Abstracts

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DEVELOPMENT OF MALAYSIAN BREAST CANCER SURVIVAL PROGNOSTIC TOOL (MYBEST) FOR PREDICTION OF SURVIVAL PROBABILITY AMONG WOMEN WITH BREAST CANCER IN MALAYSIA

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Introduction: Breast cancer accounts for a sizeable portion of newly diagnosed cancer. Prognostic tools were developed to inform patients regarding their outcomes. Performance of Western-centric tools found to be less accurate when applied in our setting with PREDICT breast cancer (PREDICT) had an acceptable accuracy.

Objective: The study aimed to develop predictive models for survival among women with breast cancer in Malaysia, to compare its performance with PREDICT and the model's algorithm was incorporated to develop a web-based Malaysian Breast Cancer Survival Prognostic Tool (myBeST).

Method: This study consists of two phases. Phase 1 is a retrospective cohort study using data abstracted from seven regional breast cancer referral centres in Malaysia. We collected 13 predictors and survival outcomes. Time-to-event Cox proportional hazard (PH) analysis and two supervised machine learning classifiers (decision tree [DT] and artificial neural networks [ANN]) were employed to model and predict 5-year survival probability. The model with the best performance indices was compared with the PREDICT tool. Subsequently, in Phase 2, the model was deployed in a webbased format with accompanying content to describe the tool. The website underwent several user-centred iterative development stages, including content (n = 8) and face validity (n = 20) assessments by medical specialists and medical officers.

Results: There were 1,006 patients included for model derivation and validation. They were mostly Malay, with ductal carcinoma, hormone-sensitive, HER2-negative, at T2, N1-stage, without metastasis, received surgery and chemotherapy. The 5-year survival was 60.5% (95% CI: 57.6, 63.6). By the Cox PH model, Indians had a higher hazard of death compared to Malay (adj. HR: 1.77; 95% CI: 1.19, 2.63). Histological type, cancer grade, tumour, node and metastasis stage at diagnosis significantly associated with death. Those who received surgery (adj. HR: 0.49; 95% CI: 0.28, 0.87), chemotherapy (adj. HR: 0.59; 95% CI: 0.44, 0.79) and radiotherapy (adj. HR: 0.70; 95% CI: 0.51, 0.96) had a lower risk of death. Cox PH model outperformed the DT and ANN model in terms of accuracy (Cox PH: 0.841; DT: 0.811; ANN:

0.821), F1-score (Cox PH: 0.879; DT: 0.859; ANN: 0.870) and the area under the receiver operating characteristic curve (Cox PH: 0.891, DT: 0.39; ANN: 0.877). The Cox PH was more accurate in predicting 5-year survival probability with a higher AUC (0.78; 95% CI: 0.73, 0.82) than PREDICT (AUC: 0.75; 95% CI 0.70, 0.80). Thus, the model was deployed as the main feature of our web-based prognostic tool. The website was developed and improved at every iterative stage. The content validity indices were \geq 0.88 and face validity indices were > 0.90, resulting in a functioning and user-centred prognostic tool.

Conclusion: The web-based tool derived from robust Cox PH model showed promising results. Further validation, usability and feasibility studies are necessary as the tool could potentially be used by care providers to convey individualised survival prediction for newly diagnosed breast cancer patients.

Supervisor: Dr. Suhaily Mohd Hairon

Co-Supervisor: Associate Professor Dr. Najib Majdi Yaacob

PERCEPTION AND PRACTICE OF WORKPLACE VIOLENCE PREVENTION AND THEIR ASSOCIATED FACTORS AMONG EMPLOYERS AT HEALTHCARE FACILITIES IN MELAKA USING A NEWLY DEVELOPED QUESTIONNAIRE

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Introduction: Workplace violence is a major public health concern that affects healthcare workers of all ages, from the newly-hired to the soon-to-retired. The role of healthcare employers in workplace violence prevention is crucial, but it has received little attention. Healthcare employers' perception and practice towards workplace violence prevention are dubious given the surge prevalence of workplace violence.

Objective: This study aims to develop and validate a new questionnaire to assess the perception and practice scores of workplace violence prevention among employers at healthcare facilities, and to determine the perception and practice towards workplace violence prevention and its associated factors.

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Methods: Existing literature has been reviewed to establish the domains and refine the items. The first domain was the perception constructed by six components and 59 items. The second domain was practice, consisting of 6 components and 41 items. Content validation was measured by a panel of experts using the item-level content validity index (I-CVI). Then, face validation analysis was carried out among ten healthcare employers and presented as the itemlevel face validity index (I-FVI). Exploratory factor analysis (EFA) was conducted by recruiting 222 healthcare employers to determine the validity and reliability of the questionnaire, followed by internal consistency reliability. Subsequently, 333 healthcare employers were recruited to evaluate construct validity through confirmatory factor analysis (CFA) and internal consistency. A cross-sectional study was conducted by recruiting 162 at healthcare employers at healthcare facilities in Melaka, which were obtained from five categories of workplaces: hospitals, health clinics, dental clinics, district health offices and district dental offices. Data were collected using the newly validated questionnaire and analysed using simple and multiple linear regression analyses with perception and practice as dependent variables.

Results: The I-CVI values of content validation for all items in both domains were above 0.78, whereas the I-FVI values of face validation for both domains were above 0.80. Exploratory factor analysis shows all items load above 0.6 in their respective factor, significant Bartlett's test of sphericity for both domains (P < 0.001), and Kaiser-Meyer-Olkin Measure was 0.879 and 0.941 for the perception and practice domain, respectively. The Cronbach's alpha coefficient of the reliability test ranged from 0.71 to 0.92 and 0.82 to 0.97 for the perception and practice domains, respectively. The fit indices of CFA were χ^2 = 2092.6 (*P* < 0.001), SRMR = 0.053, RMSEA = 0.042, CFI = 0.928 and TLI = 0.920, while the factor loadings for all items were above 0.6 with Raykov's rho coefficients above 0.70. The newly validated questionnaire consists of 13 factors and 56 items. Of 162 healthcare employers recruited in the cross-sectional study, 13.6% were representative directors of the organisation, 71.6% were location supervisors, and 14.8% were Occupational Safety Health Committee. The mean age of employers was 43.9 years old. Most of them were female (63%), married (88.9%), diploma holders (49.3%) and had working experience of more than 10 years (90.1%). Employers from the hospital were the highest proportion (39.5%), while the district dental offices (1.2%) were the least. The participants had a mean percentage score of 67.2% for perception and 80% for practice towards WPV prevention. The perception towards workplace violence prevention was significantly associated with female (adj. $\beta = -3.95$; 95% CI: -7.81, -0.09; P = 0.045), Indian ethnicity (adj. $\beta = 16.04$; 95% CI: 2.34, 29.74; P = 0.022), other ethnic groups (adj. β = 25.71; 95% CI: 8.94, 42.47; P = 0.003), degree holder (adj. β = 4.35; 95% CI: 0.15, 8.54; P = 0.042), master holder (adj. β = 7.63; 95% CI: 1.11, 14.14; P = 0.022) and enough funding (adj. $\beta = -5.46$; 95% CI: -9.25, -1.67; P = 0.005). Meanwhile, the practice towards WPV prevention was significantly associated with Chinese ethnicity (adj. β = -9.25; 95% CI: -18.36, -0.14; P = 0.047), Indian ethnicity (adj. ß = -14.97; 95% CI: -29.48, -0.46; P = 0.043), other ethnic groups (adj. $\beta = 23.55$; 95% CI: 5.59, 41.51; P = 0.011), degree's holder (adj. $\beta = -4.41$; 95% CI: -8.67, -0.14; P = 0.043) and availability of standard

operating procedure for reporting WPV (adj. $\beta=6.07;~95\%$ CI: 1.58, 10.57; P=0.008).

Conclusion: The newly validated questionnaire demonstrated excellent psychometric properties and adequate validity and reliability, demonstrating that this instrument is reliable and valuable for assessing employers' perception and practice toward WPV prevention at healthcare facilities. The high perception and practice towards WPV prevention among healthcare employers and the associated factors provide evidence-based input for better public health planning and strategies to empower employers to implement WPV prevention. The existing workplace violence prevention guidelines and training modules also need to be improved.

Supervisor:

Associate Professor Dr. Nik Rosmawati Nik Husain

Co-Supervisor: Professor Dr. Aziah Daud

DEVELOPMENT AND VALIDATION OF A QUESTIONNAIRE ASSESSING EXPECTATIONS OF THE CHARACTERISTICS OF FRIENDLY PRIMARY HEALTH SERVICES FROM MEN'S PERSPECTIVE

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Introduction: Underutilisation of healthcare services may contribute to poor health status among men.

Objectives: This study aimed to explore men's experiences with primary health services and their expectations regarding the characteristics of friendly primary health services in Kelantan, Malaysia and develop a questionnaire assessing those expectations.

Methods: The study was conducted in two phases using a mixed-method approach. Phase 1 involved the development of a questionnaire based on an extensive literature review, in-depth interviews with adult males in Kelantan, content validation, face validation and pilot testing. Face-to-face interviews were conducted with 15 adult males purposefully selected using a maximum variation sampling method from six government-based primary health facilities in Kelantan. Data were transcribed and analysed using the thematic analysis method. The qualitative study findings were used as the basis for item generation. The procedure was followed by content validation by seven experts and face validation by ten adult males in Kelantan. Phase 2 involves exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) to measure the questionnaire's internal structure validity and reliability. A cross-sectional study was conducted for EFA with 280 conveniently selected participants and followed by another 280 for CFA in eight government primary health clinics in Kelantan.

Results: The interview findings showed that the theme of men's experience with existing primary health services was derived from four subthemes: provision of health services, health promotion delivery, attributes of healthcare

providers and the physical environment of the health facilities. Four other subthemes formed the theme of men's expectations of the characteristics of friendly primary health services: meeting men's needs in primary health services, approaching men through effective health promotion strategies, standards of a healthcare provider from a men's viewpoint, and a comfortable physical environment for men. A new questionnaire was developed with 69 items and 4 domains. Following the content validation phases, items were reduced to 65, with several items with low I-CVI maintained for testing in the following process. Two items were deleted during face validation, with the remaining 63 items tested for EFA, yielding a new hypothesised model with 44 items and 8 domains. The model was revised during CFA, and the best model of 5 domains and 39 items that met the model fitness analysis was chosen as the final questionnaire.

Conclusion: The newly developed questionnaire with 39 items in 5 respective domains, which are the provision of health services, service time extension, health promotion and education, characteristics of healthcare providers, and physical environment of health facilities, is a valid and reliable instrument for assessing expectations of the characteristics of friendly primary health services from men's perspective in Kelantan.

Supervisor: Dr. Tengku Alina Tengku Ismail

Co-Supervisors: Associate Professor Dr. Mohd Ismail Ibrahim Associate Professor Najib Majdi Yaacob

REVEALING THE PATIENT'S PERSPECTIVE ON PUBLIC HOSPITAL HEALTHCARE WORKERS COMPASSIONATE CARE AND ITS PREDICTORS DURING COVID-19 PANDEMIC IN KELANTAN USING A MALAY-VALIDATED QUESTIONNAIRE

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Introduction: Compassionate care is progressively taking an important place in the healthcare system worldwide. With rapid progress in the work of compassion, Malaysia is still a step back. Even though the framework for compassion has been embedded in the Ministry of Health's corporate culture, the assessment of the outcome remained unmet. The magnitude of stressors during the COVID-19 pandemic urges a greater need to assess this relational aspect of care from the patient's perspective. The predictors that contributed to the perceptions need to be studied for improvements in the near future.

Objectives: To study the compassionate care perceived by patients in public hospitals in Kelantan and its predictors during COVID-19 using a translated and validated Relational Aspect of Care Questionnaire Malay version. *Methods:* The study consisted of two phases. The first phase involved the translation and validation of the Malay version Relational Aspect of Care by using confirmatory factor analysis (CFA). The second phase was a cross-sectional study involving 315 patients from non-COVID wards in public hospitals in Kelantan. The study aimed to reveal the compassionate care perceived by the patients at the hospitals and determine the predictors. The predicting factors were obtained through multiple linear regression. The study used different respondents for each phase.

Results: The analysis showed that the measurement model of the RAC-Q Malay version (RAC-QM) fits well based on several fit indices: a standardised factor loading range from 0.40 to 0.73, comparative fit index (CFI) of 0.917, Tucker-Lewis fit index (TLI) of 0.904, root mean square error of approximation (RMSEA) of 0.06 and a standardised root mean square residual (SRMR) of 0.073. It has good reliability, with a Cronbach's alpha of 0.857 and a composite ratio of 0.857. 60% of the patients found that the healthcare compassionate workers (HCWs) remained compassionate, while another 34% complimented HCWs as more compassionate during the current admission than their previous. The majority also claimed they were not affected by the visiting restriction. Patients' occupation, income level and also dependency level are among the significant predictors that could affect compassionate care as perceived by patients.

Conclusion: This study showed that the RAC-QM demonstrated good psychometric properties and is valid and reliable based on the confirmatory analysis. Therefore, it could be used to evaluate the level of compassionate care in Malaysia. Despite the challenging COVID-19, HCWs have successfully provided compassionate patient care. While in the ward, patients felt supported and cared for even without family members. Patients with disability and financial constraints tend to score lower, while students had a lower threshold for a positive experience.

Supervisor: Associate Professor Dr. Mohd Ismail Ibrahim

Co-Supervisor: Dr. Suhaily Mohd Hairon

ERGONOMIC RISK ASSESSMENT AND WHOLE-BODY VIBRATION MEASUREMENT IN RELATION WITH WORK-RELATED MUSCULOSKELETAL DISORDERS AMONG FOOD DELIVERY RIDERS IN TERENGGANU, MALAYSIA

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Introduction: Work-related musculoskeletal disorders (WMSDs) were currently a subject of concern on occupational world where they were the leading cause of major disabilities and absenteeism among the workers. These phenomena affected global economic due to reduce

in productivity among the workers. Pandemic COVID-19 had caused major drawback in occupational world where many people lose their job. In Malaysia, food delivery riders became the alternative and popular choice of job especially during pandemic COVID-19 as food delivery services were listed as essential service during movement control orders (MCOs). However, the incidence of road traffic accident (RTA) keeps increasing with high mortality rate among the riders. Many studies had reported the WMSDs were among the factors which contributed to the inappropriate riding behaviour among motorcyclist where WMSDs tend to cause psychological distress among the riders. These eventually lead to inappropriate behaviour such as speeding and violation of traffic light to chase for the trips. Meanwhile, there were many factors was revealed to be significantly associated with development of WMSDs such as working posture and exposure to the chronic vibration.

