regression model. Data were analysed by using the Statistical Package for Social Science (SPSS) version 29.0.

Results and Discussion

There were eighty-eight (88) laboratory workers involved, with a mean age of 34.73 (± 6.58) years. Average years of working in data entry tasks were 8.22 (± 6.65) years. Most of the workers were females (80.7%) and most of them were either married, widowed, or divorced (65.9%). The prevalence of low back pain for the past 12 months among them was 27.3%.

According to the ergonomic risk assessment, 70 of them had medium-risk ROSA scores, with 18 workers having high-risk scores. There were no workers with neither low-risk nor very high-risk scores. Table 1 shows the detailed scoring results of the laboratory workers involved.

Table 1: Rapid Office Strain Assessment (ROSA) results.

ROSA score	Risk level	Number of workers
1	Low	0
2	Low	0
3	Medium	25
4	Medium	45
5	High	7
6	High	11
7	High	0
8	Very high	0
9	Very high	0
10	Very high	0

The adequacy of leg room at the working space was the essential element of the ROSA scoring system. Figure 1 shows the example of different leg room conditions during the risk assessment.

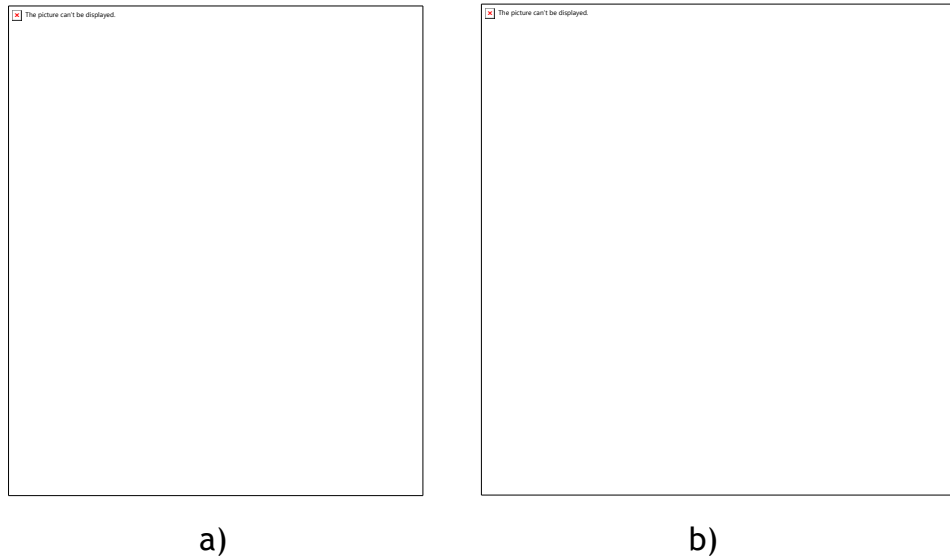


Figure 1. a) A laboratory worker with sufficient leg space, b) with insufficient leg space.

In regression analysis, workers with high-risk ROSA scores had significantly 3 times higher odds of having LBP, compared to those in the medium-risk scores. Although females and non-single workers showed higher odds, these associations were not statistically significant ($p > 0.05$). Age, albeit insignificant, was included in this model to adjust for the age factor. Table 2 describes the findings.

Table 2: Univariate and multivariate logistic regression.

Variable	Crude OR	95% CI	p-value	Adjusted OR	95% CI	p-value
Age	1.00	0.93-1.08	0.955	0.99	0.91-1.07	0.809
Gender						
Male	1.00	-	-	1.00	-	-
Female	3.37	0.71-16.00		2.50	0.50-12.58	0.268
Marital status						
Single	1.00	-	-	1.00	-	-
Married/Separated/Widowed	3.42	1.05-11.18	0.042	2.92	0.82-10.44	0.099
ROSA Score						
Medium Risk	1.00	-	-	1.00	-	-
High Risk	3.67	1.24-10.87	0.019	3.12	1.01-9.67	0.048

Note: Significant p-values of less than 0.05 were highlighted in bold.

These findings underscore the importance of adequate ergonomic workplace setup such as leg spaces in work tasks involving visual display unit (VDU) ⁵. There is a room for improvement in designing a better workstation as there were no low-risk scores recorded in any of the workers.

Conclusion

Conducive workplace settings such as adequate leg room, flexible table and chair configuration, and presence of assistive devices in data entry tasks are vital elements in reducing the ergonomic risk exposed to the workers. Investments in ergonomically healthy workstations along with continuous ergonomic training and risk assessments are essential to prevent the incidence of musculoskeletal disorders, particularly low back pain.

References

1. Buruck G, Tomaschek A, Wendsche J, et al. Psychosocial areas of worklife and chronic low back pain: a systematic review and meta-analysis. *BMC Musculoskelet Disord.* **2019;20(1):480.**
2. AlNekhlan AF, AlTamimi AM, AlAqeel BY, et al. Work-related musculoskeletal disorders among clinical laboratory workers. *Avicenna J Med.* **2020;10(1):29-34.**
3. de Barros FC, Moriguchi CS, Chaves TC, et al. Usefulness of the Rapid Office Strain Assessment (ROSA) tool in detecting differences before and after an ergonomics intervention. *BMC Musculoskelet Disord.* **2022;23(1):526.**
4. Crawford JO. The Nordic Musculoskeletal Questionnaire. *Occup Med.* **2007;57(4):300-1.**
5. Kibria MG, Parvez MS, Saha P, et al. Evaluating the ergonomic deficiencies in computer workstations and investigating their correlation with reported musculoskeletal disorders and visual symptoms among computer users in Bangladeshi university. *Heliyon.* **2023;9(11):e22179.**

OESHPP49 / 402

How Far Is Too Far? Comparing Straight-Line and Road-Network Travel Burdens for Low-Income Cancer Patients in Malaysia

Farhana Aminuddin¹, Marhaini Mostapha¹, Tan Yui Ping¹, Nur Amalina Zaimi¹, Mohd Shahri Bahari¹, Mohd Shaiful Jefri¹, Sivaraj Raman¹, Nor Zam Azihan Mohd Hassan¹

¹Centre of Health Economics Research, Institute for Health Systems Research, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: farhana.a@moh.gov.my

Summary

Cancer referral centres in Malaysia serve patients across various regions, yet geographic accessibility remains a challenge. This study compares straight-line estimates with actual road travel distances for 469 lower-income cancer patients using QGIS software. Findings reveal notable differences, with straight-line estimates averaging 42.9 km compared to actual travel distances of 72.5 km. Patients in Sabah and Sarawak face greater travel burdens, and some bypassed nearby centres. These results highlight the limitations of straight-line estimates and emphasize the need for road network-based analysis in healthcare planning. Further research should explore how travel distance impacts treatment accessibility and patient outcomes.

Keywords

Cancer patients, Geographic accessibility, Road network analysis, Straight-line distance, QGIS

Introduction

Access to cancer care services is critical in ensuring timely diagnosis and treatment. In Malaysia, six cancer referral centres are distributed regionally to serve patients from various localities. However, the geographical accessibility remains a challenge for those living in rural areas or farther from these facilities¹, particularly for lower-income patients. A study by Yahya et al.² reported that 25% of Malaysians need to travel over 100 km to the closest radiotherapy centre. Geographic accessibility studies often rely on straight-line (Euclidean) distance for simplicity; however, this approach overlooks real-world barriers, including road networks, terrain, and infrastructure. Such estimates may underestimate the true travel burden, especially in rural or underserved regions like Sabah and Sarawak. This study compares straight-line distance with actual road network distances for lower-income cancer patients traveling to cancer referral centres in Malaysia. Analysing discrepancies between these measures, thus highlighting the limitations of Euclidean estimates in healthcare planning.

Methods

A cross-sectional study was conducted involving 469 cancer patients undergoing treatment at six referral cancer centres between 2021 and 2022. Patient residential

locations were geocoded using QGIS with the WGS84 (EPSG:4326) coordinate reference system, and cancer centre locations were similarly mapped (Figure 1). Each patient's journey was measured as a single trip from their residence to the attending cancer centre. Road network data were sourced from OpenStreetMap (OSM) projected in WGS84/UTM zone 48N (EPSG:32648) for distance calculations. Travel distances and estimated travel times were calculated using the QNEAT3 plugin in QGIS, accounting for actual road networks. Straight-line distances were computed for comparison. The Bland-Altman method was used to assess agreement between the two distance measures and quantify systematic bias. A paired t-test evaluated differences between the measures. The estimated travel time was calculated using a default speed limit of 90km/h. However, this assumption does not account for real-world factors such as traffic conditions, road types, or speed limits in urban vs rural areas. Given the variation in road infrastructure, sensitivity analyses are recommended to address variability in speed limits in future work.

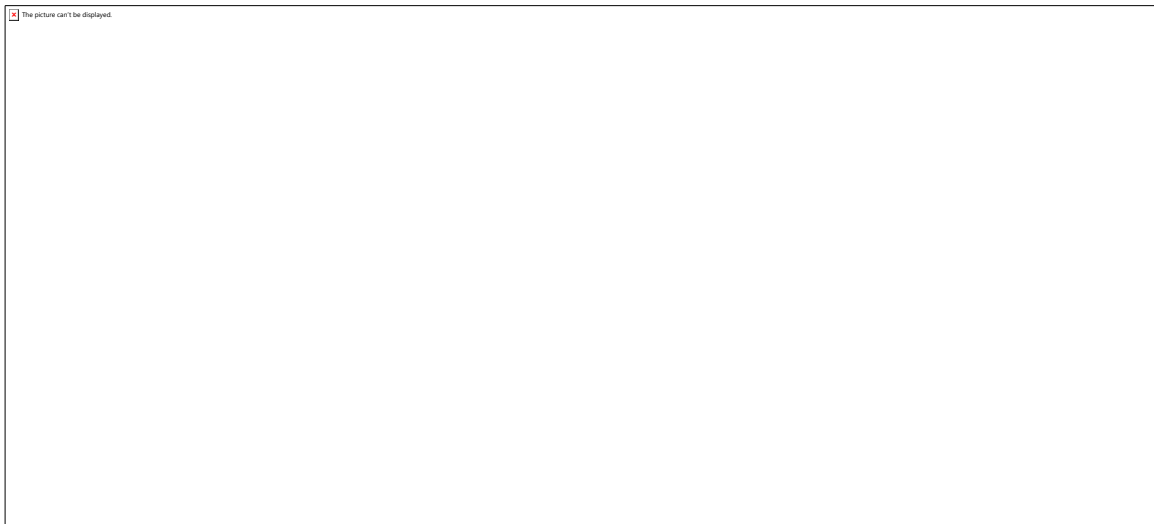


Fig. 1 - Mapping distribution of referral cancer centres across Malaysia (black bullets) and patients' residential (colour-coded by attending cancer centres). The straight-line journeys showed variations in travel distances.

Results

The analysis revealed substantial discrepancies between straight-line and road-network distances (Table 1). On average, actual road travel distances (72.5 km) exceeded straight-line estimates (42.9 km) by 69% ($p < 0.001$), with even greater disparities in Sabah and Sarawak (100% increase) and rural areas (74% increase). The paired t-test confirmed systematic underestimation by straight-line metrics across all regions ($p < 0.001$). Regarding time travelled, cancer patients from the Peninsular and Sabah/Sarawak spent an average of 32.1 minutes and 84.8 minutes, respectively, to reach the cancer centres using road network analysis. These highlight the importance of integrating road-network distance measures in healthcare service planning, especially for underserved regions.

In the East Peninsula, where no cancer referral exists, 2.3% of patients travelled longer distances to other regions for care. Similarly, patients in Sarawak covered extended distances, exacerbating accessibility issues due to sparse infrastructure

and challenging terrain. Additionally, 2.8% bypassed nearer centres, suggesting the influence of non-geographic factors such as referral or service preference, which warrants qualitative investigation.

The Bland-Altman analysis showed the average difference between straight-line and actual road distances was 29.68 km (SD = 84.96 km), indicating that straight-line estimates become less reliable as travel distance increases (Figure 2). Road-network analysis proved particularly critical for Sabah/Sarawak, where complex terrain inflated travel burdens (134.8 km actual vs. 67.2 km straight-line). Analysis in this study was based on OSM data and a uniform speed of 90 km/h, which may influence travel time accuracy and should be addressed in future studies using dynamic traffic or region-specific data.

Table 1: Comparison of Straight-Line vs. Actual Road-Network Travel Distances

Category	Straight-Line (km)	Road Distance (km)	% Increase	Travel Time (min)	Paired t-test
Peninsular Malaysia	33.4 ± 40.9	48.2 ± 66.0	+44%	32.1	<0.001*
Sabah & Sarawak	67.2 ± 83.3	134.8 ± 211.7	+100%	84.8	<0.001*
Urban Locality	41.4 ± 59.5	69.7 ± 134.0	+68%	-	<0.001*
Rural Locality	56.6 ± 40.9	98.4 ± 99.0	+74%	-	<0.001*
Overall	42.9 ± 58.1	72.5 ± 131.1	+69%	-	<0.001*

*All straight-line to road-network distance increases were statistically significant (p<0.001)

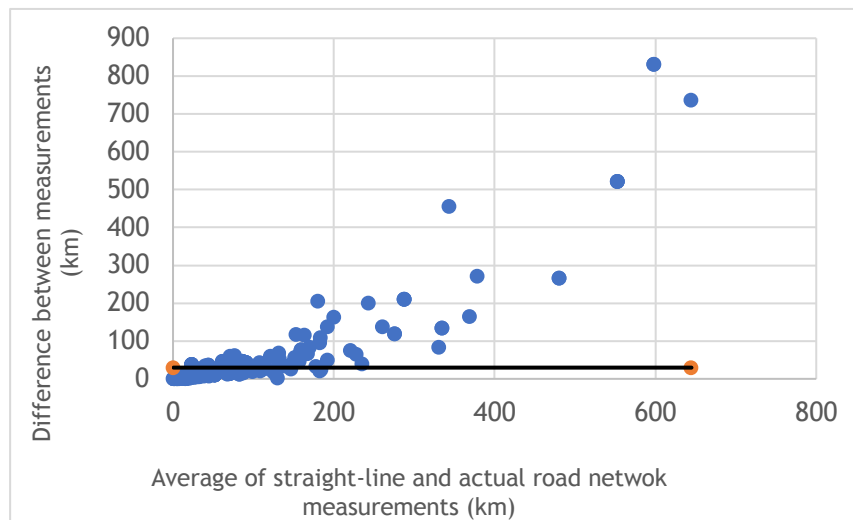


Fig. 2 : The Bland-Altman plot showed the average difference between straight-line and actual road network measurements as indicated by the solid line.

Conclusion

This analysis reveals that straight-line estimates significantly underestimate travel burdens, especially for patients farther from cancer centres. Using actual road distances enables policymakers to assess accessibility more accurately and allocate resources more effectively, improving access to cancer care and ensuring a more equitable distribution of services.

References

1. Nolan-Isles D, Macniven R, Hunter K, et al. Enablers and barriers to accessing healthcare services for Aboriginal people in New South Wales, Australia. *Int J Environ Res Public Health*. 2021;18(6):3014. doi:10.3390/ijerph18063014
2. Yahya N, Sukiman NK, Suhaimi NA, et al. How many roads must a Malaysian walk down? Mapping the accessibility of radiotherapy facilities in Malaysia. *PLoS One*. 2019;14(3):e0213583. doi:10.1371/journal.pone.0213583

OESHPP50 / 409

Association between HbA1c and Optical Coherence Tomography Angiography (OCTA) Parameters in Type 2 Diabetes Mellitus without Retinopathy

Abdallah Naqaweh¹, Shelina Oli Mohamed², Noor Haziq Saliman¹

¹Centre for Optometry Studies, Faculty of Health Sciences, Universiti Teknologi MARA (UiTM), Cawangan Selangor, Kampus Puncak Alam, Selangor.

²Department of Ophthalmology, Faculty of Medicine, Universiti Teknologi MARA, Sungai Buloh Campus, Selangor.

Corresponding author's email: haziqsaliman@uitm.edu.my

Summary

The study aimed to investigate the association between HbA1c and retinal vessels in patients with type 2 diabetes mellitus (T2DM) without retinopathy. Recent record of HbA1c was obtained retrospectively from the hospital database, and retinal vessels were examined using OCTA for retinal foveal avascular zone (FAZ) and vessel density (VD) at both superficial and deep retinal layers. The study found a negative correlation between HbA1c and FAZ parameters in the deep retinal layer. These findings suggest that combining HbA1c and OCTA may help to detect early retinal vascular changes before retinopathy develops, offering a non-invasive diagnostic strategy.

Keywords

Type 2 diabetes mellitus (T2DM), ocular coherence tomography angiography (OCTA), haemoglobin A1c (HbA1c), foveal avascular zone (FAZ), vessel density (VD).

Introduction

Diabetes mellitus (DM) affected 9.3% of the population worldwide where the majority suffered from T2DM (90%). It is anticipated the prevalence will rise to 10.2% by 2030¹. One of the sinister complications of DM is retinopathy, where it may not be detected during the routine retinal screening using a fundus camera. OCTA is a non-invasive technology that offers a detailed and high-quality image of retinal microvascular structure. It enables the imaging of deep retinal layers which is useful to detect early microvascular changes². Previous reports showed the microvascular changes occur in the preclinical stage of retinopathy³. However, the factors contributing to the changes remain a matter of contention. Considering the glycaemic control plays a major role in DM patients, the present study aimed to investigate the correlation between HbA1c and OCTA parameters in T2DM patients without clinical evidence of retinopathy.

Materials and Methods

This was a cross-sectional, observational study conducted at Hospital Al-Sultan Abdullah (HASA), UiTM Puncak Alam. Patients diagnosed with T2DM underwent a standard routine retinal screening using a fundus camera, and were only recruited

if the clinical retinopathy was absent. The participants then underwent preliminary examinations including visual acuity, inter ocular pressure measurement, blood pressure and dilated fundus exam to satisfy the study criteria. Recent HbA1c data were recorded retrospectively from the hospital database within the past three months. The participants then underwent OCTA examination using SPECTRALIS HRA + OCT® (Heidelberg Engineering, Heidelberg, Germany) in both superficial and deep retinal layers. The images were then binarized by ImageJ software (National Institutes of Health, MD, USA) to quantify the OCTA parameters, namely FAZ and VD as shown in Figure 1 and Figure 2, respectively. The descriptive and Pearson correlation analysis was tested between HbA1c and OCTA parameters using SPSS version 29.

Results and Discussion

A total of 54 participants were recruited in this study and the majority of them are males (64.8%). The mean $\pm$ standard deviation of the participants' age and HbA1c was 57.37 ± 9.99 years and 7.2 ± 1.27 , respectively. Table 1 presents the results of Pearson correlation analysis between HbA1c and OCTA parameters. In the superficial retinal layer, there was a significant but weak negative correlation between HbA1c and FAZ area ($r = -0.291$, $p = 0.033$) and FAZ perimeter ($r = -0.288$, $p = 0.035$). A similar trend was found in the deep retinal layer as a weak negative correlation between HbA1c and FAZ area ($r = -0.377$, $p = 0.005$) and FAZ perimeter ($r = -0.371$, $p = 0.006$). However, there was no significant correlation noted between HbA1c and VD in both superficial and deep retinal layers ($p > 0.05$). The findings of the present study show that poor glycaemic control may be associated with alterations in retinal microvascular structure, which could represent an early sign of retinal microvascular changes otherwise known as diabetic retinopathy. A likely explanation lies in the pathogenic effects of chronic hyperglycaemia, which causes mitochondrial overproduction of superoxide that leads to oxidative stress. This phenomenon will then impact the capillary endothelial damage⁴. These alterations typically followed by capillary remodelling, abnormal perfusion, or premature vascular dropout, which then reduce or distort the FAZ area and perimeter before the clinical expansion of ischaemia takes place. Overall, findings from this study underscore a putative association between poor glycaemic control and early microvascular changes. Although this link is considered weak, it might serve as a potential surrogate biomarker for diabetic retinopathy.

Table 1: Pearson correlation between HbA1c and OCTA biomarkers in SVP and DCP.

OCTA parameters	SRL	DRL
FAZ area	$r = -0.291$ $p = 0.033^*$	$r = -0.377$ $p = 0.005^*$
FAZ perimeter	$r = -0.288$ $p = 0.035^*$	$r = -0.371$ $p = 0.006^*$
VD	$r = 0.073$ $p = 0.598$	$r = -0.085$ $p = 0.540$

*Significant level ($p < 0.05$)

SRL; superficial retinal layer, DRL; deep retinal layer, FAZ; foveal avascular zone, VD; vessel density

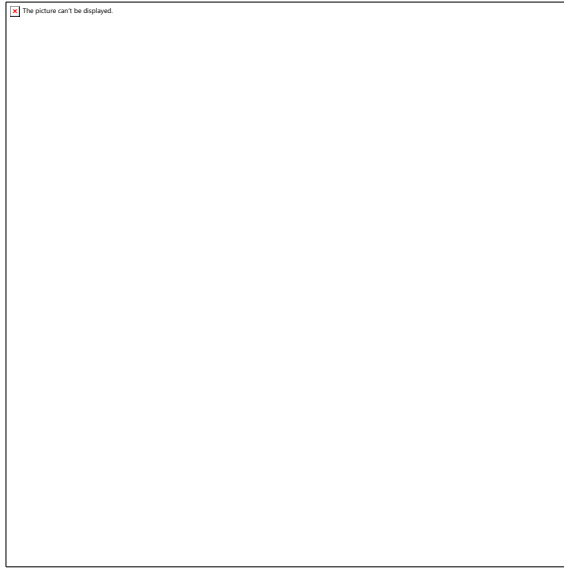


Figure 1: Representative image of SRL for FAZ area and perimeter (yellow spot)

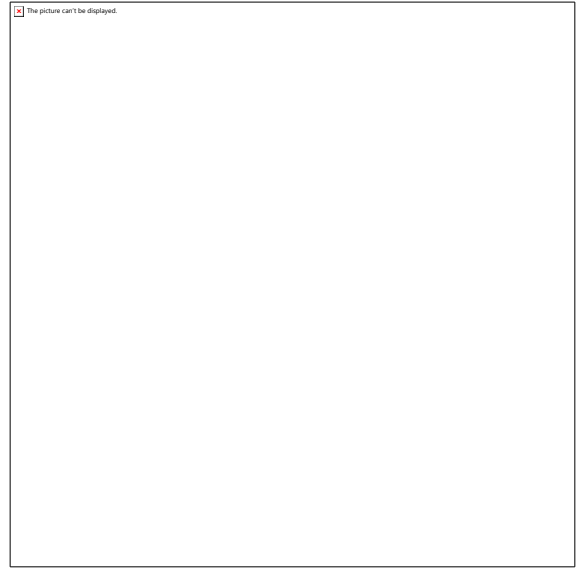


Figure 2: OCTA image of SRL for the measurement of VD

Conclusion

OCTA parameters could serve as a valuable, non-invasive tool for early detection and monitoring of microvascular changes in T2DM patients before clinical signs of retinopathy become apparent. However, a longitudinal study is warranted including other diabetic risk factors to establish a more robust predictive model for diabetic retinopathy.

Acknowledgments

The authors extend their gratitude for the funding by Fundamental Research Grant Scheme (FRGS) under the Ministry of Higher Education (KPT) Malaysia with the grant No. FRGS/1/2024/SKK06/UITM/02/2. Special thanks are extended to Universiti Teknologi MARA (UiTM) for the support in this study.

References

1. Akhtar S, Nasir JA, Ali A, Asghar M, Majeed R, Sarwar A. Prevalence of type 2 diabetes and prediabetes in Malaysia: a systematic review and meta-analysis. *PLoS One*. 2022;17(1):1-14.
2. Chua J, Sim R, Tan B, Wong D, Yao X, Liu X, et al. Optical coherence tomography angiography in diabetes and diabetic retinopathy. *J Clin Med*. 2020;9(6):1-23.
3. Lajmi H, Hmaied W, Othmen A, Chelly Z, El Fekih L. Optical coherence tomography angiography microvascular changes in diabetics without diabetic retinopathy. *Saudi J Ophthalmol*. 2020;34(3):156-9.
4. Beyaztas H, Aslanoglu CE, Yildiz A, Guler EM. Providing preclinical prediction of diabetic retinopathy via oxidative stress levels. *Rom J Diabetes Nutr Metab Dis*. 2022;29(2):236-44.

OESHPP51 / 414

Prevalence Of Refractive Error Among Malay Primary Schoolchildren In Denai Alam, Selangor

Fatin Nur Najwa Norazman¹, Nurul Syahidah Jasmi¹

¹ *Centre for Optometry Studies, Faculty of Health Sciences, Universiti Teknologi MARA Cawangan Selangor, Kampus Puncak Alam, Selangor, 42300, Malaysia*

Corresponding author's email: fatin161@uitm.edu.my

Summary

Refractive error is a leading cause of visual impairment and preventable blindness globally. This cross-sectional study aimed to determine the prevalence and types of refractive errors among Malay primary schoolchildren in Denai Alam, Selangor. A total of 60 students aged 8, 10, and 12 years were examined through visual acuity assessments and refraction tests. The findings revealed that 50% had refractive errors, predominantly myopia. A significant gender disparity was observed, with higher prevalence in males. Early detection through school-based eye health programmes is critical, as refractive errors are easily correctable, cost-effective to manage, and significantly improve academic performance and productivity.

Keywords

Refractive error, Myopia, Schoolchildren, Malay, Visual impairment

Introduction

Refractive error is widely recognised as one of the most common visual disorders globally and is the second leading cause of treatable blindness¹. In children, particularly those of school-going age, uncorrected refractive errors can hinder academic performance, cognitive development, and social interaction. The prevalence of refractive errors varies across geographical regions, ethnic backgrounds, and socio-economic status, highlighting the importance of population-specific data². In Malaysia, with increasing near-work activities and digital screen exposure, there is growing concern regarding early-onset myopia. However, data concerning specific ethnic subgroups such as Malay primary schoolchildren remain limited. This study was therefore conducted to determine the prevalence and distribution of refractive errors—myopia, hyperopia, and astigmatism—among Malay children attending a primary school in Denai Alam, Selangor. The study aimed to generate localised evidence to guide targeted vision screening and early intervention initiatives in the community.

Materials and Methods

A cross-sectional study was conducted involving 60 Malay students aged 8, 10, and 12 years from primary school in Denai Alam, Selangor, Malaysia. Participants were recruited via stratified random sampling. Visual acuity (VA) testing was conducted at 6 metres using a Snellen chart for distance vision, and at 40 cm using a Near Visual Acuity Chart. Objective refraction was performed through static retinoscopy, followed by subjective refinement. Refractive error classification was based on

spherical equivalent (SE): myopia as $SE \geq -0.50$ D, hyperopia as $SE \geq +0.50$ D, and astigmatism as cylindrical ≥ -0.75 DC. Data were analysed using SPSS (version 27) with significance set at $p < 0.05$. Ethical clearance and informed consent were obtained prior to data collection. This methodology ensured a reliable and standardised assessment of visual status among the participants.

Results and Discussion

Out of the 60 Malay primary schoolchildren evaluated, 50% were found to have refractive errors. Myopia was the most prevalent condition, affecting 33.3% of the children, followed by astigmatism at 10%, and hyperopia at 6.7%. The average refractive error measurements were -2.04 ± 1.96 D for myopia, $+0.94 \pm 0.59$ D for hyperopia, and -0.83 ± 0.20 DC for astigmatism. Notably, 25% of children with refractive errors remained uncorrected, reflecting a gap in vision care access or awareness³. Gender distribution revealed that refractive errors were more prevalent among males (62.5%) than females (37.5%). Myopia showed a statistically significant gender difference ($p = 0.017$), with 36.7% of males affected (mean -2.38 ± 1.35 D), compared to 30% of females (mean -1.45 ± 2.50 D). Interestingly, hyperopia was exclusively observed in males (13.3%). The difference in astigmatism prevalence between genders was not significant ($p = 0.213$), although it was more common in males (33.3%) than females (20%). When analysed by age, a trend of increasing severity of myopia was observed. The average power of participants for eight years old was -0.34 ± 1.12 D, ten years old was -0.34 ± 0.80 D and twelve years old was -1.24 ± 2.18 D. These findings are consistent with global trends indicating progressive myopia development during school years, possibly due to increased near work and reduced outdoor activity⁴. Uncorrected refractive errors can lead to various problems, including poor academic performance, decreased quality of life, and potential long-term vision impairment⁵. Overall, the findings align with regional studies and reinforce the need for vision screening programmes. Early detection and timely correction of refractive errors can prevent further deterioration and ensure optimal visual and academic development in children.

Table 1: Distribution of refractive error among schoolchildren

Refractive error	Prevalence (%)	Mean $\pm$ SD
Myopia (D)	33.33	-2.04 ± 1.96
Hyperopia (D)	6.67	$+0.94 \pm 0.59$
Astigmatism (DC)	10.00	-0.83 ± 0.20

Table 2: Prevalence and magnitude of refractive error by gender

Refractive error	Prevalence (%)		Mean $\pm$ SD		P-value
	Male	Female	Male	Female	
Myopia (D)	36.70	30.00	-2.38 $\pm$ 1.35	-1.45 $\pm$ 2.50	0.017
Hyperopia (D)	13.30	0.00	+0.94 $\pm$ 0.59	-	-
Astigmatism (DC)	33.30	20.00	-1.11 $\pm$ 1.28	-1.86 $\pm$ 1.45	0.213

Table 3: Distribution of refractive error by age

Age (years)	Refractive error (mean $\pm$ SD)	P-value
8	-0.34 $\pm$ 1.12 D	0.097
10	-0.34 $\pm$ 0.80 D	
12	-1.24 $\pm$ 2.18 D	

Conclusion

This study highlights a high prevalence of refractive errors, particularly myopia, among Malay primary schoolchildren in Denai Alam, with significant gender and age-related variations. The results underscore the importance of implementing routine vision screening and intervention programmes in schools to address uncorrected refractive errors and promote children's visual health.

References

1. Pascolini D, Mariotti SP. Global estimates of visual impairment: 2010. *Br J Ophthalmol*. 2012;**96**(5):614-8.
2. Ismail LA, Sukumaran S. Prevalence of refractive errors among school children in Wangsa Maju, Kuala Lumpur, Malaysia. *Med Hypothesis Discov Innov Optom*. 2022;**3**(3):106-12.
3. Naidoo KS, Leasher J, Bourne RR, et al. Global vision impairment and blindness due to uncorrected refractive error, 1990-2010. *Optom Vis Sci*. 2016;**93**(3):227-34.
4. Ip JM, Saw SM, Rose KA, et al. Role of near work in myopia: findings in a sample of Australian school children. *Invest Ophthalmol Vis Sci*. 2008;**49**(7):2903-10.
5. Resnikoff S, Pascolini D, Mariotti SP, Pokharel GP. Global magnitude of visual impairment caused by uncorrected refractive errors in 2004. *Bull World Health Organ*. 2008;**86**(1):63-70.