Objectives: The first objective was to determine the prevalence of WMSDs among food delivery riders in Terengganu. Second objective was to assess the ergonomic posture of motorcycle riding using REBA (rapid entire body assessment) methods among food delivery riders in Terengganu. Third objective was to measures the level of whole-body vibration (WBV) experienced by food delivery riders in Terengganu and compare the parameters with the limit values required by European Directive 2002/44/EC. Fourth objective was to determine the factors associated with WBV exposure above Exposure Action Value (EAV) limit among food delivery riders in Terengganu. Final objective was to the associated factors of WMSDs among food delivery riders in Terengganu.

Methods: A cross-sectional study was conducted among 191 food delivery riders in Terengganu, Malaysia. A snowball sampling method was applied in this study where the 'captain rider' act as the seed. This study involved answering self-administered questionnaire, REBA assessment and WBV measurement. The self-administered questionnaire contained validated Malay-Translated Standardised Nordic Musculoskeletal Questionnaire (M-SNMQ) which was designed to be completed within 30 min. Then, working posture was assessed using REBA method to quantify the risk of WMSDs. Meanwhile, WBV measurement was done using a calibrated Larson Davis HVM 100 Human Vibration Meter with a tri-axial accelerometer seat pad following ISO 2631-1 standards. The data was then analysed using SPSS 20.4 where descriptive analysis, simple and multiple logistic regression were performed.

Result: This study revealed high prevalence of WMSDs (74.9%) among the riders which predominant by low back pain (LBP) (73.3%). In addition, the mean (SD) final REBA score also was high which was 5 (0.88) indicating of medium risk of developing WMSDs which requires further investigation and the need of change to be done. Furthermore, the mean (SD) of daily vibration exposure, A(8) was also high (0.624 [0.317] m/s²) which exceeded EAV. Three factors were found to be the factors associated with WBV above EAV level which were average working days (AOR = 1.56; 95% CI = 1.11, 2.19; P = 0.011), presence of WMSDs (AOR = 2.93; 95% CI = 1.37, 6.28; P = 0.006) and suspension service (AOR = 0.39; 95% CI = 0.19, 0.82; P = 0.012). This present study also proved that three factor significantly associated with WMSDs development among food delivery riders in Terengganu which were increasing average working days (AOR = 2.00; 95% CI = 1.34, 2.98;

P = 0.001), WBV above EAV limit (AOR = 2.71; 95% CI = 1.13, 6.53; P = 0.026), and not doing stretching exercise before work (AOR = 21.63; 95% CI = 7.45, 62.79; P < 0.001).

Conclusion: The high prevalence of WMSDs among food delivery riders were significantly associated with unergonomic posture which reflected by high REBA score and WBV exceeded EAV level. The result from this study should be used by health sectors as an indicator to implement change and improve the working environment of the riders. Multi-sectoral approach is vital to ensure the prevalence of WMSDs among this neglected group can be reduced which in turn can reduce the incidence of RTA and mortality among the riders.

Supervisor: Professor Dr. Aziah Daud

Co-Supervisors: Professor Dr. Rusli Nordin Dr. Suhaily Mohd Hairon

THE DEVELOPMENT OF PROBLEM SOLVING-BASED LIFESTYLE MODULE AND ITS EFFECTIVENESS ON DIABETES RISK SCORE, RANDOM CAPILLARY BLOOD GLUCOSE AND PERCEPTION IN PRACTISING HEALTHY LIFESTYLE AMONG DIABETES HIGH-RISK GROUP IN KELANTAN

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Introduction: Diabetes high-risk groups are at intermediate stage in developing type 2 diabetes mellitus (T2DM) but are still reversible. A structured lifestyle education that empowers self-care in lifestyle modifications must be tailored to high-risk groups.

Objectives: To develop a problem-solving-based lifestyle education and determine its effect on diabetes risk score (FINDRISC), capillary blood glucose (CBG), and perception practising five healthy lifestyle tasks using MySTAR among diabetes high-risk population in Kelantan. Module satisfaction was assessed among the intervention group participants at post-intervention.

Methods: There are two phases of this study. Phase one is the development of the module and phase two is a quasi-experimental study. Based on the literature review and expert discussions, problem-solving based lifestyle education module was developed. Materials include narrated lectures, self-care and simulated counselling videos. Twelve experts evaluated the content validity index (CVI) and 20 community members assessed face validity index (FVI). The intervention group was from the community in Bachok, while the control group was in from Tumpat, who received usual health education from their clinic. The FINDRISC diabetes risk score, CBG and perceived confidence in practising MySTAR tasks were collected pre-and post-8 weeks intervention among 80 diabetes high-risk participants. Module satisfaction questionnaire was given to the intervention group post-intervention. Diabetes risk score was compared

using RM ANOVA, while CBG and MySTAR tasks were compared using RM ANCOVA between groups overtime. For each analysis, intention-to-treat (ITT) and per-protocol (PP) analysis were performed.

Results: The problem-solving-based lifestyle module was named STOP & SLIMS module, consisting of 17 narrative educational videos, four self-care videos, and twoweekly healthy eating and active lifestyle challenges. Three subcomponents of the module; introduction of prediabetes, healthy eating, and active lifestyle, showed high CVI (90.4%, 88.1% and 90.2%, respectively) and high FVI, ranging from 0.88 to 1.0. Out of 80 participants, 31 participants in the intervention group and 33 in the control group completed the study. There was no significant difference in FINDRISC diabetes risk score between the groups after 8 weeks of intervention. CBG was not significantly different in ITT but significant in PP analysis between the group. In the comparison of groups, the intervention group showed a significantly higher score of perceived confidence to practice MySTAR tasks with adjusted mean difference [95% confidence interval (CI)] by doing moderate-intensity exercise 150 min per week (15.25 [3.45, 27.05]) and regular physical activity at least three times per week (18.00 [8.14, 27.85]). Meanwhile, at post-intervention, there were significant differences in mean scores of perceived practising 'suku suku separuh' (15.00 [1.82, 28.17]), avoid consume sweet food and beverages (19.15 [8.20, 30.09]), moderateintensity exercise 150 min per week (31.41 [18.44, 44.39]) and regular physical activity at least three times per week (28.44 [15.35, 41.53]) between the groups. The intervention group also had high mean satisfaction score for the module ranging from 4.3 to 4.7.

Conclusion: The STOP & SLIMS module has the potential to be delivered, particularly to diabetes high-risk groups in order to improve their healthy lifestyle practising, particularly healthy eating and active lifestyle.

Supervisor:

Associate Professor Dr. Nor Azwany Yaacob

Co-Supervisors:

Associate Professor Dr. Rohana Abdul Jalil Dr. Nik Mohd Rizal Mohd Fakri

SELECTED AIR POLLUTANTS AND THEIR EFFECTS ON LUNG FUNCTION AMONG PETROL STATION WORKERS IN JOHOR

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Background: Petrol station workers are exposed to various air pollutants in their workplaces. These air pollutants include particulate matters $(PM_{2.5} \text{ and } PM_{10})$ and VOC that were proven hazardous to health, especially

respiratory systems. With the increasing number of petrol stations, no enforcement on self-service, and no specific safety and health programmes, petrol station workers may develop abnormal lung function due to exposure to air pollutants.

Objectives: This study aimed to assess the mean concentrations of air pollutants and their associations with respiratory illness among petrol station workers in Johor.

Methods: This cross-sectional study was conducted from January 2022 to December 2022 at selected petrol stations in Johor sampled using proportionate stratified random sampling. The concentrations of $PM_{2,5}$, PM_{10} , and TVOC at the petrol stations were measured. Subsequently, workers from the selected petrol stations were interviewed regarding respiratory symptoms using standardised questionnaires and underwent the lung function test. All data were analysed descriptively, and the One-way Repeated Measures ANOVA test was conducted to look for the mean differences in air pollutants concentrations. Logistic and linear regression analyses were used to identify associated factors of abnormal lung function and its parameters.

Results: The mean concentrations of $PM_{2.5}$ and PM_{10} at the petrol stations in Johor were 12.93 μ g/m³ and 42.02 μ g/ m³, respectively, which did not exceed the 24-hour standard of WHO and NAAQS. There were significant mean differences in particulate matter concentrations between the different periods of the day [F(1.2, 52.6) = 95.587, P < 0.001 for $PM_{2.5}$ and F(1.2, 53.3) = 158.294, P < 0.001 for PM_{10}]. Mean differences in TVOC concentrations between various work processes or conditions were also found to be significant [F(1,43) = 3295.59, P < 0.001]. Ninety-three (38.3%) out of 243 petrol station workers had at least one respiratory symptom in which cough was the most commonly reported (25.9%). The prevalence of abnormal lung function among petrol station workers was 28.8%, predominantly obstructive impairment pattern (15.6%). Multiple logistic regression revealed that being a pump attendant (AOR = 6.75; 95%CI: 2.70, 16.90; *P* < 0.001), duration of employment (AOR = 1.05; 95% CI: 1.01, 1.08; P = 0.016), respiratory symptoms (AOR = 13.44; 95% CI: 5.28, 34.23; P < 0.001), significant past medical history (AOR = 20.77; 95% CI: 5.57, 77.45; P < 0.001) and workplace PM₁₀ concentration (AOR = 1.11; 95% CI: 1.06, 1.16; P < 0.001) were significantly associated with abnormal lung function.

Conclusion: Abnormal lung function was quite prevalent among petrol station workers in Johor, even though the mean concentrations of air pollutants did not exceed the standard. This warranted more confirmatory studies to establish the causal relationship between air pollutants and abnormal lung function and the development of safety and health programmes for petrol station workers.

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Co-Supervisor: Dr. Nurul Ainun Hamzah

INFORMAL CAREGIVER BURDEN AMONG STROKE PATIENTS IN EAST COAST PENINSULAR MALAYSIA: A SHORT-TERM LONGITUDINAL STUDY

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Introduction: Stroke is a leading cause of death and disability worldwide. Many stroke survivors require assistance for basic activities of daily living (ADL) and instrumental activities of daily living (IADLs). Stroke attacks happen suddenly, and family members must act as informal caregivers swiftly. Unfortunately, many caregivers feel upset or burdened during caring for stroke survivors. Studies on caregiver burden are vital in helping policymakers prioritise support and researchers develop interventions targeting stroke survivors and caregivers.

Objectives: This study aims to measure the burden among informal caregivers for stroke survivors in East Coast Peninsular Malaysia.

Methods: In this research, three related research articles were produced. First, a bibliometric analysis was done to measure the academic production and collaboration of the author, institutions, and countries. The publications with a title containing 'stroke' and 'caregiver' were searched using Clarivate's Web of Science database. Second, a descriptive analysis was done to describe the distribution of stroke survivors, informal caregivers and the burden of stroke caregivers. Stroke survivors and their caregivers were recruited from three East Coast Peninsular Malaysia hospitals. The caregiver burden was measured using the Malay version of Zarit burden interview (MZBI) and the Malay version of caregiver appraisal of function and upset (Malay-CAFU) via phone call four times within the first 3 months post-discharge. Third, using the same data, an inferential analysis was done using a linear mixed effect model to estimate the stroke caregiver burden trends and the effect of stroke survivors' dependency level on the burden trajectory.

Result: In the bibliometric analysis, it was found that 678 publications dated from 1989 to 2022 with titles containing the terms 'stroke' and 'caregiver'. The publications were primarily published in the English language. The publications mainly were produced in the USA (28.6%), by The University of Toronto (9.5%), in 'Topics in Stroke Rehabilitation' journal (5.8%) and the most productive author was Tamilyn Bakas (3.1%). For the caregiver burden, 85 stroke survivors and 155 informal caregivers were recruited. On average, the stroke survivors had two caregivers, mainly female (58.1%). In the first 3 months, the burden was reduced, with the mean (SD) of MZBI reduced from 27.42 (12.73) in the first week to 17.77 (11.20) in the third month, while IADL Malay-CAFU Upset reduced from 1.14 (0.94) to 0.62 (0.64) and ADL Malay-CAFU from 1.36 (1.00) to 0.78 (0.65) in the same period. When accounted for the clustering effect using a linear mixed effect model, the MZBI shows a reduction from 1-week post-discharge to 3-month [beta = -10.76 (95% CI = -11.94, -9.57)] and Malay-CAFU at 3-month [beta = -0.68 (95% CI = -0.80,

-0.57)]. The burden was higher among caregivers with dependent stroke survivors; however, the rate of reduction of burden was not significantly different.

Conclusion: The studies on stroke caregivers were extensive; however, ongoing studies on the field are essential. Areas of interest in the field include the experience of stroke caregivers, the level and the determinant of burden and the interventions in managing the burden. Many stroke survivors were taken care of by several informal caregivers, especially family members. However, the caregivers may feel burdened while giving care; however, the burden is usually reduced in the first three months post-stroke. Therefore, policymakers and healthcare providers should initiate support and interventions for caregivers and stroke survivors as early as at the time of diagnosis.

Supervisor:

Associate Professor Dr. Kamarul Imran Musa

Co-Supervisor:

Associate Professor Dr. Mohd Ismail Ibrahim

THE EFFECTIVENESS OF ROBOTIC REHABILITATION THERAPY ON ACTIVITIES OF DAILY LIVING AMONG WORKERS WITH ACQUIRED BRAIN INJURY

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Introduction: Stroke is one of the leading causes of acquired disability in adults and the sixth leading cause of death worldwide. In Malaysia, there are 50,000 cases of stroke per year, and 40,000 of those cases occur in working-age people. Ageing populations have increased the global need for physical therapy services. Many use the Barthel index self-care evaluation to determine whether a stroke, neuromuscular, or cancer patient can meet their basic needs. This study aims to determine the effectiveness of robotic rehabilitation therapy compared to conventional rehabilitation therapy on Modified Barthel Index (MBI) score and the predictor effect among workers with stroke in East Coast Peninsular Malaysia.