OESHPP52 / 415

Digital Transformation of COMBI in Dengue Prevention: Development and Evaluation of the eCOMBI-*Denggi* Mobile Application

Ahmad Farid Nazmi Abdul Halim ¹, Mohd Rohaizat Hassan ², Rozita Hod ², Khaironi Yatim Sharif ³, Muhammad Luqman Mahamad Zakaria ⁴, Noor Khalili Mohd Ali ⁵, Rozita Ab Rahman ¹, Mohd Fauzy Samsudin ¹, Nur Faezah Che Mat ¹, Karthik Sundram A/L Mohanasundram¹, Roslinda Aziz ¹

¹ Putrajaya Health Office, Ministry of Health Malaysia

² Department of Public Health Medicine, Faculty of Medicine, Universiti Kebangsaan Malaysia

³ Department of Computing, Faculty of Science, Management & Computing, Universiti Teknologi Petronas

⁴ Department of Software Engineering and Information System, Faculty of Computer Science and Information Technology, Universiti Putra Malaysia

⁵ Seremban District Health Office, Ministry of Health Malaysia

Corresponding author's email: dr.faridnazmi@moh.gov.my

Summary

This study aimed to develop and evaluate a mobile application to support the implementation of the Communication for Behavioural Impact (COMBI) program in dengue prevention. By digitalizing COMBI, the initiative seeks to empower community involvement in dengue control activity while addressing challenges such as inadequate workforce and financial constraints. Usability testing revealed that the app is highly usable and well accepted by users, indicating its potential as an innovative tool for enhancing behavioural change and health education efforts in dengue prevention.

Keywords

COMBI, dengue, mobile application, usability

Introduction

Dengue remains a major global public health threat. In Malaysia, various health promotion and advocacy initiatives have been implemented, including the Communication for Behavioural Impact (COMBI) program developed by WHO in 2001, which engages communities as the primary agents in dengue prevention. It is one of the social mobilization and communication approaches to empower individuals, families, and communities to address the issue of dengue. The digitalization of COMBI through mobile application is an innovative solution to disseminate timely information and promote preventive behaviours. This study focuses on the development of a mobile health application, eCOMBI-*Denggi*, and the assessment of its usability.

Materials and Methods

The eCOMBI-*Denggi* app was developed using the Agile methodology¹. Content selection was guided by the Health Belief Model² and refined using the Nominal Group Technique³, involving three public health physicians, one health education officer, one entomologist, three members of the COMBI committee, and five mobile app software engineers. The application prototype was developed and tested iteratively. Usability testing was conducted over four weeks with 33 purposively sampled COMBI volunteers, using the validated Malay version of the System Usability Scale (SKAMA). 4. Participants downloaded the Android Package Kit version of the app and, after the trial period, completed the online SKAMA questionnaire. Usability was measured across effectiveness, efficiency, and user satisfaction, where a score ≥ 68 indicated good usability.

Results and Discussion

The eCOMBI-*Denggi* app was developed in two phases: content selection and prototype development. Twenty prioritised items were identified and categorised into three core modules: health communication, real-time surveillance, and behaviour modification (Table 1). Each module underwent content validation by relevant health authorities. Following validation, the modules were handed over to software developers for implementation. The technical specifications of the application are summarised in Table 2, and a sample interface screenshot is shown in Figure 1. Subsequent usability evaluation using the SKAMA instrument yielded a score of 85.9, categorised as excellent. Users reported that the app was user-friendly, well-integrated, and self-explanatory. According to established benchmarks, scores above 80 indicates high user satisfaction, strong system acceptance, and a high likelihood of sustained use (4). The findings support eCOMBI-*Denggi* app as a highly usable tool with strong potential to enhance community mobilisation and public health interventions for dengue prevention.

Table 1: Validated content items and their classification within the eCOMBI-Denggi app module

No.	Proposed content Item	Content Category	Module
1	Introduction to COMBI	COMBI information	Health Communication
2	Information on dengue vectors	Key dengue-related information	Health Communication
3	Information on breeding sites	Key dengue-related information	Health Communication
4	Search and destroy activity information	Dengue prevention measures	Health Communication
5	How to protect oneself from mosquito bites	Dengue prevention measures	Health Communication
6	Larviciding methods	Dengue prevention measures	Health Communication
7	Scheduling for search and destroy activities	Reminders and activity planning	Behaviour Modification
8	Notifications of scheduled search and destroy activities	Reminders and activity planning	Behaviour Modification
9	Daily dengue case updates	Current dengue situation	Real-time Surveillance
10	Weekly dengue case updates	Current dengue situation	Real-time Surveillance
11	Dengue outbreak locality	Current dengue situation	Real-time Surveillance
12	Information on dengue virus agents	Key dengue-related information	Health Communication
13	Symptoms and warning signs of dengue	Key dengue-related information	Health Communication
14	Actions during dengue outbreaks	Outbreak response	Health Communication
15	Outpatient dengue monitoring records	Dengue fever monitoring	Behaviour Modification
16	Home care advice for dengue patients	Dengue fever monitoring	Health Communication
17	Destruction of Disease-Bearing Insects Act 1975	Legal enforcement	Health Communication
18	Complaint reporting system	Complaint reporting system	Behaviour Modification
19	Updates on COMBI activities	COMBI Information	Health Communication
20	URL links	URL links	Health Communication

Table 2: Technical specifications

Platform	Android 7 and above
Framework	Flutter and Laravel framework
Database	SQL
Data privacy and security	Format Message Digest Algorithm 5

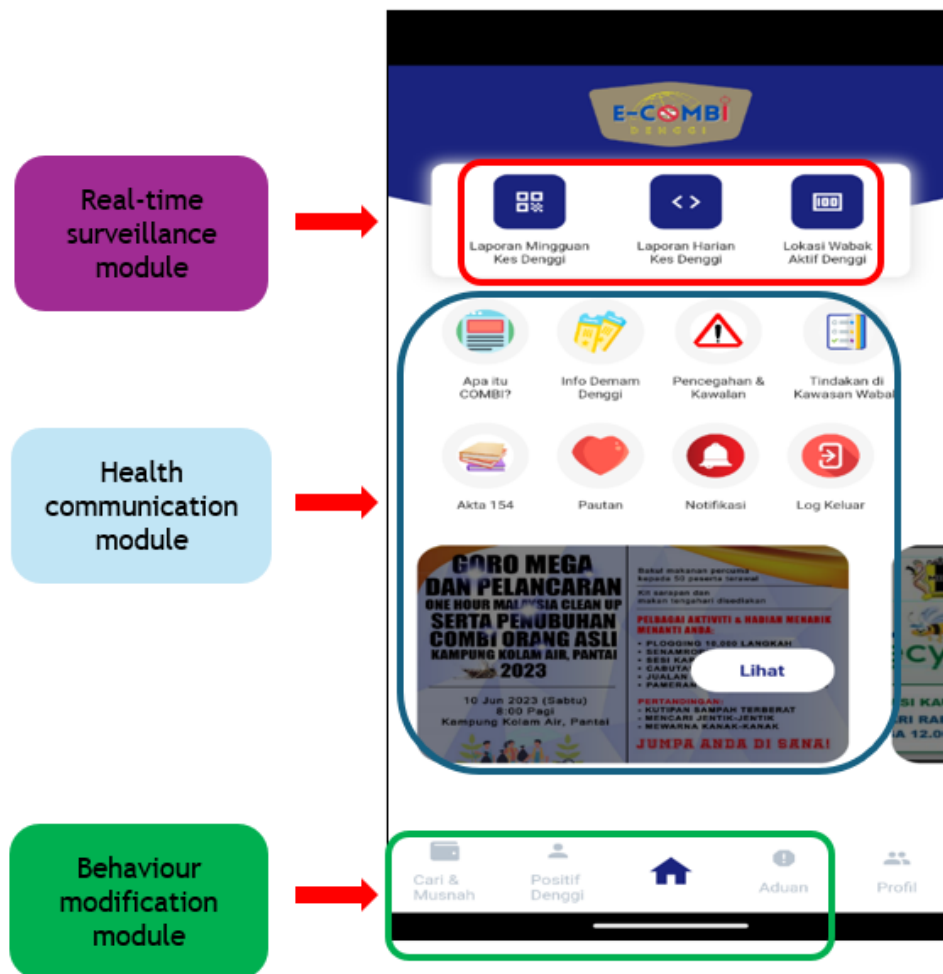


Figure 1: The screenshot from the app interface

Conclusion

eCOMBI-Denggi app may serve as a practical tool to enhance community awareness, knowledge, and attitudes towards dengue prevention. It also can facilitate the translation of knowledge into practice and aligns with COMBI's objectives, offering a potentially effective and integrated strategy for dengue intervention.

References

1. Sommerville I. *Software engineering*. Harlow: Pearson; 2016.
2. Cho YM, Lee S, Islam SM, et al. Theories applied to m-health interventions for behavior change in low- and middle-income countries: a systematic review. *Telemed e-Health*. **2018**;24(10):727-41. doi:10.1089/tmj.2017.0249
3. Rosa AF, Martins AI, Cerqueira M, et al. Applying the nominal group technique for the conceptual validation of eHealth solutions. *Procedia Comput Sci*. **2023**;219:1240-8. doi:10.1016/j.procs.2023.01.407
4. Marzuki MFM, Yaacob NA, Yaacob NM. Translation, cross-cultural adaptation, and validation of the Malay version of the System Usability Scale questionnaire for the assessment of mobile apps. *JMIR Hum Factors*. **2018**;5(2):e10308. doi:10.2196/10308

OESHPP53 / 417

Correlation Between HbA1c and Intra-Retinal Layers in Type 2 Diabetes Mellitus Without Retinopathy

Noor Haziq Saliman¹, Nasrul Rasydan Faizal¹, Abdallah Naqaweh¹, Shelina Oli Mohamed²

¹*Centre for Optometry Studies, Faculty of Health Sciences, Universiti Teknologi MARA (UiTM), Cawangan Selangor, Kampus Puncak Alam, Selangor.*

²*Department of Ophthalmology, Faculty of Medicine, Universiti Teknologi MARA, Sungai Buloh Campus, Selangor.*

Corresponding author's email: haziqsaliman@uitm.edu.my

Summary

The study aimed to investigate the association between HbA1c and retinal layers in patients with type 2 diabetes mellitus (T2DM) without retinopathy. Recent record of HbA1c was obtained retrospectively from the hospital database, and thickness of intra-retinal layers, namely inner retinal later (IRL) and outer retinal layer (ORL) were measured using optical coherence tomography (OCT). The study found a significant positive correlation between HbA1c and two parafoveal regions (temporal and superior) of IRL. These findings suggest that combining HbA1c and OCT may help detect early thickness retinal layers changes before diabetic retinopathy develops, offering a non-invasive diagnostic strategy.

Keywords

Type 2 diabetes mellitus (T2DM), optical coherence tomography (OCT), haemoglobin A1c (HbA1c), inner retinal layer (IRL), outer retinal layer (ORL)

Introduction

It is estimated that in Malaysia, there will be 2.48 million individuals with diabetes mellitus (DM) by 2030, an increase of 164% compared to 0.94 million in 2000¹. This is worrying considering DM would have an impact on the retinal structure, which typically go undetected at the early stage. The emergence of OCT may, however, address this issue. OCT enables deeper visualisation of the retinal structure depending on the layer of interest. A study found that overall retinal manifestations in T2DM affects the thickness of intra-retinal layers². Nonetheless, there is still contention over the cause of the alteration. Considering the glycaemic control play a major role in T2DM patients, and the intra-retinal layer is made up of inner and outer retinal layer (IRL and ORL), the present study aimed to investigate the correlation between HbA1c and these two retinal layers in T2DM patients without clinical evidence of retinopathy.

Materials and Methods

This was a single centre, cross-sectional, observational study. T2DM patients attending diabetic retinopathy (DR) screening were recruited after the absence of

the retinopathy has been confirmed. To satisfy the study criteria, the participants underwent preliminary assessment including visual acuity, inter ocular pressure and blood pressure measurements, followed by OCT examination (Heidelberg Engineering, Heidelberg, Germany). Data of IRL and ORL captured by the OCT were analysed by the built-in software (Figure 1) and further segmented into four quadrants of two regions (parafoveal and perifoveal) (Figure 2). Recent data of HbA1c were retrieved retrospectively from the medical record within the past three months. Data analysis was carried out using SPSS Version 27 (International Business Machine Corp. IBM, Chicago, IL, USA). Each respective retinal layer (IRL and ORL) and HbA1c was descriptively analysed. Additionally, the relationship between the respective intra-retinal layer (IRL and ORL) and HbA1c was analysed using simple linear regression.

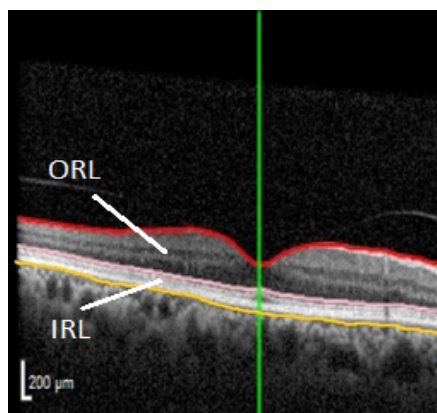


Figure 1: The cross sectional image of IRL and ORL obtained by built-in OCT software.

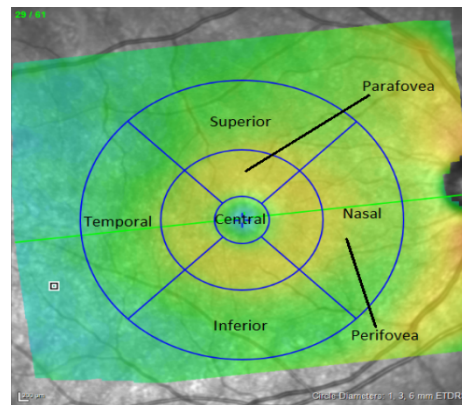


Figure 2: The parafovea and perifovea regions with the macula quadrants (superior, inferior, nasal and temporal).

Results and Discussion

A total of 73 participants were recruited in the study and majority were males (60.3%). The mean $\pm$ standard deviation of the participants' age and HbA1c was 58.27 ± 10.61 years and 7.14 ± 1.19 , respectively. Table 1 presents the overall linear regression between HbA1c and the intra-retinal layers (IRL and ORL). There was a significant positive correlation between HbA1c and parafoveal-temporal ($\beta = 0.248$, $p = 0.040$) and parafoveal-superior ($\beta = 0.265$, $p = 0.027$) of the IRL. This could be due to poor glycaemic control induces increased vascular permeability of the IRL, as neuronal axons are more concentrated in this layer. Thus, when glycaemic control deteriorates, a rise in retinal thickness would be apparent³. On the contrary, there was no significant correlation noted between HbA1c and the remaining IRL quadrants and all ORL quadrants ($p > 0.05$). One possible reason could be due to ORL being predominantly made up of fewer neural layers, hence, it may not be affected especially at the pre-clinical stage of retinopathy(3). The pathophysiological processes underlying DR are indeed complicated and multifactorial. The present study however shows that the retinal structure of individuals with T2DM who do not exhibit clinical retinopathy may be influenced by glycaemic control. These results

raise the possibility of OCT as the biomarker for subclinical retinal alteration in early detection of DR⁴.