Objectives: The first objective of the study was to measure the changes of MBI scores among workers with acquired brain injury who underwent robotic rehabilitation therapy compared to conventional rehabilitation therapy, upon starting therapy (baseline), during therapy (week 2), and at the discharge of therapy (week 4). Secondly, to measure the effect of HADS on the changes of MBI during a 4-week follow-up on intervention in robotic rehabilitation therapy. Thirdly, we would like to determine the mediating effect of HADS between the mRS and MBI score among workers with stroke who underwent robotic rehabilitation therapy.

Methods: A prospective cohort study was implemented in Kelantan, which receives stroke patients throughout east coast Peninsular Malaysia. Each group of robotic

and conventional rehabilitation therapy consisted of 50 samples. Robotic rehabilitation therapy comprises of three sessions every day for 4 weeks. Meanwhile, the conventional rehabilitation therapy group did gait training for 2 weeks, 5 days a week, with a weekend rest day. Data was collected at baseline (at admission), week two, and week four (at discharge) for both therapies. The patient's impairment was assessed using the modified Barthel index (MBI) by a certified therapist. Modified Rankin scale (mRS) was the predictor to observe the effect of the rehabilitation outcome. Anxiety and depression that were assessed by hospital anxiety and depression scale (HADS) was considered the mediator that explained the underlying mechanism of the relationship between mRS and MBI. As for the first objective, repeated measures analysis of variance (RM-ANOVA) was performed to evaluate the outcome's changes and compare the changes with both treatment groups. The overall effectiveness was analysed using generalised linear mixed model (GLMM) for both rehabilitation for second and third objectives.

Results: We only managed to recruit 54 acquired brain injury patients to participate in this study. Thirty (55.6%) of these patients received robotic rehabilitation therapy. When we compared for all the characteristics, those who received conventional rehabilitation therapy were significantly older than those who received robotic rehabilitation therapy, while the MBI scores has a significant increased over 4 weeks duration for both therapies. The MBI scores also significantly increased when compared with the treatment group. As for HADS-Anxiety (HADS-A), there was a significant difference between the treatment group, in which those in the robotic rehabilitation group had higher HADS-A. When adjusted HADS to the treatment group, there is a decrease in HADS with HADS-A reduced to 0.22 units and HADS-Depression reduced to 0.28 units although it was not significant. After we add mRS in model 5, it showed that the MBI score improve overtime and those with Poor mRS had lower MBI by 11.15 units. HADS also did not influence the mRS when adjusted with the treatment group when the MBI scores still showed significant improvement with an average of 3.74 units at week 2 from baseline and 5.41 units at week 4 from baseline.

Conclusion: Functional recovery occurs in acute stroke patients when the mean Barthel Index score increases from baseline (week 0) to week 2 and then to the time of discharge (week 4) in both therapies. It shows that the activities of daily living improved over time and the psychological status of the workers with acquired brain injury did not affect the level of disability after undergoing robotic rehabilitation therapy. There is no harm or disadvantage in introducing robotic rehab in post-stroke patients. However, evaluation in a larger clinical trial is required to evaluate the effectiveness of this useful adjunct therapy in the stroke population.

Supervisor: Associate Professor Dr. Mohd Nazri Shafei

Co-Supervisors:

Associate Professor Dr. Kamarul Imran Musa Associate Professor Dr. Muhammad Hafiz Hanafi

PROCESS EVALUATION AND COST ANALYSIS OF THE TEAM APPROACH IN DIABETES MANAGEMENT IN A PRIMARY CARE SETTING

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Introduction: The Team Approach is a patientcentred multidisciplinary approach in the management of diabetes that aims to empower patients in the self-care towards achieving good diabetes control. This study began with the development of the flow chart and clinical pathway of the Team Approach that guided the process evaluation and cost analysis of the programme and the additional costs that required to improve the programme.

Objectives: To conduct a process evaluation and cost analysis of the Team Approach in diabetes management at the Simpang Kuala health clinic, Kota Setar.

Methods: This study consisted of three parts. Part 1 of the study is the design and development of a flow chart and clinical pathway that was developed from observing the work processes and activities of the Team Approach at the Simpang Kuala health clinic. The development of the flowchart and clinical pathway was based on the 10-step framework for developing and disseminating clinical pathway by the Centre of Evidence-based Practice, University of Pennsylvania Health System, Philadelphia. Part 2 was a process evaluation of the Team Approach on the programme's context, reach, dose delivered, fidelity and implementation. Part 3 of the research was a cost analysis of the Team Approach using the top-down and bottom-up costing approach to determine the cost per patient from providers' perspective. Additional resources and costs required to expand the program to achieve 50% and 70% of patients with HbA1c level $\leq 6.5\%$ was also forecasted.

Result: The Diabetes Patient Process Flow Chart (DPPF) and the Integrated Care Pathway of Diabetes Management (ICPDM) of the Team Approach work processes were visualised using the Business Process Model and Notation tool and the time-task matrix format of a chain model. The process evaluation discovered factors that influenced the implementation of Team Approach was the leadership of the clinic's manager, human resource, facilities and equipment, health informatics, variations in consultation practices, commitments of patients, acceptance of new knowledge, stigma on insulin use and the effect of COVID-19 pandemic. The scores obtained in the evaluation of reach, dose delivered and fidelity of the services and consultations in the Team Approach ranged from 0% to 100%. The overall score for the implementation of the Team Approach in diabetes management and care was 57%. The cost of treatment for diabetes patient in 2020 was RM1,330.05 per patient. To achieve 50% and 70% of the total diabetes patients with HbA1c of ≤6.5% in the same year, the cost per patient will be RM1,659.34 and RM2,117.68, respectively.

Conclusion: The research is a comprehensive study of the Team Approach in diabetes management in a primary care setting. The flow chart and clinical pathway will be useful in standardising the delivery of care and sharing of practices among other clinics. Whilst the process evaluation enabled the weaknesses of the programme to be identified, thus aiding future improvements and guiding the Ministry of Health in the planning resources and funding for the management and care of diabetes mellitus in Malaysia.

Supervisor: Dr. Surianti Sukeri

Co-Supervisor: Dr. Ong Siew Chin

DEVELOPMENT AND VALIDATION OF FOOD SAFETY AND HYGIENE ASSESSMENT FORM AND THE KNOWLEDGE AND PRACTICE OF FOOD SAFETY IN KOTA BHARU KELANTAN PRESCHOOLS

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Introduction: The hygiene of the food preparation areas in preschool is essential to ensuring the food produced is safe to be consumed by the preschool students. This can be achieved by the preschool's teacher having good food safety knowledge and practise. However, the current checklist used in the inspection of the food preparation areas in preschools in Malaysia has not been revised since 2012. Thus, there is a need to improve the content of the checklist to ensure that all relevant parameters are covered during the preschool inspection.

Objective: Phase 1 of this study is to develop and validate an observation checklist for assessing the hygiene and sanitation of preschool food preparation areas. Phase 2 aimed to: i) determine the level of knowledge and practise of food safety among preschool teachers using a validated questionnaire; ii) evaluate the hygiene level of the food preparation area in the preschool using the newly developed and validated checklist in Part 1 of this study; and iii) determine the association between the knowledge and practise of food safety among preschool teachers and the hygiene of food preparation areas in the preschool.

Methods: The study was conducted in Kota Bharu, Kelantan, from April 2021 to February 2022. Phase 1 of the study involved the development and validation of the observation checklist, conducted in four stages: i) the construction of domains and items from the existing literature; ii) content validation by six experts (using the item-level content validity index [I-CVI] and the scale-level content validity index [S-CVI]); iii) face validation by 10 experts (using the item-level face validity index [I-FVI] and the scale-level face validity index [S-FVI]); and 4iv) reliability analysis (using the inter-correlation coefficient [ICC]). Four assessors performed the reliability analysis at two preschools. Phase 2 was a cross-sectional study conducted from April 2021 until February 2022. The study involved 70 preschools and 70 preschool teachers in Kota Bharu, Kelantan. This study used a validated questionnaire to determine preschool teachers' food safety knowledge and practises and a validated observation checklist to assess the hygiene of food preparation areas in preschools.

Results: Phase 1: The initial draft of the checklist contained three domains and 57 items: i) building and facility (10 subdomains and 38 items); ii) process control (4 subdomains and 12 items); and iii) food handlers (1 subdomain and 7 items). The I-CVI scores for building and facility, process control, and food handlers were 0.97, 1.00 and 1.00, respectively, indicating good relevancy of items. The S-CVI value was 1.0 for all domains, showing good relevance of the items. The I-FVI above 0.8 and S-FVI above 0.9 for all domains imply that the participants easily understood the checklist. The ICC for the three domains combined was 0.848 (95% CI: 0.772, 0.904). The final validated checklist consists of 3 domains with 57 items. Phase 2: All of the study participants in this study were female (100%) with an average age above 30 years old (65.7%) and the majority of them completed education at STPM/ STPMV/Diploma levels (65.7%). Almost all participants were vaccinated with an anti-typhoid vaccine (97.1%) and underwent food safety training (97.1%). The average mean score for knowledge of food safety and practise of food safety among the study participants was 71.6% (SD = 10.73) and 86.1% (SD = 5.81), respectively. The average mean score for the hygiene of the food preparation areas in preschool was 62.6% (SD = 9.86). Work experience was significantly associated with food safety knowledge among study participants (adj. β = 0.411; 95% CI: 0.031, 0.612; *P* = 0.021). Food safety training (adj. β = 0.426; 95% CI: 0.021, 0.633; P = 0.001) was significantly associated with the practise of food safety among study participants. The hygiene score of the food preparation areas in preschool was significantly associated with work experiences (AOR = 1.82; 95% CI: 1.6, 2.2; P = 0.012) and secondary education level (AOR = 24.50; 95% CI: 1.28, 46.77; *P* = 0.031).

Conclusion: The newly developed observation checklist is a valid and reliable tool for assessing the hygiene and sanitation of preschool food preparation areas. The food safety knowledge and practise among preschool teachers were good; however, they failed to translate into good hygiene levels in food preparation areas in preschools. The preschool hygiene level can be improved by regular monitoring by health authorities or administrators and by periodic food safety education and training, primarily focusing on those lacking work experience, never attending food safety training courses, and having low education levels.

Supervisor:

Associate Professor Nik Rosmawati Nik Husain

Co-Supervisor:

Associate Professor Wan Mohd Zahiruddin Wan Mohammad

MODELLING AIR POLLUTION AND EMERGENCY DEPARTMENT VISITS AMONG CHILDREN WITH RESPIRATORY DISEASES IN RELATION TO PHASES OF THE MOVEMENT CONTROL ORDER IN MALAYSIA

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Introduction: Children's increased vulnerability to air pollution exposure, and their increased susceptibility to the adverse effects of air pollution, increase their risk of mortality and morbidity. Their respiratory health is the most affected and has been among the top leading cause of emergency department (ED) visits worldwide. Following the COVID-19 pandemic, an improvement in the world's air quality was observed secondary to the implementation of state-wide lockdowns, known as the movement control order (MCO), in Malaysia. Therefore, we construct four objectives to model the changes in the relationship between air pollution and ED visits among children with respiratory diseases in relation to the phases of the MCO in two cities in Malaysia which are: i) to determine the changes in the trend of paediatric ED visit; ii) to determine the changes in the trend of paediatric ED visits with respiratory disease; iii) to determine the changes in the trend of air pollution concentrations; and iv) to model and compare the relationship between air pollution and respiratory-related ED visits among children across the pre, during, and post-MCO periods in two Malaysian cities.

Methods: We analysed secondary data of children's ED visits from two public hospitals in Kota Bharu and Johor Bahru cities over 5 years (17 March 2017-17 March 2022). Predictor variables included air pollution index, particulate matter less than 10 μm (PM10), particulate matter less than 2.5 µm (PM2.5), nitrogen dioxide (NO2), sulphur dioxide (SO₂), carbon monoxide (CO) and ozone (O₃). Whereas the response variables are the number of children's ED visits and their characteristics which include the triage category, visit outcome, ED diagnosis and respiratory diagnosis subtype. The study included all children under the age of 18 years old who fulfils the selection criteria. The study period was divided into three periods based on the MCO in Malaysia, which are the pre-MCO (17 March 2017-17 March 2020), MCO (18 March 2020-2 January 2022), and post-MCO (3 January 2022-17 March 2022) periods. The trend of air pollution concentration and paediatric ED visits' characteristics were compared between the three periods using Welch *t*-tests for numerical outcomes and multinomial logistic regressions for categorical outcomes. Changepoint analysis was used to detect any changepoints within the trend of paediatric ED visits whereas generalised additive models were used to examine the relationship between air pollution and children's ED visits for respiratory diseases across the three periods.

Result: A total of 175,737 visits were recorded over the five years where nearly 30% (52,704) were diagnosed with a respiratory disease. During the MCO, the children's ED visits decreased by 57.57%. An increase in the proportion of yellow (OR = 1.23; 95% CI: 1.20, 1.28; P < 0.001) and red (OR = 1.79; 95% CI: 1.69, 1.90; P < 0.001) triage categories was observed in contrast to a decrease in the proportion

of hospitalised cases (OR = 0.19; 95% CI: 0.18, 0.19; P < 0.001) during the MCO period. Although respiratory diseases remain as the main reason for ED visits across all three periods, we observed changes in the trend of the respiratory subtypes. The odds of being diagnosed with influenza and pneumonia increased significantly during the post-MCO period (Kota Bharu: OR = 1.43; 95% CI: 1.07, 1.91; P < 0.001; Johor Bahru: OR = 1.43; 95% CI: 1.15, 1.78; P < 0.001) whilst the odds for chronic lower respiratory disease decreases (Kota Bharu: OR = 0.07; 95% CI: 0.05, 0.09; P < 0.001; Johor Bahru: OR = 0.06; 95% CI: 0.05, 0.07; P < 0.001). All air pollutants experienced a significant decline during the MCO and post-MCO periods except for SO₂ concentration in the Kota Bharu city for both the MCO (t(1626.18) = 6.78; P < 0.001) and post-MCO periods (t(76.63) = 5.05; P < 0.001) and CO concentration in Johor Bahru city during the post-MCO period (t(73.18) = 4.84; P < 0.001). Our model explained 69.9% (R2 = 0.62) and 53.0% (R2 = 0.49) of the variation in paediatric respiratory ED visits in Kota Bharu and Johor Bahru based on the air pollution concentrations, respectively. In Kota Bharu, PM10 is significantly associated with acute upper respiratory infections during the pre-MCO period (edf = 6.44; P < 0.001) but was no longer significantly associated in the post-MCO period. In Johor Bahru, although the number of significant relationships between individual air pollutants to the different respiratory subtypes increased during the MCO period, the significance of these relationships diminishes during the post-MCO period, and the number of significant relationships becomes less compared to the pre-MCO period.