Table 1: Results of HbA1c and macular layers *statistically significant p<0.05

Parameter	Inner retinal layer (IRL)		Outer retinal layer (ORL)	
	Standardized ®	p-value	Standardized ®	p-value
Central	0.097	0.426	-0.046	0.710
Parafoveal-Temporal	0.248	0.040*	0.036	0.767
Parafoveal -Nasal	0.196	0.106	0.028	0.821
Parafoveal -Superior	0.265	0.027*	0.055	0.655
Parafoveal -Inferior	0.211	0.082	0.068	0.58
Perifoveal-Temporal	0.203	0.094	0.028	0.818
Perifoveal -Nasal	0.230	0.057	0.037	0.765
Perifoveal -Superior	0.150	0.218	0.074	0.546
Perifoveal -Inferior	0.021	0.867	0.013	0.917

Conclusion

The application of OCT is valuable to be included in the clinical assessment during DR screening. Ultimately, this would benefit both clinicians and patients to take precautions and have a better understanding about the early signs of DR.

Acknowledgments

The authors extend their gratitude for the funding by Fundamental Research Grant Scheme (FRGS) under the Ministry of Higher Education (KPT) Malaysia with the grant No. FRGS/1/2024/SKK06/UITM/02/2. Special thanks are extended to Universiti Teknologi MARA (UiTM) for the support in this study.

References

1. Aljunid SM, Aung YN, Ismail A, Rashid SAZA, Nur AM, Cheah J, et al. Economic burden of hypoglycaemia for type II diabetes mellitus patients in Malaysia. *PLoS One*. **2019**;14(10):e0222364.
2. Mititelu M, Uschner D, Doherty L, Bjornstad P, Domalpally A, Drews KL, et al. Retinal thickness and morphology changes on OCT in youth with type 2 diabetes: findings from the TODAY Study. *Ophthalmol Sci*. **2022**;2(4):100135.
3. Kapti H, Şahin A, Özdemir Ö. Evaluation of retinal and choroidal thicknesses in patients with diabetes mellitus without diabetic retinopathy. *Niger J Clin Pract*. **2022**;25(9):1495-500.
4. Jiang J, Liu Y, Chen Y, Ma B, Qian Y, Zhang Z, et al. Analysis of changes in retinal thickness in type 2 diabetes without diabetic retinopathy. *J Diabetes Res*. **2018**;2018:1234567.

OESHPP54 / 422

Vitamin D Levels Among Female Adults and Factors Associated: Findings from National Health & Morbidity Survey (NHMS) 2024

Lalitha Palaniveloo¹, Fazila Haryati Ahmad¹, Ahmad Ali Zainuddin¹

¹Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

Corresponding author's email: lalitha.p@moh.gov.my

Summary

This study aimed to determine the Vitamin D levels among female adults in Malaysia and the factors associated. Using data from a nationally representative survey, serum vitamin D levels were measured and analysed against socio-demographic and nutritional factors. The findings showed that urban residence, Malay ethnicity, and education level were significantly associated with poorer vitamin D status. These findings are consistent with global evidence that limited sun exposure, cultural clothing practices and lifestyle factors contribute to vitamin D inadequacy among women.

Keywords

Vitamin D, Deficiency, Adults, Females, Malaysia

Introduction

Vitamin D plays a crucial role in calcium metabolism, bone health, and immune function, yet vitamin D deficiency remains prevalent among female adults worldwide. Numerous studies have highlighted that women, particularly those of reproductive age, are at increased risk of vitamin D insufficiency due to factors such as limited sun exposure, dietary inadequacy, higher adiposity, and cultural practices that limit skin exposure to sunlight. This public health issue is significant as vitamin D deficiency has been linked not only to poor skeletal health but also to adverse pregnancy outcomes, autoimmune disorders, and chronic diseases¹. Therefore, this study aimed to determine the Vitamin D levels among female adults in Malaysia and the factors associated.

Materials and Methods

Data were obtained from a cross-sectional nutrition survey conducted in Malaysia between July and September 2024 using a two-stage stratified random sampling design encompassing all states and federal territories for national representation. Information on socio-demographic characteristics was collected via a self-administered questionnaire. Venous blood samples were collected from respondents and sent to an accredited private diagnostic laboratory for analysis. A quantitative delayed one-step competitive immunoassay using CMIA technology on the ARCHITECT iSystem was used to analyse serum Vitamin D levels and classified as deficiency (<30nmol/L), insufficiency (30-<50nmol/L) and sufficiency (≥50nmol/L) (2). Body Mass Index (BMI) was calculated by weight (kg) divided by the square of height (m²) and categorised as underweight, normal, overweight and obese

according to the WHO 1998 Guidelines. Complex sample analysis was applied in descriptive and multivariate logistic regression (MLR) analysis using SPSS Version 27. Statistical significance was set at $p < 0.05$.

Results and Discussion

A total of 729 female adults participated in the study. Most were aged between 40 and 59 years (43.5%) and resided in rural areas (51.0%). Ethnically, almost half were Malay (49.4%) with a secondary education level (58.6%) and unemployed (65.1%). Regarding nutritional status, 32.9% were overweight and 28.1% were obese. More than half of the women (54.7%) had vitamin D deficiency or insufficiency. Multivariate logistic regression examined the association between age, strata, ethnicity, education level, employment status and BMI with vitamin D deficiency or insufficiency among female adults. The dependent variable was serum vitamin D status, categorised as deficiency or insufficiency (< 50 nmol/L) versus sufficiency (≥ 50 nmol/L) as the reference group. After adjusting for covariates, female adults residing in urban areas (AOR = 2.28 [95% CI: 1.26-4.14], $p = 0.01$) and those of Malay ethnicity (AOR = 5.51, [95% CI: 1.66-18.34], $p = 0.01$) had significantly higher odds of vitamin D deficiency or insufficiency compared to their respective reference groups. Conversely, those with no formal education had significantly lower odds of deficiency or insufficiency (AOR = 0.25, [95% CI: 0.07-0.87], $p = 0.03$).

A high prevalence of vitamin D deficiency or insufficiency among female adults (54.7%) is consistent with previous reports indicating widespread vitamin D inadequacy in tropical countries despite abundant sunlight³. Notably, urban residence, Malay ethnicity and lower education were independently associated with poorer vitamin D status. Women living in urban areas may have reduced sun exposure due to indoor lifestyles and higher use of sun protection. The higher odds among Malay women could be attributed to cultural and clothing practices that limit skin exposure to sunlight. Interestingly, women with no formal education were less likely to have deficiency or insufficiency than those with tertiary education, which may relate to differing outdoor activity patterns or sun avoidance behaviour among more educated individuals⁴.

Table 1: Sociodemographic Characteristics of the Respondents (N=729)

Variables	n	%
Age (years)		
18-39	203	27.8
40-59	317	43.5
≥ 60	209	28.7
Strata		
Urban	357	49.0
Rural	372	51.0
Ethnicity		
Malay	360	49.4
Chinese	100	13.7
Indian	38	5.2

Variables	n	%
Bumiputera Sabah & Sarawak	166	22.8
Others	65	8.9
Education Level		
No Formal Education	114	15.7
Primary	126	17.3
Secondary	426	58.6
Tertiary	61	8.4
Employment Status		
Employed	250	34.9
Unemployed	467	65.1
BMI		
Underweight (<18.5kg/m ²)	31	4.3
Normal (18.5 - 24.9 kg/m ²)	253	34.7
Overweight (≥25.0 - 29.9 kg/m ²)	240	32.9
Obese (≥30.0 kg/m ²)	205	28.1
Serum Vitamin D Levels		
Deficiency or Insufficiency (<50nmol/L)	399	54.7
Sufficiency (≥50nmol/L)	330	45.3

Conclusion

This study highlights a high prevalence of vitamin D deficiency or insufficiency among female adults, particularly among those living in urban areas, of Malay ethnicity, and with varying education levels. These underscore the need for targeted public health strategies to improve vitamin D status, especially among urban-dwelling and Malay women.

References

1. Palacios C, Gonzalez L. Is vitamin D deficiency a major global public health problem? *J Steroid Biochem Mol Biol.* **2014**;144(Pt A):138-145. doi:10.1016/j.jsbmb.2013.11.003
2. Institute of Medicine Committee to Review Dietary Reference Intakes for Vitamin D and Calcium. In: Ross AC, Taylor CL, Yaktine AL, Del Valle HB, editors. *Dietary reference intakes for calcium and vitamin D*. Washington (DC): National Academies Press (US); **2011**.
3. Nurbazlin M, Chee WSS, Rokiah P, et al. Effects of sun exposure on 25(OH) vitamin D concentration in urban and rural women in Malaysia. *Asia Pac J Clin Nutr.* **2013**;22(3):391-399.
4. Moy FM, Bulgiba A, Zaleha MK, et al. Vitamin D deficiency and its risk factors among women in Malaysia. *Asia Pac J Clin Nutr.* **2015**;14(4):391-397.

OESHPP55 / 431

Development of a School-based *Aedes* Breeding Search and Destroy Online Checklist and Collaborative Dengue Transmission Risk Stratification of School Compounds in Wilayah Persekutuan Putrajaya, Malaysia

Mohd Fauzy Samsudin¹, Ahmad Farid Nazmi Abdul Halim¹, Nur Faezah Che Mat¹, Karthik Sundram Mohana Sundram¹, Roslinda Aziz¹, Rozita Ab Rahman¹

¹ Putrajaya Health Office, Kuala Lumpur and Putrajaya Health Department, Ministry of Health Malaysia

Corresponding author's email: dr.mohdfauzy@moh.gov.my

Summary

Eliminating *Aedes* mosquito breeding sites in school compounds requires a collaborative and systematic approach that empowers school authorities, cleaning staff, and students. This study focused on the development of a standardised online Search and Destroy (S&D) checklist to identify and manage *Aedes* mosquito breeding sites in Malaysian public schools under the Putrajaya Department of Education. A mixed-methods approach was used to gather quantitative data on common breeding habitats and qualitative insights from key stakeholders, including school administrators, health officers, and cleaning staff. Conducted across 27 government schools in Putrajaya over two months, the study culminated in co-creating a practical, context-sensitive checklist tailored for routine use in school settings. The finalised checklist reflects both entomological evidence and operational feasibility, serving as a foundational tool for future dengue prevention efforts in educational institutions.

Keywords

Aedes search & destroy checklist development, environmental dengue control, community participation, vector control, dengue transmission risk stratification, Putrajaya

Introduction

Dengue fever, transmitted by *Aedes* mosquitoes, remains a critical public health issue in Malaysia. Urban and semi-urban areas, where human-vector interaction is frequent, are especially vulnerable. Schools represent high-risk environments due to their physical structure, vegetation, and water storage practices. This study was designed to develop a school-based checklist for *Aedes* breeding site detection and destruction, incorporate it into dengue transmission risk stratification and intervention, and to validate its relevance and usability.

Materials and Methods

This is a cross-sectional study over two months across 27 public primary and secondary schools under the Putrajaya Department of Education, Wilayah

Persekutuan Putrajaya. This study is divided into two phases: (1) Situational assessment, site observation, and document review, (2) development and validation of the online checklist and risk stratification.

In Phase 1, environmental observations were conducted to identify typical mosquito breeding sites across school facilities. Observations focused on stagnant water, mosquito larvae, and risk factors such as clogged drains or uncovered containers. A document review was also conducted to identify the existing framework and guidelines for environmental control strategies in combating dengue.

Based on findings from the first phase, a draft checklist was developed to guide weekly inspection routines using Google Forms. The checklist included water containers, sanitation areas, drains, flower pots, and miscellaneous indoor and outdoor locations. Each item was framed practically to ensure ease of understanding and usability by non-healthcare workers, such as teachers or maintenance staff.

In Phase 2, a two-step validation process was designed to ensure the checklist's relevance, clarity, and usability. First, a content validation exercise was conducted with a panel of five experts in entomology, public health, and school health management. Using a Content Validity Index (CVI), panel members rated each checklist item for clarity, relevance, and necessity on a 4-point Likert scale. Items scoring below the accepted threshold ($CVI < 0.78$) were revised or removed.

Second, a field validation (face and construct validity) was conducted in three purposively selected schools. The checklist was used during routine weekly inspections over two weeks. Observers recorded feedback on time taken to complete the checklist, ease of understanding, and any difficulties encountered. Additionally, findings from the checklist were compared against inspections by trained vector control officers to assess agreement. Inter-rater reliability was assessed using Cohen's kappa coefficient to evaluate consistency between users and expert inspectors.

Results and Discussion

Environmental scanning revealed several common *Aedes* breeding habitats such as stagnant drain water, uncovered water containers, uneven concrete slabs, and flowerpot saucers—often overlooked by routine cleaning activities.

The draft checklist was comprehensive and user-friendly, as confirmed by the field validation. Inter-rater agreement between staff and expert inspectors was substantial ($\kappa = 0.76$), indicating good reliability. The validated checklist includes 25 key inspection points and is designed for weekly routine inspection by the designated team known as “School Dengue Squad” under the existing “Dengue-free School Facilities Program”.

The checklist also aligns with empowering communities—in this case, school ecosystems—to play a proactive role in dengue prevention. Given the complexity and recurrence of dengue outbreaks, decentralising responsibility through guided tools like this checklist can contribute to sustainable, bottom-up control strategies. Incorporation of dengue transmission risk stratification allows timely intervention by the district health office for the practical, targeted implementation of preventive vector control activities.

Conclusion

Developing a standardised S&D checklist, along with a risk stratification system for school compounds, is essential for achieving sustainable dengue prevention. This checklist is crafted for practicality, scalability, and user-friendliness, making it an effective tool for school communities. By adopting this checklist, schools can conduct regular inspections and proactively address *Aedes* mosquito breeding sites, ultimately fostering a culture of long-term behavioural change in dengue prevention. This proactive approach not only empowers school communities but also facilitates timely interventions by district health offices based on actual transmission risks. Future research should focus on evaluating the large-scale implementation of this checklist and its effectiveness in reducing entomological indices, thereby contributing to more effective dengue control strategies.

References

1. Azmawati MN, Aniza I, Ali M. Evaluation of the impact of communication for behavioural impact (COMBI) program in dengue prevention: a qualitative study in Selangor, Malaysia. *BMC Public Health*. 2021;21(1):2094. doi:10.1186/s12889-021-12128-5
2. Shuaib F, Thein TL, Loke P, *et al*. Integrating community engagement strategies in school-based dengue prevention: a Malaysian case study. *Trop Med Int Health*. 2022;27(4):431-439. doi:10.1111/tmi.13774
3. Abu Bakar S, Wong PF, Ng LC. Update on dengue epidemiology in Malaysia. *Front Cell Infect Microbiol*. 2020;10:328. doi:10.3389/fcimb.2020.00328
4. Mazrura S, Norhaida MZ, Azmi MN, *et al*. Community knowledge and practices in dengue prevention: a comparative study in urban and rural Malaysia. *Int J Environ Res Public Health*. 2023;20(6):5123. doi:10.3390/ijerph20065123
5. Zaki R, Khalid F, Ong GJ, *et al*. Implementation of school-based dengue surveillance and prevention programs in Malaysia: challenges and opportunities. *Am J Trop Med Hyg*. 2022;106(2):435-442. doi:10.4269/ajtmh.21-0821

OESHPP56 / 438

Expanding MyVAS for HIV Screening: A Case Report on Integrating Public Health Services into Malaysia's National Provider Platform

Nurain Amirah Zolkefli¹, Nurul Zariffa Saat¹, Siti Aishah Iskandar¹, Lee Wei Jia¹, Maheshwara Rao Appannan¹, Vivek Jason Jayaraj¹

¹Digital Health Division, Ministry of Health Malaysia

Corresponding author's email: amirah.zolkefli@moh.gov.my

Summary

This case report presents the adaptation and implementation of a HIV screening module within MyVAS, the provider portal of Malaysia's MySejahtera health application. Originally developed for COVID-19 vaccination tracking, the functionality of MyVAS was later expanded to support multiple public health modules through collaboration among various stakeholders within and outside the Ministry of Health (MOH). The HIV screening module, in particular, was co-developed by the MOH and the Malaysian AIDS Foundation to strengthen outreach-based HIV services, enabling systematic screening, risk assessment, and commodity distribution for key populations.