Conclusion: The COVID-19 lockdown improved air quality and altered the patterns and causes of paediatric respiratory ED visits in two Malaysian cities. Thus, highlighting air pollution as a significant risk factor for respiratory diseases in children, in Malaysia, with different effects depending on the exposure type and duration. This study suggests some public health recommendations to raise awareness, improve the national pandemic preparedness plan, and introduce early warning systems for air pollution and respiratory diseases in the ED.

Supervisor:

Associate Professor Dr. Nik Rosmawati Nik Husain

Co-Supervisor: Professor Dr. Kamarul Imran Musa

RELATIONSHIP BETWEEN SOCIO-EMOTIONAL DIFFICULTIES WITH 24-HOUR MOVEMENT BEHAVIOUR AND OTHER FACTORS AMONG PRESCHOOLS CHILDREN IN KELANTAN, MALAYSIA

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Introduction: Children's mental health disorders are a serious concern, and adherence to the 24-h movement behaviour guidelines is one of the contributing factors.

Measuring movement behaviour such as physical activity, sedentary behaviour and sleep time throughout 24 h is critical for assessing early childhood development.

Objective: This study aims to identify socioemotional problems and associated factors among preschool children and determine the association between adherence to 24-h movement behaviour guidelines and socioemotional problems in Kelantan, Malaysia.

Methods: This study was conducted in two phases. The first phase was a cross-cultural adaptation of the movement behaviour questionnaire (MBQ). The original version of MBQ contains a 15-item short-form instrument for measuring preschool children's physical activity, screen time and sleep. Permission was granted to translate into Malay version using a 10-step process. Ten independent experts were involved in the content validity process, while 30 parents of children aged 4 years old-6 years old were selected for face validation. The second phase was conducted from November 2022-December 2022 using a cross-sectional design with a sample size of 612 preschools determined using the single proportion formula. All participants were selected from 18 public and private preschools using a multistage random sampling technique. All eligible parents of children aged 4 years old, 5 years old and 6 years old were contacted, and each preschool was required to enrol an average of 34 children. The selfadministered proxy report Malay validated questionnaire was used. The data was analysed using SPSS version 26.0. As for phase 1, the content validity ratio (CVR), content validity index (CVI), modified kappa agreement and face validity index (FVI) were reported; for phase 2, the data was analysed using logistic and linear regression.

Results: The content validation of the experts' ratings and responses revealed that the MBQ-M contained significant and essential questions. All remaining MBQ-M items had a CVR greater than 0.62. I-CVI scores of 0.95 for relevance, 0.93 for clarity, 0.95 for simplicity and 0.93 for ambiguity indicated adequate and acceptable content validity. The face validity index of clarity and comprehension were 0.95 and 0.93, respectively, indicating a satisfactory and acceptable level. Of the 612 questionnaires distributed, 557 (91%) parents consented to participate in the study and completed the form. The average children's age was 70.19 months old; 52.1% were boys, 56.7% were 6 years old and 66.6% of parent' respondents were female. The estimated prevalence of socio-emotional problems was 8.4% and peer problem was the most prevalent attribute (19.7%.). Girls, one parent working, at least two siblings and single-parent families were associated with socio-emotional problems. The percentage of met guidelines for physical activity was 42.2%, screen time 65.5%, sleep duration 70.3% and only 17.6% adhered to all three guidelines. Children in preschool do not meet individual screen time guidelines, and the specific combination of screen time and physical activity was associated with increased socioemotional problems, including emotional symptoms, conduct problems and hyperactivity (P < 0.05). In addition, a specific combination of screen time and sleep guidelines and a general combination of at least two or three guidelines was associated with emotional symptoms among preschools (P < 0.05) after adjusting for child and parent socio-demographics.

Conclusion: Socioemotional problems remain a significant concern, with peer problems as a top priority for stakeholders. Only one in ten preschool children meet the recommended 24-h movement behaviour guidelines. Non-

adherence, screen time and physical inactivity guidelines are linked to more serious socioemotional difficulties like emotional symptoms, conduct problems and hyperactivity. Early inappropriate intervention during early childhood can impact a child's healthy development. This highlights the importance of policy initiatives and health promotion programs for preschoolers to encourage healthy 24-h movement behaviours.

Supervisor:

Associate Professor Dr. Mohd Ismail Ibrahim

Co-Supervisors:

Associate Professor Dr. Azriani Berahim @ Ab. Rahman Associate Professor Dr. Najib Majdi Yaacob

TRANSLATION AND VALIDATION ON HOUSEHOLD COVID-19 FOOD INSECURITY EXPERIENCE SCALE AND ITS ASSOCIATION WITH PSYCHOLOGICAL WELL BEING AMONG LOW INCOME WOMEN IN KELANTAN DURING THE COVID-19 PANDEMIC

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Introduction: The COVID-19 pandemic is a public health and humanitarian crisis threatens the food security and nutrition of millions of people around the globe. Worsening food insecurity level during pandemic may have long-term implications and lower the psychological wellbeing level of the vulnerable group particularly low-income women. Currently, there is no validated Malay instrument available to measure the food insecurity experience scale due to COVID-19 crisis and its association with psychological wellbeing in the country.

Objectives: Thus, the objective of first phase of this study was to translate the COVID-19 Food Insecurity Experience Scale (COVID-19 FIES) into Malay and to determine its construct validity and reliability. The second phase was to describe the proportion of individual and household food insecurity experience and its association with psychological well-being among low-income women in Kelantan during the COVID-19 pandemic.

Methods: Phase one involved 10 and 68 mothers or women caretakers from Kota Bharu district were invited for face and construct validity, respectively. The second phase was a cross sectional study involving 252 mothers or women caretakers of malnourished children who were the recipients of Food Basket Programme conducted at 24 health clinics in Kelantan from November 2022 to March 2023. All respondents were randomly selected by proportionate stratified sampling. The face validity has been tested by the Face Validity Index (FVI) and the construct validity and reliability has been tested using exploratory factor analysis and Cronbach's alpha coefficient, respectively. The association between individual and household food insecurity

experience with psychological well-being has been identified through Analysis of Covariance (ANCOVA) analysis.

Results: The Item-Level Face Validity Index (I-FVI) range was 0.9-1.0 and the Scale-Level Face Validity Index (S-FVI) was 0.73. Three major components have been identified from exploratory analysis factors which are uncertainty component, quality component and quantity component with factor loading range from 0.428 to 0.866 and acceptable reliability index (Cronbach's $\alpha = 0.710$). A total of 26 (10.3%) households were identified as food security, 122 (48.4%) mild, 85 (33.8%) moderate and 19 (7.5%) severe food insecurity. There was no significant association between food security and food insecurity group for both individual and household experience level with mean psychological well-being score [-0.37 (-4.38, 5.11), P = 0.880] among low-income women in Kelantan during COVID-19 even after controlling for possible sociodemographic confounders (ethnic, educational level and receiving supplementary food assistance) and covariates (age, number of children, number of household members and total household income).

Conclusion: Malay version of COVID-19 FIES is valid and a reliable tool to measure household food insecurity among low-income women in Kelantan. Although there was no significant association between food insecurity and psychological well-being, however, other study on structural relationship between sociodemographic with food insecurity as mediating effect, toward psychological well-being need to be carried out.

Supervisor: Associate Professor Dr. Rohana Abdul Jalil

Co-Supervisor: Associate Professor Dr. Nor Azwany Yaacob

THE RELATIONSHIP BETWEEN PLASMODIUM KNOWLESI MALARIA DISTRIBUTION AND ENVIRONMENTAL FACTORS IN KELANTAN

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Introduction: *P. knowlesi* malaria infection has emerged in Kelantan for the past two decades. Despite considerable preventive measures to combat *P. knowlesi* malaria infection, the prevalence of *P. knowlesi* malaria in Kelantan is not predicted to decline anytime soon. To improve control measures of *P. knowlesi* malaria infection in Kelantan, the assessment of the relationship between *P. knowlesi* malaria and the environment is important due to the impact of environmental factors, such as spatial, climatic, and land use changes, on the transmission dynamics of *P. knowlesi* malaria.

Objectives: The study aimed to develop the cumulative and annual spatial intensity map of notified *P. knowlesi* malaria infection in Kelantan, to estimate the relationship

between meteorological indicators and the relative risk of *P. knowlesi* malaria in Kelantan using distributed lag nonlinear analysis, and to predict the geographical distribution of *P. knowlesi* malaria incidence using data from e-Vekpro system from the year 2012 to year 2021 in Kelantan, Malaysia.

Method: The secondary data review was conducted using registered malaria cases in the e-Vekpro system from 2012 to 2021 via R software. The spatial intensity map of the cases was stratified by age group, sex, month and year of diagnosis, and was estimated using kernel density estimation via 'spatstat' package. Six meteorological variables from Kuala Krai Weather Station, namely daily rainfall, daily mean temperature, daily minimum temperature, daily maximum temperature, daily mean surface wind speed and daily mean relative humidity were obtained from Malaysia Meteorological Department. A distributed lag non-linear model was used to examine the significant correlated meteorological parameters on the relative risk of P. knowlesi malaria infection in Kelantan. Bayesian geostatistical modeling based on integrated nested Laplace approximation and stochastic partial differential equation approach was used to map the predicted P. knowlesi malaria incidence in Kelantan with a 5 km × 5 km spatial resolution. This geostatistical approach used open-source continuous raster data as covariates from various sources, namely rainfall, mean temperature, temperature annual range, water vapor pressure, wind speed, elevation, forest height, and population density, representing environmental factors.

Results: A total of 1,014 cases were included in the study. Mapping of spatial intensity demonstrated that the interior area of Kelantan had a higher spatial intensity of P. knowlesi malaria infection. Spatial variation of case intensity demonstrated that cases among male were more scattered and dispersed towards Kelantan's western, southern and eastern border. The cases aged between 20 years old and 49 years old were more abundant within Gua Musang district. Meanwhile, the other age groups tend to be clustered in Jeli and Kuala Krai districts. Temporal variation by month revealed that the cases become more abundant in Jeli, Kuala Krai and Gua Musang districts from October to April, then Jeli districts in May, and Gua Musang districts from June to September. Temporal variation by year showed a shifting pattern of case intensity from centre of Gua Musang towards the southern Kelantan border. The relationship between a meteorological variable and the number of P. knowlesi malaria cases reveals that the minimum temperature and weekly average rainfall were significantly and negatively associated with the number of P. knowlesi malaria cases. Weekly average rainfall below 4.2 mm was linked to a higher relative risk of *P. knowlesi* malaria, while higher than 4.2 mm was linked to a lower relative risk of P. knowlesi malaria up to 12 lag weeks. Weekly average minimum temperatures below 23.4 °C reduce the relative risk of P. knowlesi malaria, but temperatures over 23.4 °C raise that risk within 12 lag weeks. Geostatistical shows spatial heterogeneity of predicted geographical distribution of P. knowlesi malaria infection was prominent over the central western part of the Gua Musang district and spread toward the southern border of Kelantan. Several areas in Gua Musang District have predicted geographical incidence of P. knowlesi malaria higher than 450 cases per 10,000 population, which is approximately 3.9 times higher than the

observed incidence. The exceedance probability suggested that several areas in the Gua Musang district have a higher chance of predicted *P. knowlesi* malaria infection than 100 cases per 10,000 population.

Conclusion: Environmental factors, including meteorology, topography and land cover, have an impact on the relative risk and incidence of *P. knowlesi* malaria in Kelantan. This may provide additional information for more innovative and strategic intervention planning, optimising funding allocation and human resources, as well as multisectoral approach in *P. knowlesi* malaria prevention and control specifically in Kelantan.

Supervisor:

Associate Professor Dr. Nor Azwany Yaacob:

Co-Supervisor: Professor Dr. Kamarul Imran Musa

PREVALENCE AND FACTORS ASSOCIATED WITH PREVENTABLE UNDER-FIVE MORTALITY IN KELANTAN, MALAYSIA FROM 2018–2021

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Introduction: The Sustainable Development Goals (SDG) target to end the preventable deaths of newborns and children under-5 years of age by 2030, with all countries aiming to reduce under-5 mortality to at least as low as 25 per 1,000 live births. Under-5 Mortality Rates is an important indicator for child health and well-being, and reflects the social and economic development.

Objective: The aim of the study was to determine the prevalence, causes and factors associated with preventable under-5 mortality in Kelantan from 2018–2021.

Methods: A cross sectional study was conducted between December 2022 and June 2023 among under-5 deaths from 10 districts in Kelantan notified to Kelantan State Health Department from 2018 to 2021. The study used secondary data derived from Stillbirth and Under-5 Notification System and Stillbirth and Under-5 Mortality Investigation Form. A simple random sampling method using Microsoft Excel was applied to select 904 deaths from all cases. The descriptive, simple logistic regression and multiple logistic regression analysis were applied.

Results: A total of 904 under-5 deaths who fulfill the inclusion and exclusion criteria were studied. This study showed that 46.7% of under-5 deaths was preventable. Further analysis showed that preventable under-5 deaths was significantly associated with maternal aged 14 years old–19 years old (AOR = 2.69; 95% CI: 1.24, 5.83; P = 0.012), household income less than RM3,000 (AOR = 1.55; 95% CI :1.05, 2.31; P = 0.030), child age (AOR = 0.19; 95% CI: 0.12, 0.31; P < 0.001), child without comorbidities (AOR = 3.26; 95% CI: 2.37, 4.49; P < 0.001) and shortfall of quality of care (AOR = 7.02; 95% CI: 4.23, 11.65; P < 0.001).

Conclusion: The number of preventable under-5 deaths is substantiate and it was associated with family related factor, child related factor and health service related factor. Factors such as maternal aged 14 years old–19 years old, household income less than RM3,000, child age, child without comorbidities and shortfall of quality of care were significantly associated with preventable under-5 deaths. Recognition of these associated factors hence may guide healthcare providers for improvisation of strategy and future intervention in order to end the preventable under-5 deaths and achieve the SDG by 2030.

Supervisor:

Associate Professor Dr. Azriani Ab Rahman @ Berahim

THE CHANGES IN GLYCEMIC CONTROL AND CARDIOVASCULAR RISKS AMONG TYPE 2 DIABETES MELLITUS PATIENTS IN KELANTAN ENHANCED PRIMARY HEALTHCARE CLINICS PRE- AND POST-COVID-19 PANDEMIC

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Introduction: Type 2 diabetes mellitus (T2DM) is a significant health concern and has reached alarming levels. Diabetes patients are two to three times more likely to develop cardiovascular disease and die prematurely than non-diabetics. The COVID-19 pandemic has affected lifestyle and healthcare access to patients and exacerbated this challenging situation.

Objective: To study the changes in glycemic control and cardiovascular risk pre- and post-pandemic COVID-19 and associated factors of uncontrolled post-pandemic glycaemic status among T2DM patients at Kelantan EnPHC clinics.

Methods: This was a cross-sectional secondary data review, conducted from 14 March 2023 till June 2023. Two hundred and fifty data of T2DM patients were acquired from patients' medical records. Descriptive and multiple logistic regression analysis were performed using IBM SPSS Statistics version 27.0 software.

Results: The mean age was 64.7 (10.40) years old. The majority of patients were Malay [236 (94.4 %)], female [187 (74.8%)], married [149 (59.6%)], unemployed which is housewives [129 (66.2%)] and [79 (47.6%)] patients received secondary education followed by primary education [50 (30.1%)]. Ninety-five percent of the patients have underlying comorbidities and the highest comorbidities were hypertension [215 (86.0%)] and hyperlipidemia [203 (81.2%)]. Nephropathy [72(28.8%)] was the highest diabetic complication followed by retinopathy [40 (16%)]. There were 182 (72.8%) patients with uncontrolled glycaemia postpandemic COVID-19, respectively. Patient with uncontrolled glycaemia pre-pandemic COVID-19 has 16.03 times the odds to have uncontrolled glycaemia post-pandemic COVID-19 compared to patient with controlled glycaemia pre-pandemic when adjusted for total cholesterol level pre-pandemic

COVID-19 (16.03 (8.11, 31.70), *P*-value < 0.001). Patient with an increase in 1 mmol/L of total cholesterol level prepandemic has 1.36 times the odds to have uncontrolled glycaemia post-pandemic (95% CI: 1.020, 1.806; *P*-value < 0.05) when adjusted for uncontrol glycaemic pre-pandemic COVID-19.

Conclusion: The pandemic restrictive measures do not affect glycaemic control as well as other cardiovascular risks. Individual patient factor on self-management is important to ensure the continuation of good glycaemic control despite changes in healthcare services due to the pandemic. Enhancing the implementation of a chronic care model (CCM) for chronic disease management and telemedicine is a good alternative for patient monitoring, health education, consultation and psychosocial support especially during a pandemic or disaster situation.

Supervisor: Associate Professor Dr. Nor Azwany Yaacob

DIET QUALITY AND ITS ASSOCIATED FACTORS AMONG UNDERNOURISHED CHILDREN AGED TWO TO SIX YEARS OLD PARTICIPATING IN THE FOOD BASKET PROGRAM IN KOTA BHARU, KELANTAN

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Introduction: Diet quality of children is the conformity to the Malaysian Dietary Guideline for Children and Adolescent 2014 in the context of nutrition adequacy, variety and moderation to provide essential nutrition for health. However, there are no available studies done on diet quality among the undernourished children in the Rehabilitation Programme for Undernourished Children or Food Basket Programme (FBP).

Objective: To determine the diet quality score among the FBP recipients and its associated factors.

Methods: A cross sectional study was conducted among children aged 2 years old–6 years old who registered as active FBP recipients in Kota Bharu, Kelantan. The sociodemographic data were obtained from e-PPKZM online registry or the manual record available at the health clinics. Information on food basket provision and food sharing was collected during the interview. A 24-h dietary recall method was conducted among mothers or caretakers who acted as a proxy of their respective children. Malaysian Healthy Index (MHEI) score was determined to assess the diet quality among the respondents. The descriptive, simple linear regression and multiple linear regression analysis were applied.

Results: A total of 122 children participated in this study with a response rate of 91.7%. The median (IQR) duration of receiving food basket since enrolment was 13.2 (15.6) months. Given the poverty index as the primary eligibility criterion for FBP, therefore the median (IQR) of total family income was RM1,000.00 (450.00) Majority

of the mothers were housewives (82.9%) and fathers worked as labourers/drivers/mechanics (42.1%). Most of the participants reported good access to FBP, sharing food basket with family members (65.6%) and receiving other financial aid (64.8%). The study showed poor diet quality with the mean MHEI score of 43.66 (12.67) with low intake of fruits, vegetables and legumes and excessive in sodium and total fat. A significant mean difference was found between the weight-for-age-Z-score (WAZ) upon initiation of FBP and current measurement F(1, 116) = 8.05; P = 0.005 after controlling the covariate, duration of enrolment to FBP. Multiple linear regression analysis showed a significant linear relationship between age ($\beta = -0.20$ (-0.37, -0.05); P = 0.015) and not receiving other financial aid ($\beta = -5.16$ (-9.75, -0.57); P = 0.028) with diet quality. The overall regression was statistically significant (R2 = 0.093, F(2, 119) = 6.11; P = 0.003).

Conclusion: The study revealed poor diet quality with imbalanced diet among children in the FBP. Younger age and receiving financial aid were associated to better diet quality scores. There is a need to enhance the FBP as only weight status (WAZ) showed significant improvements in underweight children but not in height (HAZ) indicated stunting and body mass index (BAZ) between the initiation of FBP and current measurement. Recommendations include early detection, nutrition education from a young age, and providing cash aid to complement the FBP in order to improve the diet quality of FBP participants.

Supervisor: Associate Professor Dr. Rohana Abdul Jalil

PROPORTION AND FACTORS ASSOCIATED WITH BROUGHT-IN-DEAD (BID) AMONG COVID-19 MORTALITY IN KELANTAN FROM 2020–2022

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Introduction: The global COVID-19 pandemic has led to many deaths, and brought-in-dead (BID) cases among COVID-19 mortality indicate the local outbreak's severity and the virus's community spread. However, the factors linked to BID cases in COVID-19 mortality remain unclear.

Objective: The aim of the study was to determine the prevalence, causes and factors associated with preventable under-5 mortality in Kelantan from 2018–2021.

Methods: A retrospective record review of anonymous data was conducted in November 2022 using secondary data obtained from the COVID-19 Mortality Database, Kelantan State Health Department for the period from March 2020 to December 2022. Total of 1,255 death cases was selected for descriptive analysis and regression analysis. Simple and multiple logistic regression was performed to determine the factors associated with BID among COVID-19 mortality in Kelantan.

Results: A total of 1,255 deaths were recorded due to COVID-19, with 356 cases (28.4%) classified as BID and 899 cases (71.6%) as inpatient deaths. The average age at diagnosis for COVID-19 mortality cases was 67.44 years old (SD 15.2), with 652 cases (52.0%) being female and 603 cases (48.0%) being male. Among these cases, the Malay ethnic group accounted for 1,195 cases (95.2%) and the majority of these cases, totaling 1,231 (98.1%), were Malaysian individuals. In the BID cases, the largest proportion consisted of individuals aged 60 years old and above (n = 283, 79.5%), followed by the 18–59 age range (n = 71, 19.9%). Majority of these BID cases were from the Malay ethnic group (n = 334, 93.8%). It is worth noting that the majority of these BID cases were in Pasir Mas (n = 90, 25.3%), followed by Tumpat (*n* = 52, 14.6%) and Pasir Puteh (*n* = 50, 14.0%). The majority of COVID-19 deceased individuals were not vaccinated (n = 746, 59.4%). Among BID cases, a higher percentage were unvaccinated (n = 222, 62.4%) compared to those who completed vaccination (n = 108, 30.3%) or had incomplete vaccination (n = 26, 74.1%). Most BID cases presented with symptoms (n = 293, 82.3%) and had comorbidities (n = 264, 25.0%). The majority of BID cases were classified as Category 2 (n = 156, 43.8%), not related to COVID-19 clusters (n = 337, 337%) and had no travel history (n = 255, 71.6%). The multiple logistic regression analysis revealed BID cases were significantly associated with presence of comorbid (AOR = 2.66; 95% CI: 1.89, 3.73; P < 0.001), not related to COVID-19 cluster (AOR = 2.19; 95% CI: 1.20, 4.01; P = 0.011), being asymptomatic (AOR = 9.17; 95% CI: 5.20, 16.17; P < 0.001) and categorised as Cat 1 at diagnosis (AOR = 4.99; 95% CI: 2.90, 8.59; P < 0.001).

Conclusion: In conclusion, BID had a significant impact on COVID-19 mortality in Kelantan, adding to the burden faced by the state. To mitigate the risks, it is crucial to ensure accessible healthcare facilities, enhance home quarantine monitoring, educate about warning signs, and expand testing capabilities.

Supervisor: Dr. Suhaily Mohd Hairon

PROPORTION AND FACTOR ASSOCIATED WITH TREATMENT DEFAULT AMONG TUBERCULOSIS PATIENTS IN SABAH FOR THE YEAR 2016–2020

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Background: Tuberculosis (TB), an airborne communicable disease, continues to pose a significant threat in our community and is the primary focus of concern for public health. Despite being preventable and curable, TB remains the second leading infectious cause of death after COVID-19, ranking 13th among all causes of mortality. According to data from the WHO Global Tuberculosis Report, TB claimed the lives of 1.6 million individuals in 2021. A significant challenge in managing TB is the inability to successfully complete the extended treatment duration,

which typically lasts for 6 months or more. The persistence of the infection source contributes to heightened mortality rates, increased relapse rates and facilitates the emergence of drug-resistant strains.

Objective: This study aims to determine the proportion of treatment default, describe and determine sociodemographic, underlying disease, clinical characteristic and lifestyle factor associated with treatment default among tuberculosis patients in Sabah from year 2016–2020.

Methods: A case control study was carried out in March 2023 using secondary data. Eligible cases (treatment default) and control (treatment success) were selected through simple random sampling. The data was sourced from the National TB Registry, MyTB. Collection of data involved the use of a proforma form, which was later analysed using SPSS software. The association between treatment default and various factors, such as socio-demographic indicators, lifestyle, comorbidities and clinical characteristics, was examined and analysed using simple and multiple logistic regression.

Result: The proportion of treatment default among TB patients in Sabah from 2016–2020 was 3.13%. A total of 380 patients (190 cases and 190 controls) were selected in the study. Among cases group, majority of them were male (77.4%), local Sabahan (74.2%), Malaysian citizen (86.3%), lived in rural area (63.2%), received secondary education as highest education level (41.6%), non-diabetic (96.8%), HIV negative (98.4%), smoker (55.8%), diagnosed with pulmonary tuberculosis (93.7%), initial smear positive sputum AFB (73.7%), had minimal chest X-ray lesion (44.7%). Citizenship status (non-Malaysian citizen) and smoking status (smoker) and showed a significant association with TB treatment default (AOR = 0.423; 95% CI: 0.248, 0.719) and (AOR = 2.268; 95% CI: 1.492, 3.448), respectively.

Conclusion: Based on these findings, we reached the conclusion that default in treatment was linked to non-Malaysian citizen status and smoking.

Supervisors:

Dr. Noor Aman A Hamid Associate Professor Dr. Nik Rosmawati Nik Hussain

INCIDENCE AND SPATIOTEMPORAL DISTRIBUTION OF PLASMODIUM KNOWLESI INFECTION IN PAHANG FROM 2011 TO 2022

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Introduction: Plasmodium knowlesi malaria poses a significant public health challenge in Pahang and Malaysia, as it can result in severe and fatal malaria cases in humans. Moreover, this disease threatens efforts towards malaria elimination. An analysis of the incidence and spatiotemporal patterns of *P. knowlesi* malaria is necessary to gather crucial information for identifying high-risk areas, making informed decisions, and allocating resources effectively for malaria control and prevention.

Objective: The study aims to evaluate the incidence rate and spatiotemporal distribution of *P. knowlesi* infection in Pahang from 2011 to 2022.

Methods: The study was a cross-sectional study conducted from January 2023 to June 2023, using a retrospective secondary data review of reported *P. knowlesi* cases that met the predefined inclusion criteria from the e-Vekpro system in Pahang. A descriptive analysis and mapping of the incidence rate were conducted. Density and cluster analysis were performed using Kernel Density Estimation (KDE) and Nearest Neighbour Index (NNI), respectively. While Global Moran's I and LISA statistics for autocorrelation at the subdistrict level. Spatial analysis was done using R software version 4.2.3.

Results: Of 967 confirmed *P. knowlesi* malaria registered in Pahang from 2011 to 2022, the majority were male (83.7%). The mean age was 36.9 (SD = 15.83) and the Malay predominants (58.3%). The average 12 years incidence rate of *P. knowlesi* in Pahang was 0.053 cases per 1,000 population and exhibited an upward and downward trend, with peaks in 2013, 2018 and 2021. The Lipis district has a high density of *P. knowlesi* malaria cases, together with the neighbouring districts of Raub and Jerantut. *P. knowlesi* cases exhibited clustering patterns (NNI < 1) except for 2011, 2015, 2016 and 2019. The results of the autocorrelation analysis indicated the presence of positive spatial correlation during the years 2012 and 2013 and identified specific hotspot areas located in the subdistricts of Tembeling, Cheka, Kechau, Telang and Gua.