Results show improved efficiency, centralized data access, and program scalability. Lessons learned highlight the potential of national digital infrastructure in strengthening integrated public health systems beyond the pandemic.

Keywords

Digital health, HIV screening, MySejahtera, MyVAS, Public Health Mobile Applications

Introduction

The COVID-19 pandemic accelerated the adoption of digital health tools in Malaysia, with MySejahtera emerging as a nationwide public health application for contact tracing, case management, and vaccination¹. Recognizing its potential, the Ministry of Health and Malaysian AIDS Foundation (MAF) collaborated to expand MySejahtera's staff portal; MyVAS to include a digital HIV screening module. This initiative aimed to streamline the workflow of outreach teams, enable real-time data collection, and tracking of commodities distributions for key populations. The intervention involved integrating and utilizing this new module, designed to facilitate systematic screening, risk assessment, and tracking of commodity distribution by outreach workers under MAF using mobile devices^{2,3}. This case study details the nationwide adaptation and implementation of a digital HIV screening module within MyVAS, specifically focusing on outreach-based public health services for key populations^{4,5}.

Materials and Methods

The intervention involved integrating and utilizing this new module, designed to facilitate systematic screening, risk assessment, and tracking of commodity

distribution by outreach workers under MAF using mobile devices. Multiple engagement and discussions between stakeholders were done and previous data collection methods revised and integrated to develop this module. Data for this report were electronically collected through the MyVAS platform between March 1, 2024, and March 1, 2025, encompassing electronic screening records, risk assessment data, commodity distribution tracking, real-time reporting data, and metrics on data completeness, consistency, and accountability. The primary users were outreach workers delivering HIV and STD services from MAF, while the beneficiaries were individuals from key populations receiving these services. The HIV Community Module in MyVAS served as the core material and data collection tool for this initiative.

Results and Discussion

Following its nationwide rollout in February 2024, the digital MyVAS module facilitated electronic recording of HIV and STD screenings and risk assessments, alongside tracking of related commodities distributions to key populations like needles, lubricants and condoms. Health providers and outreach workers utilized mobile devices to enter client information, screening outcomes, and distributed commodities. Initial implementation demonstrated enhanced tracking of service uptake and commodity distribution, enabling real-time reporting for program managers. Furthermore, the system led to improved data completeness and consistency, contributing to increased accountability in service delivery. In a period of a year, more than 95,000 screening done by 243 volunteers. One key insight from the collected data is that men who have sex with men (MSM) were found to be more concentrated in urban areas. This finding supports more efficient supply chain planning and targeted allocation of screening commodities for this population.

The digitization of screening workflows through the MyVAS module was found to reduce administrative burden and improve data quality, fostering better integration of services across partners. While the module successfully demonstrated the feasibility and utility of leveraging existing national digital platforms for broader public health interventions, challenges were encountered. These included the need for adequate staff training, issues with inconsistent internet access in rural areas, and the ongoing necessity of ensuring robust client confidentiality within the digital system. Despite these hurdles, the initiative highlighted the potential of such platforms beyond their initial pandemic response purpose.

Conclusion

The integration of an HIV and STD screening module within MyVAS showcases how digital tools initially designed for pandemic response can be successfully adapted for ongoing public health needs. This case supports the broader digital health transformation agenda in Malaysia, emphasizing scalability, cross-sector collaboration, and client-centered service delivery. Future efforts will focus on further integration with other public health programs, and strengthening analytics capabilities for decision-making.

References

1. Ministry of Health Malaysia. (2021). MySejahtera: COVID-19 Management App.
2. Malaysian AIDS Foundation. (2022). Digital Innovations in HIV Outreach Services.
3. Ministry of Health Malaysia. (2024). Mid-Term Review of National Strategic Plan for Ending AIDS 2016-2030.
4. World Health Organization. (2021). Global Strategy on Digital Health 2020-2025.
5. UNAIDS. (2022). Key Populations Atlas: Malaysia.

OESHPP57 / 440

Evaluation of the Chance2Act Behavioural Intervention (Chance2act) for Weight Loss Readiness among Adults with Type 2 Diabetes and Obesity

Noraini Mohd Saad ¹, Mariam Mohamad ², Aimi Nadira Mat Ruzlin ², Mohd Hafeez Intiaz Hussein ¹

¹ Kuantan District Health Office, Pahang

² Department of Public Health Medicine, Faculty of Medicine, Universiti Teknologi MARA, Sg Buloh Campus

Corresponding author's email: noraini.ms@moh.gov.my

Summary

The Chance2Act intervention was a web-based programme grounded in the Transtheoretical Model. It supports behaviour change among adults with type 2 diabetes and obesity who were initially not ready to initiate weight loss efforts. This study aimed to evaluate the effects of the intervention in facilitating progression through the stages of change and improving dietary self-efficacy constructs. After two months of intervention, significant advancement was observed across stages of change, with notable improvement in the 'availability' construct of dietary self-efficacy. Although improvements in other constructs were less marked, the overall findings indicate that the Chance2Act intervention is a feasible and promising approach for primary care settings. Extending the intervention duration may enhance its effectiveness and promote sustained behaviour change.

Keywords

Behaviour, glucose intolerance, overweight, Stages of Change, weight loss

Introduction

In adults with type 2 diabetes (T2D), weight loss has been shown to improve haemoglobin A1C, blood pressure, triglyceride levels, health-related quality of life, and reduce the need for medications¹. Although the majority of patients with T2D are either overweight or obese, many are not ready to act for weight loss. This study aimed to evaluate a behavioural change intervention for adults with T2D and obesity who are not ready to act for weight loss.

Materials and Methods

This pilot study was implemented as an unblinded, single-arm intervention conducted from April to December 2023 at Beserah Health Clinic, Kuantan, Pahang. Eligible participants were adults with type 2 diabetes (T2D), a BMI ≥ 23 kg/m², and in the early stages of behavioural change (precontemplation, contemplation, or preparation) for weight loss. Participants were recruited through purposive sampling and received the Chance2Act web-based behavioural intervention in addition to usual clinic care. Readiness to change was assessed using the S-Weight questionnaire, while dietary self-efficacy was measured using a validated scale. Data

were analysed using SPSS. Intention-to-treat analysis was performed, including participants with a complete baseline and at least one follow-up measurement. The analysis was conducted using McNemar's test for binary outcomes and repeated measures ANOVA for continuous variables. Statistical significance was set at $p < 0.05$ with a 95% confidence interval.

Results and Discussion

A total of 46 participants completed the Chance2Act intervention. The majority were female (60.9%), Malay (93.5%), and had primary or secondary education (67.4%). At baseline, most participants were in the contemplation (39.1%) or preparation (32.6%) stage for weight loss. After two months, a statistically significant improvement was observed in participants' progression across the stages of change ($P = 0.02$), indicating positive behavioural movement toward action. However, the proportion of participants classified as 'ready to act' did not show statistically significant change ($P = 0.18$), potentially due to the limited sample size (refer Table 1 and Table 2).

Table 1: Effects of the Chance2Act Intervention on the Readiness to Change for weight loss after two months (n = 46)

Variable		Time point: 2 months		Total frequency	P-value
Proportion of being ready for change		Not ready	Ready		
Time point: 1 month	Not ready	22 (47.8)	10 (21.7)	32 (69.6)	0.18
	Ready	4 (8.7)	10 (21.7)	14 (30.4)	

Statistical test: McNemar. Statistical significance at $\alpha = 0.05$

Table 2: Effects of the Chance2Act Intervention on the progress across the Stages of Change for weight loss after two months (n = 46)

Variable		Time point: 2 months		Total frequency	P-value
Proportion of progress across stages of change		Regress or static	Progress		
Time point: 1 month	Regress static	7 (15.2)	11 (23.9)	18 (39.1)	0.02
	Progress	2 (4.3)	26 (56.5)	28 (60.9)	

Statistical test: McNemar. Statistical significance at $\alpha = 0.05$

For the secondary outcomes (refer Table 3), a significant improvement was observed in the self-efficacy for healthy diet under the availability subscale, both at one month ($P = 0.002$) and two months ($P = 0.03$), with a small effect size (partial $\eta^2 = 0.15$), but strong observed power (96%). This suggests increased confidence in

managing food-related challenges, particularly during weekends, at parties, and when unhealthy foods are present. No significant changes were found in other self-efficacy subscales.

Table 3: Effects of the Chance2Act intervention on the Self-efficacy for Healthy Diet (n = 46)

Variable	Time Point	MD	95% CI (Lower - Upper)	P-value	Partial η^2	Observed Power
Negative emotions	Baseline vs 1 month	-1.76	-4.53 - 1.01	0.36	0.05	0.41 ^h
	Baseline vs 2 months	-2.00	-4.88 - 0.88	0.27		
Availability	Baseline vs 1 month	-3.52	-5.91 - -1.13	0.002	0.15	0.96
	Baseline vs 2 months	-2.70	-5.14 - -0.25	0.03		
Social pressure	Baseline vs 1 month	-1.20	-3.64 - 1.25	0.69	0.07	0.55
	Baseline vs 2 months	-2.32	-4.87 - 0.22	0.08		
Physical discomfort	Baseline vs 1 month	0.74	-1.91 - 3.39	>0.95	0.01	0.11
	Baseline vs 2 months	0.76	-1.54 - 3.06	>0.95		
Positive activities	Baseline vs 1 month	-0.35	-2.84 - 2.14	>0.95	0.01	0.06
	Baseline vs 2 months	-0.02	-2.42 - 2.38	>0.95		

Repeated Measures ANOVA within group analysis was applied followed by pairwise comparison with 95% confidence interval adjustment by Bonferroni correction. ^hHyunh-Feldt correction was applied to meet the assumption of compound symmetry. Assumptions of normality and homogeneity of variances were checked and fulfilled. Statistically significant is at $\alpha < 0.05$. Abbreviations: MD, Mean Difference. CI, Confidence Interval.

These preliminary findings suggest that the Chance2Act intervention shows promise in promoting behavioural progress and improving certain aspects of dietary self-efficacy. Although readiness to act did not improve significantly, the observed behavioural shifts are encouraging. Previous evidence indicates that longer interventions—typically lasting nine to ten months—enable up to two-thirds of participants to achieve and maintain weight loss². Moreover, at least 12 contacts are recommended to deliver effective weight management programmes in primary care³. Given this pilot's two-month duration, a longer intervention may be necessary to achieve more substantial and sustained outcomes⁴.

Conclusion

The Chance2Act intervention showed promise in advancing stages of change and improving perceived availability for healthy diet. However, limited effects on other constructs suggest that a longer intervention or follow-up may be needed to enhance outcomes. Further evaluation in larger, controlled studies is recommended for broader application

References

1. Delahanty LM. Weight loss in the prevention and treatment of diabetes. *Prev Med (Baltim)* [Internet]. 2017;**104**:120-3. Available from: <https://doi.org/10.1016/j.ypmed.2017.07.022>
2. Olateju IV, Ogwu D, Owolabi MO, Azode U, Osula F, Okeke R, et al. Role of behavioral interventions in the management of obesity. *Cureus*. 2021;**13**(9):9-14.
3. Madigan CD, Graham HE, Sturgiss E, Kettle VE, Gokal K, Biddle G, et al. Effectiveness of weight management interventions for adults delivered in primary care: systematic review and meta-analysis of randomised controlled trials. *BMJ*. 2022;**376**:e068215.
4. Sullivan GM, Feinn R. Using effect size—or why the p value is not enough. *J Grad Med Educ*. 2012;**4**(3):279-82.

OESHPP58 / 274

Tobacco Advertising Exposure Among Malaysian Adults: Key Findings from GATS 2023

Nurzaime Zulaily¹, Hamizatul Akmal Abd Hamid¹, Thamil Arasu Saminathan¹, Tania Gayle Robert Lourdes¹, Muhammad Fadhli Mohd Yusoff¹

¹ *Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia*

Corresponding author's email: nurzaime@moh.gov.my

Summary

Tobacco advertising remains a key driver of tobacco use, particularly among youth and non-smokers. Using data from the Global Adult Tobacco Survey (GATS) 2023, this cross-sectional study assessed exposure among Malaysian adults aged ≥ 15 years. Findings showed that 14.1% were exposed to electronic cigarette ads and 18.3% to tobacco cigarette ads, with higher rates among current users. The most common sources of exposure were digital platforms (9.1%) and in-store promotions (8.3%). These findings highlight the persistent exposure despite existing regulations. Targeted policy actions—such as enhanced regulation of digital advertising and comprehensive bans on point-of-sale promotions—are urgently needed to curb tobacco use and prevent initiation.

Keywords

Adults, Global Adult Tobacco Survey, Malaysia, tobacco advertising, promotion and marketing, tobacco use

Introduction

Tobacco advertising and promotion continue to play a significant role in shaping tobacco use behaviours, particularly among vulnerable populations (1). Despite existing regulations, tobacco companies continue to find innovative ways to market their products, often exploiting loopholes in advertising bans. Research indicates that people in ASEAN countries, from adolescence into adulthood, are regularly exposed to tobacco advertising, which may contribute to positive perceptions of tobacco brands and increase the risk of use. Point-of-sale (POS) advertisements and promotions, in particular, have been identified as a major source of exposure (2). This study aims to assess the extent of exposure to tobacco advertising and promotions among Malaysian adults and identify the most common sources of exposure.

Materials and Methods

Data from the Global Adult Tobacco Survey (GATS) 2023—a nationally representative, cross-sectional survey of 4,269 Malaysian adults aged 15 years and above—were analysed. The survey used a multi-stage stratified sampling design to ensure representation across key demographic groups, including age, geographic location, education level, and ethnicity. Participants were asked whether they had noticed 11 types of tobacco advertising and seven types of promotions (e.g.,

discounts, free samples) in the past 30 days. Respondents were also asked about their awareness of public events linked to cigarette brands or tobacco companies. Descriptive statistics (frequencies and percentages) were used to estimate exposure prevalence. Differences in proportions between groups (e.g., smokers vs. non-smokers; users vs. non-users) were tested using chi-square tests, with statistical significance set at $p < 0.05$. Statistical analysis was conducted using IBM SPSS Version 29.