Conclusion: The incidence rate of *P. knowlesi* malaria in Pahang has shown fluctuations over the course of 12 years, with peaks in incidence observed in 2013, 2018 and 2021, which were characterised by higher density, clustering and correlation in rural subdistricts of Pahang. Public health authorities should prioritise targeted prevention in the identified high-risk areas, including enhancing surveillance and monitoring for populations at risk, strengthening vector control measures and organising community education initiatives.

Supervisor:

Associate Professor Dr. Nik Rosmawati Nik Husain

Co-Supervisor: Dr. Ahmad Filza Ismail

PROPORTION OF INCOMPLETE PREVENTIVE TREATMENT AND ITS ASSOCIATED FACTORS AMONG LATENT TUBERCULOSIS INFECTION PATIENTS IN SABAH

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Introduction: Latent tuberculosis infection (LTBI) is a major public health concern; almost a third of the world's population is estimated to have LTBI. A significant proportion of infected individuals progress to active tuberculosis (TB), especially among the frequently exposed

and immunocompromised groups. Completion of LTBI preventive treatment is crucial to prevent progression to active TB.

Objectives: This study aimed to identify the proportion of incomplete preventive treatment and its associated factors among LTBI patients in Sabah, Malaysia.

Methods: A retrospective record review was conducted among LTBI patients registered in the Sabah State Health Department's LTBIS 401A registry. This study utilised a retrospective cohort study design, using secondary data from the Sabah State Health Department's LTBIS 401A registry over 4 years, from January 2019 to July 2022. Data collection was conducted using a pre-designed proforma and data were subsequently entered into a Microsoft Excel spreadsheet. Statistical analysis was performed using the SPSS version 26.0 software. Multiple logistic regression was used to determine the factors associated with incomplete LTBI preventive treatment.

Results: A total of 895 LTBI patients were included in the study. The overall proportion of incomplete LTBI preventive treatment was 9.2%. Factors that were significantly associated with the incomplete preventive treatment were non-HCW occupation (OR = 4.21; 95% CI: 1.25, 14.22), residents of Tawau Division (OR = 2.00; 95% CI: 1.10, 3.65) and LTBI patients without contact to TB patients (OR = 2.79; 95% CI: 1.42, 5.48).

Conclusion: The proportion of incomplete preventive treatment among LTBI patients in Sabah was comparatively lower than in previously published studies. Targeted interventions should be developed to address the specific needs of the groups with higher odds of having incomplete LTBI preventive treatment. This includes tackling the Social Determinants of Health for example improving healthcare system accessibility and social gradient. Prospective studies should be conducted to evaluate these interventions' effectiveness in improving LTBI preventive treatment completion rates.

Supervisor:

Associate Professor Dr. Mohd Nazri Shafei

FACTORS ASSOCIATED WITH LATE PRESENTATION OF HIV CASES IN PULAU PINANG, 2017–2021

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Introduction: HIV infection remains a significant public health problem, with the World Health Organization reporting approximately 37.7 million people living with the disease globally and 81,000 in Malaysia in 2021. Despite the national goal to end AIDS epidemic by 2030, the incidence of new HIV cases in Malaysia, has remained static since 2010, in part due to late presentation of the cases where in 2021, 68% of new HIV cases presented late.

Objective: This study aimed to describe the trend and characteristics of late presenters of HIV cases in Pulau Pinang from 2017–2021 and to identify the factors associated with late presentation of HIV cases in this region over this timeframe.

Method: This was a cross-sectional study using secondary data, year 2017 until year 2021. The study was conducted from March to June 2023. Relevant data were extracted from National AIDS Registry and the Lampiran_13a_Daftar PLHIV Penang State Health Department. The data were collected using proforma and were analysed using SPSS software version 27.0. The data were analysed using descriptive analysis, simple and multiple logistic regression.

Results: A total of 1196 sample were included in the study in which the proportion of late presentation was 62.2%. Majority of cases with late presentation are those age above 50 (80.4%), Chinese (65.5%), unemployed (60.6%), people who injected drugs (68.2%), Timur Laut District (64.4%), Hepatitis C coinfection (72.5%) and tuberculosis coinfection (81.4%). Trend in Pulau Pinang showed an overall rising of late presentation proportion ranging from 57.6% to 64.4%. The associated factors for late presentation were individuals aged 30 years old–49 years old (AOR = 1.91; 95% CI: 1.45, 2.51) and age 50 years old and above (AOR = 4.0; 95% CI: 2.44, 6.55), Chinese (AOR = 2.06; 95% CI: 1.35, 3.13) and Malay (AOR = 2.45; 95% CI: 1.64, 3.65), unemployed (AOR = 1.40; 95% CI: 1.00, 1.95) and tuberculosis coinfection (AOR = 2.64; 95% CI: 1.69, 4.14).

Conclusion: Age, ethnicity, employment status and tuberculosis coinfection significantly were the factors associated with HIV late presentation in Pulau Pinang. Future research should explore the reasons behind the observed disparities in late presentation among different age group, races, employment status, tuberculosis coinfection and develop strategies to address these issues.

Supervisor:

Associate Professor Dr. Wan Mohd Zahiruddin Wan Mohammad

PREVALENCE AND FACTORS ASSOCIATED WITH NEGATIVE EMOTIONAL STATE OF STRESS AMONG ADULT POPULATION IN KEDAH, MALAYSIA DURING COVID-19 PANDEMIC

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Introduction: COVID-19 pandemic triggers significant increase in prevalence of stress worldwide. However, the extent and factors associated with psychological distress during COVID-19 in the local population are not adequately explored.

Objective: The present study aimed to determine the prevalence and factors associated with negative emotional state of stress among adult population in Kedah, Malaysia during COVID-19 pandemic.

Methods: This is a retrospective record review of adult population aged 18 years old–60 years old who were screened for mental health well-being from January 2021 until March

2022 in the state of Kedah. Simple random sampling was applied to obtain the sample size of 562. The participants' mental health status was assessed using the online platform Depression, Anxiety, Stress Scale-21 (DASS-21). Simple and multiple logistic regression analyses were conducted to determine the factors associated with negative emotional state of stress.

Results: The prevalence of negative emotional state of stress was 45.7% (95% CI: 41.6%, 49.8%). The majority of them did not have stress (54.3%), followed by severe stress (12.3%), moderate (11.9%), mild (11.7%) and very severe stress (9.8%). The significant factors associated with negative emotional state of stress among adult population in Kedah, Malaysia during COVID-19 pandemic were sex, occupation and movement control order (MCO) period. Female has 3.04 odds more stress compared to male (AOR = 3.035; 95% CI: 2.007, 4.591; *P*-value < 0.001), being unemployed has 2.17 more odds to experience stress compared to being employed (AOR = 2.171; 95% CI: 1.480, 3.185; *P*-value < 0.001) and being under MCO were 61.7% less likely to have stress compared to not being under MCO (AOR = 0.383; 95% CI: 0.264, 0.555; *P*-value < 0.001).

Conclusion: The overall prevalence of negative emotional state of stress among adult population during COVID-19 pandemic in Kedah was 45.7%, higher than other studies. Being female and unemployed were associated with stress, while the MCO period was a protective factor against stress. By tailoring interventions and strategies based on the identified characteristics and vulnerabilities of these groups such as cognitive behavioural therapy (CBT) and mindfulness-based interventions, it is possible to implement more targeted and impactful approaches to alleviate negative emotional states of stress.

Supervisor:

Associate Professor Dr. Tengku Alina Tengku Ismail

COMPARATIVE SPATIAL ANALYSIS OF ENTERIC FEVER AND LEPTOSPIROSIS IN KELANTAN, MALAYSIA USING E-NOTIFIKASI SURVEILLANCE DATABASE, 2016–2022

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Introduction: Enteric fever and leptospirosis are increasingly important bacterial causes of acute undifferentiated febrile illness associated with severe complications and higher fatality. The burden of these diseases is high in Northern Malaysia, particularly Kelantan State. Accurate diagnosis is challenging without laboratory confirmation and despite various public health strategies implemented, enteric fever and leptospirosis remain endemic in Kelantan.

Objective: To provide information on the distribution, magnitude, geographical patterns, and risk areas of enteric fever and leptospirosis in Kelantan, and to explore the spatial relationship between the two diseases.

Methods: Laboratory-confirmed enteric fever and leptospirosis cases registered in Kelantan between the years 2016 and 2022 were extracted from the national *e-Notifikasi* passive surveillance online database. Descriptive and spatial analyses were carried out including incidence and disease mapping, univariate and multitype point pattern analysis, spatial autocorrelation as well as spatial risk variation using spatstat, spdep, sparr, spatialEco and ggplot2 R packages inside RStudio IDE.

Results: A total of 212 confirmed cases of enteric fever and 1,106 cases of leptospirosis were examined in this study. The average annual incidence for the period of 2016-2022 was 0.016 per 1,000 population (95% CI: 0.011, 0.022) for enteric fever and 0.084 per 1,000 population (95% CI: 0.071, 0.097). Enteric fever cases were found to be significantly younger than leptospirosis cases, but there was no significant gender difference observed. The study identified seven cases of co-infection, primarily occurring in areas where both diseases were endemic. Both diseases did not show any spatial correlation with population density. Substantial geographical variation of enteric fever and leptospirosis was observed across the state. Enteric fever cases were significantly clustered, and hotspots were predominantly concentrated in the northern part of Kelantan. Leptospirosis cases were as intense as enteric fever in the northern region but exhibited higher spatial intensity in the southern part of Kelantan with higher spatial risk for leptospirosis compared to enteric fever. Leptospirosis was positively spatially autocorrelated with high-high clusters mostly observed in southern and southeastern regions. Spatial dependence between enteric fever and leptospirosis cases within two to 10 km distance was also demonstrated. Despite gradual declines in the number of cases for both diseases from 2016 to 2021, there were notable surges observed during the post-COVID-19 pandemic era.

Conclusion: Understanding local dynamics is crucial as infectious disease transmission is influenced by various factors, leading to geographical variations in infection risk. Spatial analysis revealed distribution patterns, clustering, and hotspot locations for both diseases, indicating common environmental and socio-economic risk factors for both diseases. Diagnostic algorithm, targeted interventions and early warning systems can be implemented based on these findings to improve disease control and prevention strategies.

Supervisor Professor Dr. Kamarul Imran Musa

SATISFACTION TOWARDS VIRTUAL CONSULTATION SERVICES AND ITS ASSOCIATED FACTORS AMONG HEALTH CARE PROVIDERS IN GOVERNMENT HEALTH CLINICS IN SELANGOR

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Introduction: Virtual consultation services have been implemented by the Ministry of Health Malaysia since

2019 to complement current healthcare service delivery in government health clinics in Malaysia. While the services have been proven to benefit the patients, little is known about the satisfaction of healthcare providers who run the services. This study utilises the extended Technology Acceptance Model to evaluate the satisfaction of health care providers and identify the associated factors to further improve the services.

Objectives: To determine the proportion of health care providers (HCP) who were satisfied with the virtual consultation services and identify the associated factors that contribute to HCP's satisfaction towards virtual consultation services.

Methods: A cross sectional study was conducted in 42 government health in Selangor using a questionnaire adopted from the extended Technology Acceptance Model. A total of 137 health care providers from various categories responded to the online survey. Data were analysed using descriptive statistic, simple and multiple logistic regression.

Results: Majority of respondents (72.3%) were satisfied with the virtual consultation services with mean score of 14.47 (3.391). Two factors were found to have significant association with health care providers' satisfaction which were perceived usefulness (AOR = 9.396; 95% CI: 3.196, 27.625) and behavioural intention (AOR = 8.311; 95% CI: 2.494, 27.694).

Conclusion: Perceived usefulness and behavioural intention of health care providers strongly predict satisfaction towards virtual consultation services in government health clinics in Selangor. Therefore, efforts should be directed towards improving satisfaction level of health care providers by addressing these factors to ensure sustainability of the services in the future and to continue benefit the patients.

Supervisor: Dr. Surianti Sukeri

PROPORTION AND FACTORS ASSOCIATED WITH COVID-19 REINFECTION AMONG UNIVERSITI SAINS MALAYSIA HEALTH CAMPUS RESIDENTS

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Introduction: COVID-19 will remain an endemic disease worldwide and reinfection is possible. This phenomenon can be attributed to the highly mutable nature of COVID-19, which gives rise to new variants that exhibit increased transmission and immune evasion. Universiti Sains Malaysia (USM) Health Campus is a unique population as the campus has a higher-risk population due to the presence of a health centre where the risk of COVID-19 exposure is the highest among the clinical staff. The risk is also shared among clinical health students who reside in student residences and risk exposing other residences. Identifying people at risk will help us in better prevention and control of the disease.

Objectives: This study aimed to describe the proportion of COVID-19 reinfection among USM Health Campus residents and to determine the factors associated

with COVID-19 reinfection among USM Health Campus residents for the years 2021 and 2022.

Methods: This was a retrospective record review using secondary data year 2021 and 2022 from COVID-19 diseases outbreak and management data in USM Health Campus. The study was conducted from November 2022 till April 2023. Relevant data were extracted from the secured Excel sheet. The data were collected using proforma and were analysed using SPSS version 26.0. The data were analysed using descriptive analysis, as well as simple and multiple logistic regression.

Results: A total of 137 cases out of 3469 COVID-19 positive cases were included in this study in which the proportion of COVID-19 reinfection cases were 3.95%. The associated factors for COVID-19 reinfection that were found to be significant were age group > 40 years old, AOR = 0.265 (95% CI: 0.15, 0.47; *P*-value < 0.001), vaccination status, AOR = 0.254 (95% CI: 0.15, 0.43; *P*-value < 0.001) and workplace transmission AOR = 1.815 (95% CI: 1.06, 3.10; *P*-value = 0.003).