Results and Discussion

Overall, tobacco smokers and electronic cigarette users in Malaysia had higher prevalence among urban residents (83.8% vs. 74.6%, $p < 0.05$), adults aged 25-44 years (52.3% vs. 55.8%, $p < 0.001$), Malay (58.9% vs. 58.8%, $p < 0.05$), and those with at least secondary education (47.8% vs. 51.1%, $p < 0.05$). The study found that 14.1% of Malaysian adults were exposed to electronic cigarette advertising, with significantly higher rates among current users (40.5%) compared to non-users (12.6%) ($p < 0.001$). Digital platforms—particularly the internet (9.1%), and in-store promotions (8.3%) were the most common sources of exposure. Exposure to traditional media was also reported, including television (2.0%) and billboards (2.6%). Among current smokers, 23.5% noticed in-store promotions for tobacco cigarettes, indicating persistent marketing efforts targeting this group. These findings highlight the widespread reach of tobacco advertising in Malaysia, despite existing regulations. High exposure among users suggests effective targeted marketing, while notable exposure among non-users raises concerns about smoking initiation. The study emphasises the urgent need for comprehensive advertising bans that include digital platforms to curb tobacco use. The continued use of multi-channel marketing strategies reflects the tobacco industry's ability to bypass regulations. Disproportionate exposure among urban youth aligns with global patterns of industry targeting (3). Despite existing bans, the ongoing presence of digital and in-store promotions, suggests enforcement gaps consistent with issues highlighted in Malaysia's National Strategic Plan for Tobacco Control (4). The 12.6% exposure among non-users is particularly concerning, as it may contribute to smoking initiation, as supported by longitudinal evidence (5).

Conclusion

The findings from this study reveal widespread exposure to tobacco advertising among Malaysian adults, particularly through digital and in-store channels. Stricter enforcement of advertising bans and collaborative, comprehensive regulations involving both government and non-governmental organisations are needed to reduce exposure, especially among non-smokers and youth, to curb the rising prevalence of tobacco use in Malaysia.

References

1. Pettigrew S, Santos JA, Pinho-Gomes AC, Li Y, Jones A. Exposure to e-cigarette advertising and young people's use of e-cigarettes: A four-country study. *Tob Induc Dis*. 2023;21(October):1-8.
2. Stubbs T. Commercial determinants of youth smoking in ASEAN countries: A narrative review of research investigating the influence of tobacco advertising,

- promotion, and sponsorship. *Tob Induc Dis.* 2021;19:61.
3. Eijk Y Van Der, Tan G, Ping P, Ong SE, Tan G, Xin L, et al. E-Cigarette Markets and Policy Responses in Southeast Asia: A Scoping Review. *Int J Heal Policy Manag.* 2021;11(9):1616-24.
 4. Sektor Kawalan Tembakau dan Urusetia FCTC Bahagian Kawalan Penyakit. *Pelan Strategik Kebangsaan Bagi Kawalan Tembakau 2021-2030.* 2021.
 5. Agaku IT, Davis K, Patel D, Shafer P, Cox S, Ridgeway W, et al. A longitudinal study of the relationship between receptivity to e-cigarette advertisements and e-cigarette use among baseline non-users of cigarettes and e-cigarettes, United States. *Tob Induc Dis.* 2017;15(1):1-7.

Table 1: Sociodemographic variables of the respondents (n=4,269)

Variables	Estimated population	Current electronic cigarette users	Current tobacco smoker
Strata	25,142,400		
Urban		83.8 (80.1, 86.9)*	74.6 (70.8, 78.0)*
Rural		16.2 (13.1, 19.9)	25.4 (22.0, 29.2)
Age group (years)	25,142,399		
15-24		34.6 (23.7, 47.4)**	15.6 (11.6, 20.5)**
25-44		52.3 (41.5, 62.9)	55.8 (50.7, 60.8)**
45-64		11.9 (6.5, 21.0)	24.0 (20.1, 28.3)**
65 or older		1.1 (0.3, 4.1)	4.7 (3.3, 6.4)
Ethnicity	25,125,943		
Malay		58.9 (46.8, 70.0)	58.8 (52.5, 64.7)
Chinese		15.5 (8.2, 27.3)	12.7 (8.8, 18.0)
Indian		9.8 (3.8, 23.3)	7.8 (5.1, 11.8)
Others		15.8 (11.2, 21.7)	20.8 (16.6, 25.6)
Education levels	24,857,116		
Less than primary completed		0.6 (0.2, 2.2)	3.4 (2.2, 5.2)
Primary completed		21.8 (14.0, 32.2)	25.3 (21.0, 30.2)*
Secondary completed		47.8 (36.1, 59.7)*	51.1 (46.3, 56.0)*
University or above		29.8 (20.9, 40.6)**	20.1 (15.4, 25.8)

Data are presented as % (95% CI); Chi-square test/ ANOVA for variables within users or smokers, ***p*-value <0.001, **p*-value <0.05

Table 2: Percentage of adults aged ≥ 15 years who were exposed to different types of cigarette advertisements and promotions in Malaysia, GATS 2023 (n=4,269)

	Electronic cigarette			Tobacco cigarette		
	Overall	Current non-users	Current users	Overall	Current smokers	Non-current smoker
Places						
<i>Noticed electronic/ tobacco cigarette advertisements</i>						
In stores where cigarette ^a sold	6.2	5.8	13.3*	6.8	6.6	7.9
On television	2.0	1.9	4.1*	4.4	4.5	4.4
On the radio	1.3	1.2	2.3*	3.4	3.0	4.9
On billboards	2.6	2.4	5.7**	4.2	4.1	4.5
On posters	3.9	3.6	8.5*	5.0	4.9	5.2
In newspapers or magazines	1.3	1.2	2.3*	3.2	3.1	3.8
In cinemas	0.7	0.6	2.1	2.0	2.0	2.1
On the internet	9.1	8.3	21.4**	8.3	8.3	8.1
On public transportation	1.3	1.2	3.6*	2.8	2.9	2.5
On public walls	1.5	1.3	4.5*	3.6	3.5	4.1
Somewhere else	0.4	0.3	2.3*	0.3	0.2	0.8
Noticed any public event associated with cigarette ^a /liquid brands or companies	1.0	0.9	2.5*	1.4	1.4	1.5*
<i>Noticed cigarette^a promotions</i>						
Free samples	0.6	0.4	4.8*	1.6	1.4	2.4**
Sale prices	1.1	1.0	2.3*	1.3	1.3	1.3*
Coupons	0.1	0.1	0.4	0.3	0.3	0.5**
Free gifts/discounts on other products	2.5	1.7	16.7**	1.4	1.2	2.3*
Clothing/item with brand name or logo	0.6	0.5	1.8*	1.1	0.8	2.5**
Mail promoting cigarettes	0.1	0.1	0.1	0.2	0.1	0.4*
One-to-one sales promotion	0.7	0.4	5.3*	0.8	0.7	1.6
Noticed any in-store advertising or promotion of cigarette ^a	8.3	7.1	27.3**	8.8	8.3	10.5*
Noticed any advertisement, sponsorship, or promotion	14.1	12.6	40.5**	18.3	17.1	23.5*

^aeither electronic cigarette or tobacco cigarette; Pearson Chi-square test variables within users or smokers, **p-value <0.001, *p-value <0.05

OESHPP59 / 349

The Impact of Air Pollution-Related Mortality in Malaysia: Assessing the Burden of Disease and Economic Consequences

Mohamad Iqbal M¹, Nor Zam Azihan MH², Mohd Azahadi O³

¹ *Institute for Medical Research, National Institute of Health Malaysia (NIH), Ministry of Health Malaysia, 40170 Shah Alam, Selangor Darul Ehsan, Malaysia*

² *Institute for Health Systems Research, NIH Malaysia, Ministry of Health Malaysia, 40170 Shah Alam, Selangor Darul Ehsan, Malaysia*

³ *Sector for Biostatistics and Data Repository, Office of NIH Manager, NIH Malaysia, Ministry of Health Malaysia, 40170 Shah Alam, Selangor Darul Ehsan, Malaysia*

Corresponding author's email: dr.miqbal@moh.gov.my

Summary

The study estimated health costs of PM_{2.5}-related mortality in Malaysia using data from remote sensing, air quality, and mortality statistics. The cost increased from MYR 3.3 billion in 2000 to MYR 5.1 billion in 2008, then MYR 12.7 billion in 2013, almost four percent of Malaysia's Gross Domestic Product (GDP). It showed rising healthcare costs due to the disease burden from PM_{2.5}. Policymakers are urged to act as these increasing costs could drain significant resources from the healthcare system and the country.

Keywords

PWEL, ambient PM_{2.5}, burden of disease, DALY, health cost

Introduction

Air pollution is a significant global health risk, affecting over 90% of the world's population. Fine particulate matter (PM_{2.5}) can cause respiratory and cardiovascular diseases (1). In 2019, air pollution caused about 4.2 million premature deaths, primarily in the Western Pacific and Southeast Asia (WHO, 2022). The economic burden involves mortality and morbidity costs, assessed using the Value of Statistical Life (VSL) and the Value of Life (2). Globally, PM_{2.5}-related health costs in 2019 amounted to USD 8.1 trillion or 6.1% of global GDP, ranging from 1.7% in North America to 12.9% in China (3). In Malaysia, there are limited studies that utilized the Burden of Disease (BOD) data to understand the national impact of ambient PM_{2.5} and its cost implications.

Materials and Methods

The objective of this research was to evaluate the health costs associated with ischemic heart disease (IHD), stroke, lung cancer, chronic obstructive pulmonary disease (COPD), and acute lower respiratory infections (ALRI) in children under the age of five for the years 2000, 2008, and 2013. We used the mortality data from these three specific years as they were the only verified mortality figures from IPH. The study population of children under 5 years old were used for children under 5 ALRI. Data were sourced from Malaysia's population censuses, medically certified death data, and Disability-Adjusted Life Years (DALYs) from the Department of

Statistics Malaysia and the Institute for Public Health. The population-weighted exposure level (PWEL) of PM_{2.5} concentrations for all Malaysian states was determined using air quality monitoring data from the Department of Environment, AERONET data, and Terra-MODIS aerosol products. The sum of all states PWEL were then averaged for Malaysia. The AirQ+ 2.2.4 software was used to calculate mortality proportions for each disease during the specified years.

DALY calculations were based on methodologies outlined by Prüss-Üstün et al. (4) and country-specific Years in Life Disability (YLD) factors from World Health Organization data. The economic burden of air pollution was estimated by assigning monetary values to attributable DALYs, applying GDP per capita figures from the Department of Statistics Malaysia for the relevant years, adjusted to 2022 values for comparison.

Results and Discussion

The annual average PWEL PM_{2.5} values were 22 µg/m³, 18 µg/m³, and 24 µg/m³ for 2000, 2008, and 2013, respectively. These values indicate a worsening air quality, mainly due to transboundary haze in 2013. Over this period, there has been a general increase in attributable deaths and cases per 100,000 people for most diseases, reflecting the growing impact of ambient air PM_{2.5} on public health. For example, the estimated attributable deaths per 100,000 population for all-natural causes rose from 129.52 in 2000, to 138.28 in 2013. This is also observed in the increased DALYs for diseases like COPD and IHD.

The cost of all-cause death increased from MYR 3.3 billion in 2000 (DALY: 215,781.00) to MYR 5.1 billion in 2008 (DALY: 155,213.00), then increased further to MYR 12.8 billion in 2013 (DALY: 382,114.00), almost four percent of Malaysia's 2013 GDP. This is equivalent to MYR 15.8 billion when adjusted to the constant prices of 2022, showing an increased disease burden due to ambient air PM_{2.5}. The mortality costs attributed to IHD emerged as the predominant contributor to the overall economic burden, accounting for 0.41% of the total cost (MYR 4.1 billion in 2013). Stroke-related mortality was the second most significant contributor, representing 0.38% (MYR 3.9 billion in 2013) of the total burden.

Our study has limitations; we did not account for combined pollutant exposure. The quality of remote sensing data used relies on satellite images, image processing software, processing algorithms, and local atmospheric conditions to accurately retrieve AOD. The AirQ+ model we used has intrinsic uncertainties, relying on assumptions and limited evidence for specific diseases. We focused on indirect costs related to mortality without considering direct costs like hospitalization or non-health expenses (5), potentially underestimating the actual economic burden. Future research should address these gaps by exploring productivity loss and patient expenses related to PM_{2.5} mortality.

Conclusion

This study reveals the health and economic impacts of rising PM_{2.5} levels in Malaysia in 2000, 2008 and 2013. Disease mortality from PM_{2.5} pollution costs up to four percent of GDP. Thus, reduction in ambient air PM_{2.5} is important factor for public

health and economic balance. Policymakers should use these insights to review current environmental health strategies and air quality regulations.

References

1. Yue H, He C, Huang Q, Yin D, Bryan BA. Stronger policy required to substantially reduce deaths from PM_{2.5} pollution in China. *Nat Commun* [Internet]. 2020;11(1):1-10. Available from: <http://dx.doi.org/10.1038/s41467-020-15319-4>
2. Robinson LA, Hammitt JK, O’Keeffe L. Valuing Mortality Risk Reductions in Global Benefit-Cost Analysis. *J Benefit Cost Anal*. 2019 Jan 15;10:15-50.
3. Bank Group W. The Global Health Cost of Ambient PM_{2.5} Air Pollution The Global Health Cost of Ambient PM_{2.5} Air Pollution [Internet]. 2020. Available from: www.worldbank.org
4. Prüss-üstün A, Prüss-üstün A, Campbell-lendrum D, Corvalán C, Woodward A. Introduction and methods Assessing the environmental burden of disease at national and local levels. 2003;(1).
5. Jo C. Cost-of-illness studies: concepts, scopes, and methods. Vol. 20, *Clinical and molecular hepatology*. 2014. p. 327-37.

OESHPP60 / 355

Sexual and Reproductive Health Knowledge, Attitudes, and Practices Among Men in an Economically Disadvantaged Community in Kuala Lumpur, Malaysia

Wan Farizatul Shima Wan Ahmad Fakuradzi, Nor Faiza Mohd. Tohit, Siti Athirah Zafirah Abdul Rashid, Nur 'Adnin Ahmad Zaidi.

Department of Community Health, Faculty of Medicine and Defence Health, National Defence University of Malaysia

Corresponding Author Email: wanfarizatul@upnm.edu.my

Summary

This study assessed knowledge, attitudes, and practices (KAP) related to sexual and reproductive health (SRH) among adult men in an economically disadvantaged urban community. A cross-sectional survey of 104 residents in PPR Raya Permai, Kuala Lumpur, revealed that although 52.88% had high SRH knowledge, significant gaps remained. While 52.88% displayed positive attitudes, risky practices such as low condom use persisted. Regression analyses highlighted significant associations between ethnicity and knowledge but not education. Findings underscore the urgent need for culturally sensitive interventions that improve male SRH literacy and behaviour to enhance community health and well-being.

Keywords

Sexual and Reproductive Health; Knowledge Attitude Practices; Economically Disadvantaged; Urban Malaysia; Male Involvement

Introduction

Sexual and reproductive health (SRH) is critical to community well-being and is recognised as a fundamental human right [3]. While much SRH research focuses on women, engaging men is essential for equitable and effective outcomes, especially in economically disadvantaged communities. Male perceptions, attitudes, and practices influence family planning [5], STI prevention, and access to services. Cultural taboos, masculinity norms, and limited SRH education often hinder men's participation. This study investigates the SRH KAP of adult men in PPR Raya Permai, Kuala Lumpur, aiming to inform inclusive interventions. It also explores how socio-demographic factors such as ethnicity and education influence SRH knowledge.

Materials and Methods

A cross-sectional study was conducted from August to September 2024 in PPR Raya Permai. A total of 104 adult male residents were recruited through convenience sampling. Participants completed a validated, self-administered KAP questionnaire. Knowledge scores ranged from 0-16, with categorisation into low (0-5), moderate (6-11), and high (12-16). Attitudes and practices were measured using Likert scales (8-40), categorised into low (8-18), moderate (19-29), and high (30-40). SPSS 27.0 was used for statistical analysis, including descriptive statistics and multiple linear regression to assess associations between KAP scores and demographic factors such as ethnicity and education level.

Results and Discussion

Among the 104 respondents, 52.88% demonstrated high SRH knowledge, while 41.35% had moderate levels. Correct knowledge was highest on pregnancy duration (83.65%) and lowest on sperm function at high temperatures (48.01%). While 78.85% correctly identified contraceptive use, only 50.96% understood HIV transmission via sperm. Regression analysis showed a significant association between ethnicity and knowledge scores ($p < 0.05$), but not education level. Attitudes were generally favourable, with 50.48% scoring high. The majority strongly agreed that sex education is a parental responsibility (62.5%) and that premarital sex is religiously discouraged (74.04%). However, only 30.8% strongly agreed that rape victims are not at fault, revealing persistent stigma and misinformation. In terms of practices, 58.7% reported low-risk behaviours. Nonetheless, 17.3% frequently masturbated and 14.4% frequently watched pornography. Alarming, 13.5% admitted to sometimes or frequently coercing a partner into sex, indicating a need for behavioural interventions. Regression findings supported significant KAP disparities linked to cultural background.

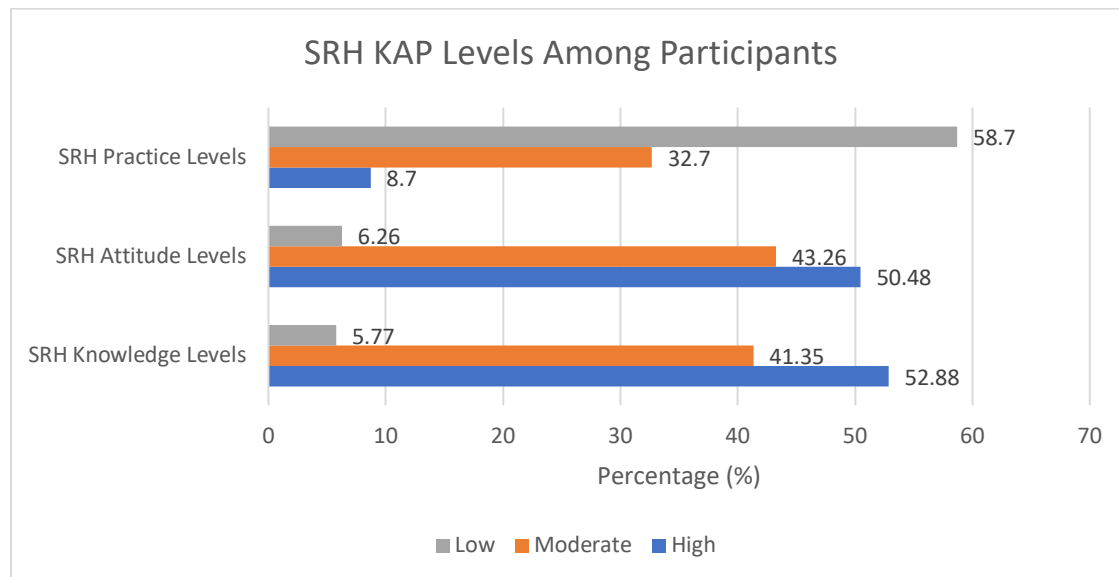


Figure 1: SRH Knowledge, Attitude and Practice Levels Among Participants

These results reinforce the importance of engaging men in SRH education tailored to their cultural and social contexts. Interventions should integrate gender-sensitive approaches and promote open communication to shift traditional norms. A targeted strategy can bridge knowledge gaps and foster healthier, more respectful practices [1,2,4].

Conclusion

This study revealed substantial gaps in SRH knowledge and practices among men in an economically disadvantaged setting. Ethnic background influenced knowledge significantly. Addressing these gaps through culturally appropriate interventions could improve male involvement in SRH and enhance overall community health outcomes.

Acknowledgments

We acknowledge the residents of PPR Raya Permai for their participation and support.

References

1. Matenga TM, Zulu JM, Corbin JH, Mweemba O. Engaging men in sexual and reproductive health in sub-Saharan Africa. *BMC Public Health*. 2021;21:1854.
2. Gopal PK, et al. Barriers to male involvement in reproductive health: A review. *Global Health Action*. 2020;13(1):1806806.
3. WHO. Defining sexual health: Report of a technical consultation on sexual health. Geneva: WHO; 2022.
4. Roudsari RL, Sharifi F, Goudarzi F. Barriers to men's participation in reproductive health care: A systematic review. *BMC Public Health*. 2023;23:818.
5. Sait W, Alahmadi H, Alghamdi A. Male contraception knowledge and perception in Saudi Arabia. *J Public Health Res*. 2021;10(1):jphr2021.2462.

OESHPP61 / 366

Healthy Malaysia in Progress: Evaluating Agenda Nasional Malaysia Sihat (ANMS) for a Sustainable Future

Logeswary Krisnan¹, Affendi Isa², Vanitha Subramaniam²

¹ *Institute for Health Behavioural Research, National Institutes of Health, Ministry of Health Malaysia*

² *Health Education Division, Ministry of Health Malaysia*

Corresponding author's email: logeswary.k@moh.gov.my

Summary

The Agenda Nasional Malaysia Sihat (ANMS), launched in 2020, is a nationwide initiative to cultivate healthier living among Malaysians. This study evaluates the effectiveness of ANMS programs, focusing on their influence on dietary practices, physical activity, and mental well-being. Findings show that while motivation to embrace healthy behaviours is high, significant gaps remain in actual engagement with physical activity and adherence to dietary guidelines. Participants also reported positive perceptions of mental well-being. These insights underscore the initiative's promise and point to the need for targeted, sustained strategies to translate motivation into consistent, health-promoting actions.

Keywords

ANMS, behavioural change, physical activity, healthy eating, mental well-being

Introduction

The Agenda Nasional Malaysia Sihat (ANMS), inaugurated in 2020, represents a strategic national commitment to improving population health through behavioural transformation. Launched in response to escalating non-communicable disease burdens and emerging mental health concerns, ANMS is spearheaded by the Ministry of Health Malaysia and implemented through a “whole-of-nation” approach. This approach involves coordinated efforts across multiple government ministries, non-governmental organisations (NGOs), and private sector partners. Central to ANMS is the *Healthy Living Culture Initiative*, an integrated framework that leverages community engagement, health education, and promotional campaigns to empower individuals and communities. Community participation is fostered through locally-led health activities, inter-agency collaborations, and grassroots mobilization, ensuring that interventions are responsive to the needs and contexts of diverse populations. This study evaluates the effectiveness of ANMS in shaping health behaviours among Malaysians, specifically in the domains of diet, physical activity, and mental well-being. By examining the real-world impact of the initiative across diverse demographic groups, this research provides critical insights into its outcomes, strengths, and limitations. The findings aim to inform future enhancements to ANMS strategies, contributing to more robust, scalable public health interventions that drive sustained behavioural change nationwide.

Materials and Methods

A cross-sectional online survey was conducted among Malaysian adults (≥ 18 years) who had participated in at least one ANMS initiative. Participants were purposively sampled from registries provided by the Health Education Division, covering programs such as Jelajah ANMS, IFitEr, Wellness Hub, WOW, BMSS, MyCHAMPION, and COMBI. The required sample size of 1,938 was calculated based on a 95% confidence level and 2.5% margin of error. A validated, self-administered questionnaire incorporating the Malaysian Healthy Lifestyle Index (Cronbach's $\alpha = 0.89$) was used to assess current health behaviours and perceived impacts of ANMS. Questions were designed to minimise recall bias by focusing on current practices and subjective perceptions rather than direct before-after comparisons. The survey was administered via Google Forms, with informed consent obtained electronically. Descriptive and inferential analyses, including chi-square and t-tests, were applied to examine associations between ANMS participation and lifestyle behaviours.

Results and Discussion

A total of 2,000 Malaysian adults (≥ 18 years) participated in the survey, with the majority being female (61.8%), aged 30-39 years (43.1%), and of Malay ethnicity (78%). The evaluation revealed that 90.3% of participants reported increased motivation to adopt healthier lifestyles due to the ANMS initiative ($p < 0.001$). However, 73.5% demonstrated insufficient engagement in moderate physical activity, indicating a gap between motivation and sustained action. Dietary assessment yielded a high mean score of 4.192 (95% CI: 4.10-4.28; $t = 94.655$; $p < 0.001$), suggesting strong adherence to *suku-suku separuh* guidelines. Mental well-being scores were notably high (mean = 2.459; 95% CI: 2.434-2.483; $t = 193.325$; $p < 0.001$), indicating a positive perception among participants engaged in the Healthy Living Culture Initiative. ANMS demonstrated clear strengths in generating motivation and improving mental well-being, likely due to its integrated, nationwide health campaigns. However, physical activity engagement remained low, possibly due to environmental or personal barriers, lack of programme continuity, or limited access in certain communities. Applying the COM-B model (Capability, Opportunity, Motivation - Behaviour) may enhance intervention design by addressing not only motivation, but also the enabling factors for actual behaviour change.

Conclusion

ANMS initiatives have effectively raised awareness and motivation for healthy living among Malaysians. However, behavioural adherence remains inconsistent, particularly in physical activity. Targeted, sustained interventions guided by behavioural science approaches are essential to bridge this gap and realise the initiative's full potential in transforming national health outcomes.

References

1. Gergen Barnett K, Sprague Martinez L, Gergen Barnett M. Youth engagement in healthcare: addressing barriers to access and preventive care. *Health City* 2023; 15(2):45-59.
2. Khaw YZ, Lim TLY, Ng JSP, et al. Behavioral impact of national health campaigns on healthy lifestyle practices among young adults in Singapore: a cross-sectional study. *BMC Public Health* 2021; 21:1-11.

3. Snyder LB. Health communication campaigns and their impact on behavior. *J Nutr Educ Behav* 2007; **39**(2 Suppl):S32-40.

OESHPP62 / 377

Parental Knowledge and Gaps: A Cross-Sectional Study on Benzene Exposure Awareness in Johor

Nabihah Ali ¹, Shamsul Bahari Shamsudin ², Haidar Rizal Toha ³

¹Kuala Terengganu District Health Office, Terengganu State Health Department, Ministry of Health Malaysia

²Department of Public Health Medicine, Faculty of Medicine & Health Sciences, Universiti Malaysia Sabah

³Johor Bahru District Health Office, Johor State Health Department, Ministry of Health Malaysia

Corresponding author's email: nabihah.ali@moh.gov.my

Summary

Parental awareness and behaviours are critical in mitigating children's exposure to environmental hazards such as benzene. This study assessed the knowledge, attitudes, and practices of parents of primary school children in Johor regarding benzene exposure. Response patterns were analysed using descriptive statistics and the Mann-Whitney U test. Overall, parents demonstrated moderate to good awareness, positive preventive attitudes, and satisfactory protective practices, although gaps remained in recognising less apparent benzene sources and maintaining consistent household preventive measures. Findings highlight the need for targeted educational interventions to strengthen parental capacity in protecting children's environmental health.

Keywords

Benzene exposure, knowledge-attitude-practice, environmental health, primary school children, Malaysia

Introduction

Benzene, a known Group 1 carcinogen, poses serious respiratory health risks, especially to children living in industrial or high-traffic areas. As a volatile organic compound, benzene is primarily released through vehicle emissions, industrial activities, and fossil fuel combustion. Children are particularly susceptible due to their developing organs and faster breathing rates, making inhalation the main route of exposure. Although dermal contact and ingestion are possible, their roles are less significant. Parental awareness and preventive actions are crucial in reducing children's exposure risks. The Benzene Exposure Knowledge, Attitude and Practice (BEKAP) questionnaire was developed and validated to measure parental awareness and behaviours. It served as part of the broader study titled Evaluating the Impact of Ambient Air Benzene Exposure on Primary School Children's Health in Johor. This study aimed to assess parents' knowledge, attitudes, and practices, ultimately guiding targeted interventions and gauging community readiness for benzene-related health prevention efforts.

Materials and Methods

This cross-sectional study was conducted from July to September 2023 among parents of primary school children aged 10 to 12 years in Pasir Gudang and Segamat, Johor. This age group was selected due to their ability to follow instructions and the alignment with single-session rural school schedules, ensuring standardised comparisons between settings. A proportionate sampling method was employed to recruit participants from both urban and rural schools. The minimum required sample size was 166, calculated using the proportion test with G*Power Program software (version 3.1.6). Eligible participants were parents or guardians who could read and understand Malay. A total of 334 parents completed the self-administered, validated BEKAP questionnaire. The knowledge, attitude, and practice domains comprised 20, 19, and 7 items respectively, with scores classified as “good” if above the median and “poor” if at or below. Data were analysed using SPSS version 29.0.

Results and Discussion

The BEKAP questionnaire was completed by 334 parents of primary school children aged 10 to 12 years, with an average child age of 11 in both urban and rural areas. Urban schools contributed 173 participants (70 males, 103 females), and rural schools 161 participants (73 males, 88 females). Most respondents were Malay (94.6%). Parental knowledge scores ranged from 0 to 20, with a median of 13.50 (IQR: 6.00), reflecting a mean correct response rate of 61.15%. As in previous environmental health studies, parents were more aware of outdoor air pollution sources, such as traffic and industry, than of indoor sources like tobacco smoke, poor ventilation, and household chemicals¹⁻³. A majority (86.2%) showed positive attitudes toward benzene risk prevention, while 13.8% had negative attitudes. Practice scores ranged from 8 to 35, with a median of 24.00 (IQR 8.00). About 54.8% demonstrated good preventive practices, including frequent handwashing before meals during pregnancy, avoiding indoor smoking, limiting children’s involvement in open burning, and reducing exposure to benzene-related activities like home renovations and painting.

Correlation analysis (Table 1) revealed a strong positive relationship between knowledge and attitude ($r = 0.556$, $p < 0.001$), suggesting that greater awareness was associated with better attitudes. However, weak negative correlations between knowledge and practice ($r = -0.131$, $p = 0.017$), and attitude and practice ($r = -0.133$, $p = 0.015$), suggest that good intentions do not consistently translate into action. This aligns with findings from environmental behavior literature and recent studies on parental responses to tobacco smoke exposure⁴. Comparing locations (Table 2), rural and urban parents displayed comparable knowledge (61.3% vs. 61.2%), attitudes (86.3% vs. 86.1%), and practices (55.3% vs. 54.3%), with no significant differences ($p > 0.05$). This indicates that both groups had comparable access to health information and likely shared behavioural norms, possibly due to widespread campaigns or similar environmental influences.

Table 1: Correlations Between Knowledge, Attitude And Practice Scores.N=334; r: correlation coefficient; *Spearman correlation

Variables		Knowledge	Attitude	Practice
Knowledge	r-value	1	0.556*	-0.131*
	p-value		<0.001	0.017
Attitude	r-value	0.556*	1	-0.133*
	p-value	<0.001		0.015
Practice	r-value	-0.131*	-0.133*	1
	p-value	0.017	0.015	

Table 2: Comparison of BEKAP Scores by Location

BEKAP Score	Urban (n=173)		Rural (n=161)		Z-stat	p-value*
	Range	Median (IQR)	Range	Median (IQR)		
Knowledge	0-20	14.0 (6.0)	0-20	13.0 (6.0)	-0.099	0.921
Attitude	-9-19	10.0 (8.0)	-5-19	10.0 (8.0)	-0.433	0.665
Practice	8-35	24.0 (9.0)	12-35	24.0 (6.0)	-0.556	0.578

N=334; IQR: Interquartile range; *Mann-Whitney test p-value

Conclusion

These findings highlight that while parental awareness of benzene exposure is generally adequate, translating it into consistent preventive behaviour remains a challenge. Effective interventions should combine education with behaviour change strategies tailored to the household and community.