Conclusion: COVID-19 reinfections were uncommon on USM Health Campus. Age group > 40 years old, vaccination status and workplace transmission were the factors associated with COVID-19 reinfection among USM Health Campus residents. Screening targeted young age group should be enhanced and greater emphasis on health promotion and awareness in workplace for prevention and control of COVID-19 reinfection.

Supervisor: Dr. Noor Aman A. Hamid

Co-Supervisor: Associate Professor Dr. Nor Azwany Yaakob

TREND AND SPATIAL ANALYSIS OF HAND, FOOT AND MOUTH DISEASE IN PULAU PINANG BETWEEN 2017 AND 2022

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Introduction: Hand-foot-mouth disease (HFMD) is a major global public health issue, especially in Asian Pacific Region including, Malaysia and particularly affects children. Recognising high-risk areas early on and understanding how the disease spreads can help public health authorities effectively prevent HFMD outbreaks from occurring.

Objective: This study aimed to determine incidence of HFMD in Pulau Pinang, map the incidence at subdistrict level, estimate the spatial intensity of HFMD infections, test for presence of spatial autocorrelation and identify hotspots of HFMD infections.

Methods: This was a cross sectional study using secondary data from Communicable Diseases Control Information System (CDCIS) E-Notification version 2011 governed by State Health Department of Pulau Pinang. Data on population in Pulau Pinang was obtained from Department of Statistic Malaysia. The coordinates were converted into the format of projected system Kertau rectified skewed orthomorphic (RSO) Malaya (EPSG:3168). Incidence of HFMD was calculated at subdistrict level and point pattern analysis conducted using Kernel density estimates and nearest neighbouring index (NNI). The study also analyses presence of spatial autocorrelation and hot spot analysis to distinguish spatial risk at subdistrict level. Analyses were done using **gtsummary**, **tmap**, **spdep**, **spatialeco** and **spastat** package in R software version 4.2.3

Results: There was total of 15,586 reported HFMD cases between 2017 until 2022. Except year 2020 and 2021, increment of incidence of HFMD was seen with highest incidence reported in 2022 at 24.81 cases per 1,000 population. Kernel density estimates (KDE) analysis revealed HFMD cases centred at District of Timur Laut, particularly in the subdistrict of Bandar Georgetown and Mukim 13, and began to spread over Barat Daya and pockets of the Seberang Perai area of the state. There was evidence of spatial cluster of HFMD based on NNI (0.21-0.50) for all studied years. The Global Moran I statistic, ranging from 0.21 to 0.38, suggests the presence of spatial autocorrelation in all the years studied. The local indicator of spatial autocorrelation (LISA) map revealed that the areas with high-high (H-H) values were mainly clustered along the eastern coast of Pulau Pinang, indicating hotspots for HFMD. Additionally, there was a decrease in the number of low-low (L-L) regions, which were replaced by high-low (H-L) regions, particularly in the Seberang Perai area. This indicates a growing risk of HFMD infections in that region.

Conclusion:nThe spatial intensity, spatial autocorrelation, and significant hotspot regions primarily located in urbanised and newly developed areas in Pulau Pinang. These areas are characterised by high population density, industrial activities and settlements. The findings from studying the incidence and spatial patterns of HFMD infections can serve as an additional parameter for HFMD surveillance activities and formulating targeted preventive actions.

Supervisor: Professor Dr. Kamarul Imran Musa

INCIDENCE AND SPATIAL DISTRIBUTION OF LYMPHATIC FILARIASIS IN SARAWAK, 2018–2022

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Introduction: Lymphatic filariasis is a neglected tropical disease caused by *Wuchereria bancrofti, Brugia malayi* or *Brugia timori.* It leads to severe morbidity and have a significant impact on health. Spatial analysis helps identify hotspot areas in Sarawak, enabling better targeting and focusing of prevention and control activities.

Objective: This study aimed to investigate the incidence and geographic dispersion of lymphatic filariasis in the region of Sarawak during the period ranging from 2018 to 2022, identify spatial distribution and hotspot area with present of any spatial autocorrelation between cases.

Methods: This study utilised secondary data from Vekpro online system, Sarawak State Health Department

for all cases registered from period of 2018–2022. The data pertaining to the population of Sarawak were acquired from the Department of Statistics Malaysia. The coordinates were transformed into the format of Kertau Rectified Skewed Orthomorphic (RSO) Malaya (EPSG:3168). The incidence of filariasis was calculated at the district level, and point pattern analysis was conducted using Kernel Density Estimates and Nearest Neighboring Index (NNI). The study additionally examines the existence of hot spots in order to differentiate spatial risk at the district level. Analyses were done using the gtsummary, tmap, spdep, spatialeco, and spastat packages in R Software version 4.2.3.

Results: There were varying incidence rates, with the highest in 2018 at 4.7 cases per 100,000 population followed by fluctuation trend, which 0.4 cases per 100,000, 2.3 cases per 100,000, 0.9 cases per 100,000 and 2.7 cases per 100,000 population in 2019, 2020, 2021 and 2022, respectively. The kernel density estimator (KDE) showed the potential hotspot area in the northern region of Sarawak, mainly Limbang district. The nearest neighbouring index (NNI) showed there was statistically significant clustering of filariasis cases, but using Global Moran's I analysis, it showed there was no spatial autocorrelation between adjacent districts where confirmed filariasis was registered in Vekpro online system.

Conclusion: The implementation of mass drug administration (MDA) has resulted in a reduction in filariasis infections in Sarawak. However, it is important to note that the risk of filariasis remains significantly high, particularly in the northern region. The application of spatial statistics and cluster detection techniques assists health planners in accurately evaluating and detecting spatial inequalities in risk among populations. Cluster analysis aids in the identification and prioritisation of regions with persistent transmission, preventing the spread of infection and subsequent resurgence on a larger scale.

Supervisor: Dr. Ahmad Filza Ismail

NURSES' PERCEPTIONS OF PATIENT HANDOFFS AND ITS PREDICTORS IN PUBLIC HOSPITALS WITH SPECIALISTS IN KELANTAN: A CROSS-SECTIONAL STUDY

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Introduction: Understanding the significance of proper handoff process will help to reduce medical errors and enhance patient safety concerns. Thus, the purpose of this study was to investigate nurses' perceptions of patient handoffs in public hospitals with specialists in Kelantan and its predictors.

Objectives: To determine the mean perception score of patient handoffs among nurses in public hospitals with specialists in Kelantan Malaysia, and to identify predictors of patient handoff perception

Methods: This cross-sectional study examined nurses from three specialist hospitals in Kelantan, Malaysia. The nurses were proportionately and randomly selected from the hospitals and included in the study. The nurses had at least 6 months of work experience and worked shifts at public hospitals with specialists in Kelantan. The study used a selfadministered questionnaire with 26 items from six domains, which was validated and scored using a 5-point Likert scale. The data was analysed using SPSS version 25.0 and linear regression analyses were used to identify predictors of nurses' perceptions of handoffs.

Results: A total of 418 nurses participated in the study. The results indicate that nurses hold a positive view of handoffs, with a mean score \pm SD of 3.53 ± 0.31 . The mean age of the participants was 41.06 ± 6.26 years old, the mean working experience was 16.80 ± 6.12 years and the mean handoff duration was 24.39 ± 10.68 min. The study identifies the paediatric department (95% CI: -0.195, -0.053; P < 0.001), in-service formal training on handoff (95% CI: 0.016, 0.161; P < 0.05) and satisfaction with the handoff process (95% CI: 0.234, 0.425; P < 0.001) as the most significant predictors of nurses' perceptions.

Conclusion: The study found that nurses generally perceived patient handoffs positively, with predictors including the paediatric department, handoff training and satisfaction with the process. To maintain good handoff practices, ongoing education, teamwork, audits and safety-focused culture are important.

Supervisor:

Associate Professor Dr. Mohd Ismail Ibrahim

CRITICAL CARE NURSES' PERCEPTION OF CAUSES AND REPORTED MEDICATION ADMINISTRATION ERRORS IN GOVERNMENT HOSPITALS WITH SPECIALISTS IN KELANTAN

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Introduction: Medication administration errors (MAEs) are a significant concern in critical care settings, posing risks to patient safety. Understanding the causes and factors associated with reported MAEs is crucial for developing effective prevention strategies.

Objectives: To determine critical care nurse' perceptions of the causes and unreported MAEs and identify factors significantly associated with reported MAEs in government hospitals with specialists in Kelantan.

Methods: This was a cross-sectional study using a validated questionnaire. It involved critical nurses from three government hospitals with specialists in Kelantan. The sample size was calculated based on the study objectives and the maximum number of samples required was 424. They were proportionately and randomly selected based on the size of the hospital and wards. The questionnaire consisted of a total of 64 questions, encompassing 28 items that investigated the causes of MAEs, 16 items that explored the reasons for the not reporting of MAEs, and 20 items that

approximated the percentages of MAEs that were reported. The current study obtained approval from the institutional review board. Descriptive statistics and logistic regression were applied in the study.

Results: A total of 424 critical care nurses participated voluntarily. Their mean age was 40.90 (6.13) years old and their mean working duration was 16.83 (5.90) years. The majority perceived that the primary cause of MAEs was illegibility of physician's medication order and the main reason for not reporting MAEs because the administration focuses on the individual rather than the system when medication errors occur. The study also revealed significant factors such as nurses working in HDW (AOR = 4.87; 95% CI: 1.58, 15.02), who had personal experience with (AOR = 2.09; 95% CI: 1.11, 3.92) and had seen MAEs (AOR = 1.91; 95% CI: 1.19, 3.07) were more likely to report the incident.

Conclusion: The current study found that critical care nurses perceived that working in the HDW and having experienced or seen MAEs were factors associated with reporting MAEs. Enhancing patient safety culture may encourage error reporting and mitigate MAE. Government hospitals should allow nurses to report problems anonymously. Rather than individual blame, a non-punitive approach and system development may increase reporting rates.

Supervisor:

Associate Professor Dr. Mohd Ismail Ibrahim

TRANSLATION AND VALIDATION OF NIOSH WORKER'S WELL-BEING QUESTIONNAIRE AMONG HEALTHCARE WORKERS (WELLBQ)

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Introduction: The measurement of a worker's wellbeing is multidimensional that includes the work life of a worker, mental and physical condition, positive feelings, negative feelings, workplace environment and workplace safety outside of work life. As we progress toward developing nations and countries, the measurement of workers' wellbeing is increasingly being prioritised. NIOSH Worker's Well-being Questionnaire (WellBQ) is developed to measure workers' well-being holistically. This study aims to establish the validity and reliability of this instrument before it can be used due to the cultural, language and environmental differences between the Western and Eastern populations.

Objectives: To translate to Malay language and to determine the validity and reliability of the Malay version NIOSH Worker's Well-Being Questionnaire among healthcare workers in Hospital Universiti Sains Malaysia.

Methods: A cross-sectional study involving a webbased survey was employed among healthcare workers at Hospital Universiti Sains Malaysia, Kubang Kerian. The study involved forward and backward translation of the NIOSH WellBQ to Malay version with content validation and face validation, and confirmatory factor analysis (CFA) to determine the construct validity. Participants were recruited using a random sampling method through a selection of emails to healthcare workers. Descriptive, confirmatory factor analysis was applied in the statistical analysis.

Results: Four expert panels were involved in content validation for the translation phase, and 30 medical officers were to rate the Face validation process. The CVI was calculated to be 0.92 for both S-CVI/Ave and the FVI score was calculated to be 0.98, indicating that all items in the questionnaire are relevant to the domain, clear and comprehensible. For the CFA phase, a total of 366 respondents participated in this study, the majority of the respondents being female (76%), Malay ethnicity (97.5%), between 30 years old and 44 years old (71%), works as nurses (52.7%) and holding education level of Diploma (63.9%) with permanent post (91.3%). The final measurement model of CFA had fit indices: CFI = 0.841, TLI = 0.834, RMSEA = 0.053, χ^2/df = 2.008. The fit indices were within the acceptable range. The composite reliability ranged from 0.603 to 0.963.

Conclusion: The final model for CFA showed a reasonably acceptable model fit, valid and reliable after model revision of higher-order factors and after removing nine items. The translated Malay version of the NIOSH WellBQ comprised 117 items across five domains/factors. The questionnaire is valid and reliable for healthcare workers in local settings.

Supervisor: Professor Dr. Aziah Daud

REVIEW OF PATIENT SAFETY INCIDENTS AND THEIR ASSOCIATED FACTORS IN A MALAYSIA TEACHING HOSPITAL IN FROM 2018 TO 2022

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Introduction: The healthcare sector poses a higher risk than the aviation and nuclear industries as the probability of a patient being harmed during a visit to a healthcare facility is one in 300 chances. The implementation of a patient safety incident (PSI) reporting system provides detailed knowledge on how and what harms the patient, and not only useful to manage the institutions' internal problems but the lesson gained can be disseminated to others as lessons to prevent similar incidents in the future.

Objectives: This research aspires to study the reporting rates, characteristics of PSIs and the factors associated with the major outcome of PSIs in a Malaysia teaching hospital from 2018 to 2022.

Methods: The secondary data obtained from paperbased reporting forms and the hospital's web-based electronic incident reporting (e-IR) system from a Malaysia teaching hospital were used for this cross-sectional study. A descriptive study was used to describe the characteristic of PSI and a logistic model was used to identify the factors associated with the major outcome of PSIs.

Results: A total of 263 PSIs cases were reported with the highest reporting rate of 0.21 for every 1,000 patients bed-day or 0.18% per admission in 2021. The highest reported PSIs based on each category were patients more than 60 years old, male patients, incidents that took place

during post-meridiem (PM) shift, PSIs from the surgicalbased department, incidents involving patient falls and inpatients. Nurses reported the majority of PSIs and 82.9% reported PSIs were actual cases. Drug-related PSI was significantly associated with major outcomes (AOR = 6.600; 95% CI: 1.364, 31.930; *P*-value = 0.019).

Conclusion: Overall reported PSI had increased after the implementation of the e-IR in 2020. However, the PSI in this teaching hospital was still underreported compared to national and global standards. Identifying and removing barriers to report PSI must be prioritised. The processes of prescribing until administering medication need to be reevaluated to prevent future major PSIs outcomes.