References

1. Yamada M, Nakazawa M. Status of home-based secondhand smoke exposure among children and its association with health risks in Japan. *Prev Med Rep* [Internet]. 2024; **38**(December 2023):102585. Available from: <https://doi.org/10.1016/j.pmedr.2023.102585>
2. Scheepers PTJ, Konings J, Demirel G, Gaga EO, Anzion R, Peer PGM, et al. Determination of exposure to benzene, toluene and xylenes in Turkish primary school children by analysis of breath and by environmental passive sampling. *Sci Total Environ* [Internet]. 2010; **408**(20):4863-70. Available from: <http://dx.doi.org/10.1016/j.scitotenv.2010.06.037>
3. Petropoulou P. Environment and public health: how the environment affects children's health and quality of life. *Int J Environ Res Public Health*. 2025; **17**(1):1-13.

4. Dai S, Au CT, Chan MHM, Kam RKT, Li AM, Chan KCC. Parental knowledge, attitude, and practice on tobacco use, smoking cessation, and children's environmental tobacco smoke exposure. *Front Public Health*. 2021; **9**(11):1-10.

OESHPP63 / 398

Prevalence of Food insecurity among adult in Malaysia: Findings from the National Health and Morbidity Surveys 2024

Ahmad Ali Zainuddin¹, Mohd Azmi Suliman¹, Ruhaya Saleh¹, Murnizar Mokhtar¹, Hasimah Ismail¹, Teh Wai Siew², Norashikin Ramlan², Khairul Zarina Mohd Yusop²

¹ *Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia*

² *Nutrition Division, Ministry of Health Malaysia*

Corresponding author's email: ahmadali@moh.gov.my

Summary

Food security refers to the ability of individuals to access sufficient, safe, and nutritious food to meet their dietary needs for an active and healthy life. The food insecurity experience scale (FIES) developed by the Food and Agriculture Organization of the United Nations (FAO) was used for the assessment of food insecurity¹. The objective of this study was to determine the prevalence of food insecurity among adults in Malaysia. The Rasch model was applied to examine the validity and reliability.

Keywords

food insecurity, food insecurity experience scale, adults

Introduction

Malaysia embraced the Food and Agriculture Organization of the United Nations (FAO) definition of food security in 2002, which defines it as a situation where all individuals, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food to meet their dietary needs and preferences for an active and healthy life. This definition encompasses the ability of individuals to obtain a food supply that is sufficient in quantity and quality, should be culturally acceptable, and be available at all times throughout the year¹. Notably, the prevalence of severe food insecurity at the global level experienced a gradual rise from 9.1% in 2019 to 11.1% in 2021 and stabilized at 10.8% in 2022 and 10.7% in 2023². The findings also demonstrated that the prevalence of food insecurity in Malaysia was lower than the estimates reported by the FAO (5.8%)².

Materials and Methods

The National Health and Morbidity Survey (NHMS) 2024 was a cross-sectional survey with a complex survey study design which included the Food Insecurity Experience Scale (FIES) data collected from 1,477 adults residing in non-institutional living quarters. The sampling frame for this survey derived from the updated National Population and Housing Census 2020. Data quality and consistency with assumptions of the Rasch measurement model were checked. Descriptive analysis and proportion analysis using Rasch were employed. All data were analysed using SPSS version 25.0.

Results and Discussion

The infit statistics were between 0.75 and 1.14, which was within the recommended range (Table 1). The high correlation of 94.5% between the common items indicates that the FIES items were consistent with each other. Finally, the Rasch reliability value of 0.76 suggested that the eight-item scale reflects reasonably good model fit. The study found that the national prevalence of moderate or severe food insecurity among adults was 8.6% and severe food security was 1.1% (Table 2). The prevalence of moderate or severe food insecurity was higher in the rural areas (11.1%) compared to urban areas (7.8%). The prevalence among males and females were 8.2% and 9.0% respectively. By ethnicity, the Others category had the highest prevalence at 17.2% followed by the Other Bumiputera group at 16.1%, Indians at 8.0%, Malays at 6.6% and Chinese at 5.8%. The prevalence among singles and married or cohabiting were 8.3% and 8.7% respectively. The prevalence of overall moderate or severe food insecurity was highest among those without formal education at 21.5%, not working (9.4%) and those from the B40 group at 11.9% (Table 3).

Table 1: Infit and outfit test, measuring the validity of FIES among adults

Question item	Severity	Infit	Outfit
Worried about not having enough food	-3.163	1.133	2.758
Unable to eat healthy and nutritious food	-1.086	1.142	1.310
Ate only a few kinds of food	-1.120	0.938	0.944
Skipped a meal	0.332	0.905	0.911
Ate less than you thought you should	-0.185	0.752	0.655
Ran out of food	1.400	1.073	0.710
Were hungry but did not eat	0.944	0.845	0.491
Went a whole day without eating	2.879	1.022	1.552

Table 2: Prevalence of Food Insecurity by Severity among Adult Aged 18 Years and Above in Malaysia (n = 1,477)

Indicators	Estimated Population	Prevalence (%)	95% CI	
			Lower	Upper
Moderate or Severe	2,128,566	8.6	6.68	10.48
Severe	265,540	1.1	0.72	1.42

Table 3: Prevalence of Moderate and Severe Food Insecurity among Adult Aged 18 Years and Above in Malaysia by Socio-demographic Characteristic (n = 1,477)

Sociodemographic	Estimated Population	Prevalence (%)	95% CI	
			Lower	Upper
MALAYSIA	2,128,566	8.6	6.68	10.48

<i>Location</i>				
Urban	1,488,083	7.8	5.58	10.05
Rural	640,483	11.1	7.62	14.56
<i>Sex</i>				
Male	1,077,558	8.2	5.71	10.75
Female	1,051,008	9.0	6.88	11.04
<i>Ethnicity</i>				
Malay ^a	782,365	6.6	4.85	8.26
Chinese	270,389	5.8	3.20	8.41
Indian	187,710	8.0	3.21	12.85
Other Bumiputera	508,876	16.1	10.03	22.24
Others	468,277	17.2	7.42	26.89
<i>Marital Status</i>				
Single ^b	786,291	8.3	5.35	11.31
Married or cohabiting	1,342,275	8.7	6.31	11.17
<i>Education Level</i>				
No Formal Education	418,715	21.5	11.93	31.06
Primary School	454,781	16.5	11.90	21.01
Secondary School	1,073,416	6.4	4.68	8.16
Tertiary Education*	-	-	-	-
<i>Occupation</i>				
Government Employee*	-	-	-	-
Private Employee	740,167	8.1	4.98	11.29
Self Employed	319,732	8.3	5.19	11.36
Not Working ^c	956,178	9.4	6.29	12.58
<i>Household Income Group</i>				
B40	1,797,171	11.9	9.04	14.80
M40	264,366	3.8	1.17	6.37
T20*	-	-	-	-

*Prevalence with high RSE

a - Malay includes Orang Asli

b - Never married or divorced or separated or widowed

c - Not working includes unpaid worker, homemaker, retiree, student, unemployed, health problem and old age

This study provides the first nationally representative prevalence data on food insecurity among Malaysian adults using a validated experiential scale. Key subgroups such as rural residents, lower-income households, and those without formal education were at elevated risk, highlighting the need for integrated food and nutrition policy responses. These may include community food pantries, income support programmes, and embedding FIES modules into routine health surveillance.

However, as this was a cross-sectional design, it restricts causal inference. Self-reported data may be subject to recall or social desirability bias.

Conclusion

This study revealed that 8.6% of Malaysian adults experienced moderate or severe food insecurity, with 1.1% experiencing severe food insecurity. The findings demonstrated that the prevalence of moderate or severe food insecurity in Malaysia was lower (8.6%) than the estimates (16.7%), whilst severe food insecurity was only 1.1% than the estimates (5.8%) reported by the FAO².

References

1. Sheikomar OB, et al. Validity of the Food Insecurity Experience Scale (FIES) for use in League of Arab States (LAS) and characteristics of food insecure individuals by the Human Development Index (HDI). *Curr Dev Nutr.* **2021**;5(4):nzab017. doi:10.1093/cdn/nzab017. PMID: 33937614; PMCID: PMC8059488.
2. Food and Agriculture Organization (FAO). *Implementing the Food Insecurity Experience Scale (FIES) in surveys*. Rome: FAO; 2016.

OESHPP64 / 413

Emergency or Not? Public Knowledge and Misuse of the Emergency Department Green Zone in Malaysia

Khairulnissa Abdul Kadir¹, Nurbaidurah Ithnain¹, Saiful Adli Suhaimi¹, Gunasundari Marimuthu¹, Elniee Melson¹, Logeswary Krisnan¹

¹ *Institute for Health Behavioural Research, National Institutes of Health, Ministry of Health Malaysia*

Corresponding author's email: khairulnissa@moh.gov.my

Summary

This study examined public understanding of emergency department (ED) functions and zone classifications, focusing on patients and visitors to the Green Zone at Hospital Tengku Ampuan Rahimah (HTAR). A total of 381 participants were surveyed. Most respondents understood that the ED is intended for life-threatening conditions; but many held misconceptions about the urgency of minor symptoms such as colds and fevers. Additionally, significant gaps were found in their knowledge of ED zoning and triage procedures, particularly regarding the Green and Yellow Zones. The study concludes that targeted public education, clearer communication of triage processes, and improved accessibility to primary healthcare are essential strategies to reduce inappropriate ED use and alleviate crowding, ensuring that emergency care remains available for critical cases.

Keywords

Emergency Department, Green Zone, Public Knowledge, Health Literacy, Healthcare Utilisation

Introduction

Emergency departments across Malaysia face significant challenges due to crowding, which delays treatment for genuine emergencies and places a strain on healthcare resources. A major contributor is the public's use of ED Green Zones for non-urgent health issues. These visits reflect not only behavioural tendencies but also gaps in public knowledge and health literacy. Studies have shown that misuse of ED services is associated with misconceptions about illness severity, limited access to primary care, and sociocultural norms (Coster et al., 2017; Selasawati et al., 2004). This study assesses the public's understanding of appropriate ED usage and the motivations for seeking care in the Green Zone at HTAR.

Materials and Methods

This cross-sectional study was conducted at the Green Zone of HTAR's ED using a convenience sampling. The calculated sample size was 381, based on a population size of 53,360 and an assumed 50% awareness level of ED functions with a 5% margin of error. Participants included Malaysian citizens aged 18 years and above—patients, caregivers, or accompanying persons—excluding foreigners and antenatal visitors. Data collection was through a self-administered questionnaire adapted from

validated instruments and reviewed by content experts. Descriptive statistics were analysed using SPSS version 22.0.

Results

A total of 381 participants were included in the study. Of these, 52.5% were male, 70.9% were Malay, and 53.8% were employed in the private sector. Approximately 58% had completed their secondary education, and 87.7% had monthly household incomes below RM4,850. Notably, 65.4% did not have any form of health insurance.

a) Knowledge of the ED Functions

The study reveals that as high as 91.3% of respondents acknowledged that ED is intended for the treatment of critical life-threatening emergencies, such as accidents and heart attacks (Tang et al., 2016). However, 37.3% mistakenly believed that symptoms such as colds and fevers also required immediate treatment, which may contribute to ED congestion, as observed in previous research (Pitts et al., 2014). Addressing these misconceptions through public education is crucial to optimise the use of ED. Additionally, 32.8% of participants were unaware of the need for initial screening before treatment in the ED Green Zone. This highlights the need for clearer communication and patient education on ED triage and screening procedures (Tanabe et al., 2015). Despite 81.6% of them knowing that screened patients would be categorised based on illness severity to be directed to different zones, aligning with the triage concept in ED to ensure patients received appropriate care based on their needs (Washington et al., 2000).

b) Knowledge of the functions of ED zones

The study revealed significant knowledge gaps among the public regarding the functions and types of cases treated in each ED zone, which can impact healthcare utilisation and resource allocation (Savioli et al., 2022). 31.2% and 29.5% of participants were unaware that the Green Zone was intended for non-critical cases, while the Yellow Zone is for semi-critical cases. However, the majority (84.3%) correctly identified the Red Zone for the critical cases, indicating a greater understanding of emergency cases among the public. These knowledge gaps can lead to suboptimal resource utilisation, as proper zoning and triage are crucial for timely and appropriate care for different severity levels. A lack of understanding about the purpose of each zone will result in congestion and treatment delays, causing a heavy strain on resources.

Discussion

The sociodemographic profile of respondents suggests potential vulnerabilities in healthcare access and literacy. A high percentage of respondents recognised the ED's role in managing life-threatening conditions, indicating general awareness. However, the significant number who misclassified non-urgent symptoms such as fever and cold as emergencies reflects persisting misconceptions.

The knowledge gaps related to triage and zoning protocols are concerning. Nearly one-third of participants did not understand the purpose of the initial screening or the role of the different ED zones. This can lead to the inappropriate use of emergency services and inefficient allocation of healthcare resources. Although

respondents showed relatively strong understanding of the Red Zone, their knowledge of the Green and Yellow Zones was notably weaker.

These findings suggest that existing health education strategies may not sufficiently address specific knowledge areas relevant to emergency care. While this study did not explore the reasons behind these knowledge gaps, the results highlight a clear need for targeted public education initiatives and enhanced communication regarding ED services.

Conclusion

This study reveals that despite widespread awareness of the emergency department's (ED) role in managing life-threatening conditions, significant misconceptions persist regarding the urgency of non-critical symptoms and the functions of ED zones, particularly the Green Zone. These misunderstandings are likely exacerbated by several interrelated factors identified in the respondent profile: limited educational attainment, lack of health insurance, and lower household income. Such socioeconomic challenges may restrict access to reliable health information and primary care services, leading individuals to rely on EDs for even minor ailments.

Furthermore, gaps in communication regarding ED processes, such as triage and zoning, further exacerbate inappropriate ED utilisation. When individuals are unaware of how and why they are assessed or redirected in the ED, it may erode trust and reinforce the belief that all symptoms warrant emergency attention.

References

1. Michal C, Adirah SN, Praneetha P, et al. (2023). Redirection of non-critical patients in the Emergency Department of Hospital Tuaran to the Primary Care Unit (Klinik Kesihatan). *Borneo Journal of Medical Sciences*, 10: 47-59.
2. Selasawati HG, Naing L, Wa WA, et al. (2004). Inappropriate utilisation of emergency department services in Universiti Sains Malaysia hospital. *Medical Journal of Malaysia*, 59: 26-33.
3. Mokhtar MAM, Pin TM, Zakaria MI, et al. (2015). Utilisation of the emergency department by older residents in Kuala Lumpur, Malaysia. *Geriatrics & Gerontology International*, 15: 944-950.
4. Coster J, Turner J, Bradbury D, et al. (2017). Why Do People Choose Emergency and Urgent Care Services? A Rapid Review Utilizing a Systematic Literature Search and Narrative Synthesis. *Academic Emergency Medicine*, 24: 1137-1149.