Supervisor: Professor Dr. Aziah Daud

THE PREVALENCE OF DRUG-RESISTANT TUBERCULOSIS AND RISK FACTORS FOR UNFAVOURABLE TREATMENT OUTCOMES IN SELANGOR AND WILAYAH PERSEKUTUAN KUALA LUMPUR, MALAYSIA

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Introduction: Drug-resistant TB (DR-TB) is a global public health burden that causes high morbidity and mortality among the population. The increase in DR-TB cases has become evident in Malaysia over the past few years. Effective and systematic treatment can save lives; however, unfavourable treatment outcomes are a barrier.

Objectives: This study aims to determine the prevalence rate and the associated factors with unfavourable treatment outcomes among DR-TB patients in Selangor and Wilayah Persekutuan Kuala Lumpur (WPKL) from 2016 to 2020.

Methods: This study has two components: prevalence rate and case-control analysis, utilising secondary data obtained from the National Tuberculosis Surveillance Database (MyTB). All reported DR-TB cases in MyTB between 2016 and 2020 that met the study criteria were analysed. The case group consists of 181 DR-TB cases with unfavourable treatment outcomes, whereas the control group consists of 222 DR-TB cases with favourable treatment outcomes. Multiple logistic regression was used for data analysis.

Results: There was an increment in the prevalence rate of DR-TB cases in Selangor and WPKL from 2016 to 2020, from 0.31 to 1.83 per 100,000 population. DR-TB cases with unfavourable treatment outcomes accounted for 42%. The significant factors associated with unfavourable treatment outcomes among DR-TB cases were male (AOR 2.38; 95% CI: 1.44, 3.94), single and divorced (AOR 1.61; 95% CI: 1.03, 2.49), receive no formal education (AOR 3.09; 95% CI: 1.49, 6.41), HIV positive (AOR 2.87; 95% CI: 1.40, 5.87), DR-TB category for RR-TB (AOR 3.34; 95% CI: 1.90, 5.86) and MDR/Pre-XDR/XDR-TB (AOR 2.57; 95% CI: 1.52, 4.33).

Conclusion: Therefore, unfavourable treatment outcomes among DR-TB cases should be tackled through holistic public health interventions involving commitment from all stakeholders. Future studies need to explore other parameters as well as drive efforts to start capturing additional significant variables in the surveillance database for all TB cases.

Supervisor: Dr. Mohd Yusof Sidek

Co-supervisor Associate Professor Dr. Nik Rosmawati Nik Husain

FACTORS ASSOCIATED WITH COVID-19 WORKPLACE TRANSMISSION AMONG GOVERNMENT HEALTHCARE WORKERS IN KELANTAN, 2020-2021

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Introduction: Pandemic COVID-19 has hit the healthcare sector very hard and understanding the transmission in the workplace can help to minimise the impact of the outbreak. This study aimed to identify the proportion of COVID-19 and associated factors of workplace transmission among government HCWs.

Objectives: To determine the proportions and to identify associated factors among COVID-19 workplace transmission in government healthcare workers in 2020–2021.

Methods: A cross-sectional study, using secondary data of COVID-19 HCW case from a registry by Unit Kesihatan Pekerjaan dan Alam Sekitar (KPAS) in Jabatan Kesihatan Negeri Kelantan, Malaysia, was analysed using Excel and SPSS version 26.0. Descriptive analysis and multiple logistic regression were performed to identify factors associated with COVID-19 workplace transmission.

Results: A total of 660 HCWs diagnosed as positive for COVID-19 between 1 March 2020 and 31 December 2021. The cases were mainly non-workplace transmission (77.1%), with workplace transmission cases contributing only 22.9% of the case. The significant factors associated with workplace transmission were the following: Health Associate Professional group (AOR = 1.66; 95% CI = 1.11, 2.63), hospital facility (AOR = 1.63; 95% CI = 1.08, 2.48), health office facility (AOR = 1.91; 95% CI = 1.01, 3.62). Further investigation is needed to examine environmental and behavioural factors, as their impact on COVID-19 transmission in the workplace has not been adequately explored.

Conclusion: The study found that by identifying these factors would aid in the development of effective planning

and control measures to prevent the spread of the virus in work settings, particularly in high-risk environments

Supervisor:

Associate Professor Dr. Muhd Nazri Shafei

CASE FATALITY RATE AMONG ELDERLY COVID-19 PATIENTS IN KELANTAN, MALAYSIA IN 2020–2022 AND ITS ASSOCIATED FACTORS

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Introduction: The COVID-19 pandemic has significantly impacted global mortality rates, with the elderly population experiencing disproportionate effects. Compared to younger individuals, elderly individuals face a higher susceptibility to severe symptoms, hospitalisation and higher case fatality rates.

Objectives: The aim of this study is to determine the case fatality rate and identify factors contributing to death due to COVID-19 among the elderly population in Kelantan, Malaysia, from 2020 to 2022.

Methods: The study was conducted utilising secondary data from the national COVID-19 database for the period of 1 April 2020–31 March 2022. This study involved cross-sectional and case-control study designs. Simple random sampling was employed to ensure a representative dataset. Data analysis was carried out using simple and multiple logistic regression methods.

Results: The study included 28,295 elderly patients (≥ 60 years old). These patients were divided into case and control groups, with 780 patients randomly selected from the case group and 3,120 patients from the control group. The case fatality rate for the elderly population with COVID-19 in Kelantan during this period was 3.6%. Out of 28,295 elderly patients, 27,204 survived the infection, 1,024 died due to COVID-19 and 67 died with COVID-19. Multiple logistic regression analysis revealed significant factors associated with death due to COVID-19, including age at diagnosis (AOR 1.09; 95% CI: 1.07, 1.10; *P* = < 0.001), one dose of the COVID-19 vaccine (AOR 0.70; 95% CI: 0.51, 0.97; *P* = 0.034), two doses of the COVID-19 vaccine (AOR 0.13; 95% CI: 0.11, 0.16; *P* = < 0.001) and three doses of the COVID-19 vaccine (AOR 0.004; 95% CI: 0.001, 0.030; *P* = < 0.001).

Conclusion: The case fatality rate for the elderly population with COVID-19 in Kelantan remains high. The findings in this study offer valuable insights into factors influencing COVID-19 mortality among this vulnerable group. By recognising the importance of age at diagnosis and vaccination status in determining outcomes for elderly patients, healthcare professionals and policymakers can devise targeted interventions and public health strategies

aimed at reducing mortality risk and improving the overall prognosis for this at-risk population.

Supervisor: Dr. Suhaily Mohd Hairon

THE PREVALENCE OF ACTUAL MEDICATION ERROR 2019-2022 IN THE ONLINE MEDICATION ERROR REPORTING SYSTEM AND ITS ASSOCIATED FACTORS IN KELANTAN

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Introduction: The online medication error reporting system (MERS) is a voluntary reporting system of medication error (ME) in public and private healthcare facilities. Introduced in 2013, the online MERS includes the reporting of near miss and actual MEs. The prevalence of reported MEs was increasing and many factors were associated with MEs, however little is known about the prevalence of actual MEs and its associated factors in Kelantan.

Objectives: The study objectives were to determine the prevalence and factors associated with actual MEs in Kelantan from 2019 to 2022.

Methods: A retrospective secondary data record review was conducted on ME reports from 2019 to 2022 in Kelantan obtained from the online MERS database. Data was analysed using simple and multiple logistic regression for endorsed MEs report.

Results: A total of 15937 ME reports from the database were analysed. The prevalence of actual MEs in 2019 to 2022 in Kelantan was 1.6%, which ranged from 1.1% to 2.8% yearly from 2019 to 2022. Six independent variables were significantly associated with actual MEs which include inexperienced personnel (AOR 1.84; 95% CI: 1.36, 2.48), sound-alike medication (AOR 1.71; 95% CI: 1.12, 2.62), look-alike packaging (AOR 3.65; 95% CI: 2.03, 6.57), stock arrangements/storage problems (AOR 6.72; 95% CI: 3.87, 11.68), failure to adhere to work procedure (AOR 10.59; 95% CI: 7.60, 14.75), and wrong labeling/instruction on dispensing envelope or bottle/ container (AOR 4.17; 95% CI: 1.89, 9.23).

Conclusion: Even with the increasing number of MEs and near misses reported every year, the prevalence of actual MEs is reducing in Kelantan, further research is warranted to investigate such occurrence as it may imply under reporting. Increasing near misses may also eventually lead to actual MEs. Awareness program and trainings are required to increase reporting of errors by strengthening the medication safety programme and cultivate safety cultures in medication management for prevention of MEs.

Supervisor: Dr. Surianti Sukeri

THE EFFECTS OF SMR NEUROFEEDBACK ON ANXIETY, STRESS, AND SELECTIVE ATTENTION IN MALE SMOKERS AND NON-SMOKERS

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Introduction: Smoking remains prevalent and resistant to cessation efforts, and has been linked to stress, anxiety, and selective attention capacity. Neurofeedback is a non-invasive method of regulating brain function based on the principle operant conditioning by providing real-time feedback of brain activity. Sensorimotor rhythm (SMR) neurofeedback training (NFT) has been shown to be effective in improving psychological conditions and cognitive function.

Objective: This study aimed to explore the utility of SMR NFT for smoking cessation by investigating its effects of stress, anxiety and selective attention capacity of smokers and non-smokers.

Methods: This is a quasi-experimental study, comprising 10 smokers and 8 non-smokers undergoing the 20 SMR NFT sessions, conducted at USM Sains KL over a duration of 10 weeks. The participants were male, residing in Malaysia, with a mean age of 28.5 years old. The research tools include an electroencephalography (EEG) device, Depression Anxiety and Stress Scale 21 (DASS21), Stroop task, Fagerstrom Test for Nicotine Dependence (FTND) and a demographic form. Participants were assessed prior, midway, after the intervention where these scores were compared and analysed using repeated measures ANOVA.

Results: The study demonstrated a significant main effect of SMR neurofeedback on reducing anxiety levels F(1.45, 16) = 5.22, P < 0.05, improving reaction time F(2, 16) = 9.41, P < 0.001 and accuracy F(1.23, 16) = 5.33, P < 0.05 during Stroop task and SMR activity for Fp1 F(2, 16) = 5.22, P < 0.05 and Fp2 F(2, 16) = 5.29, P < 0.05 for smokers and non-smokers together, though no significant difference was found for stress levels F(2,16) = 3.27, P = 0.05. There was also a significant reduction in FTND scores among the smoker group F(2, 16) = 4.19, P < 0.05. Additionally, there was no significant interaction effect between the smokers and non-smokers and non-smokers and the variables.

Conclusion: These findings support the potential effectiveness of neurofeedback as an intervention for managing anxiety, enhancing attention, increasing SMR activity and reducing nicotine dependence. Future research should explore NFT that specifically target stress reduction in the context of smoking cessation and expand the current study with larger sample sizes to fully explore the effects of neurofeedback in different subgroups and elucidate the underlying mechanisms.

Supervisor: Dr. Mohd Faizal Mohd Zulkifly

Co-Supervisors: Associate Professor Dr. Nor Azila Noh Professor Dato' Dr. Jafri Malin Abdullah

THE EFFECT OF NEUROFEEDBACK TRAINING ON PROBLEMATIC SMARTPHONE USER AMONG YOUNG ADULT

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Introduction: The concern of problematic use of smartphone has emerged in recent years. The symptoms of problematic use of smartphone have found to be much similar to other addiction disorders such as gambling and substance use. Psychopathological issues including anxiety and depression were found to be highly associated with problematic use of smartphone. Neuroimaging techniques such as the electroencephalogram discovered abnormalities in the brain of individuals with problematic use of smartphone.

Objective: This study primarily aimed to investigate the effect of neurofeedback training on young adults with problematic use of smartphone.

Methods: This is an open-labelled, randomised controlled trial study which involved 26 participants with problematic use of smartphone. Thirteen individuals will be allocated into the experimental group where they underwent 20 sessions of neurofeedback training, whereas the other 13 individuals were allocated into the controlled group and did not receive any treatments. The protocol used for the neurofeedback was individualised but mainly consisted of alpha, low-beta and SMR wave training. The research tools to measure pre and post assessment data include an electroencephalogram device, Smartphone Addiction Scale Short-Version, Beck Anxiety Inventory, Beck Depression Inventory and a demographic form. The repeated measures MANOVA analysis was used for data analysis process.

Results: The results revealed that there is a significant effect of neurofeedback training on problematic use of smartphone ($F(_{1,24}) = 66.62$, P < 0.001), self-feedback ability (alpha waves, $F(_{1,24}) = 47.80$, P < 0.001; low beta waves, $F(_{1,24}) = 4.51$, P = 0.04), anxiety ($F(_{1,24}) = 15.17$, P = 0.00) and depression ($F(_{1,24}) = 10.73$, P = 0.00).

Conclusion: The research demonstrated the effectiveness of neurofeedback training as an intervention technique in managing problematic use of smartphone. The results also suggested that the neurofeedback training was able to decrease the anxiety and depression level in individuals with problematic use of smartphone. Future research should focus on testing the efficacy of each neurofeedback protocol individually, long-term effects and measuring different brainwaves.

Supervisor:

Associate Professor Dr. Azila Noh

Co-Supervisors: Dr. Mohd Faizal Mohd Zulkifly Professor Dato' Dr. Jafri Malin Abdullah

GENDER DIFFERENCE IN NEURAL RESPONSE TO SOCIAL AND NON-SOCIAL FEAR-EVOKED STIMULI BY USING EVENT-RELATED POTENTIAL

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Introduction: The ability to identify potential threats in the environment is enhanced by the experience of fear emotions. Gender differences in emotional processing require a complex interplay of biological, hormonal, genetic and social factors. The event-related potential (ERP) technique enables the capture of dynamic cognitive and emotional processes and distinguishes sensory-perceptual responses from elaborative cognitive processes to facilitate understanding emotional reactivity differences between genders.

Objective: This study investigates gender differences in neural responses to social and non-social fear-evoked stimuli using ERPs. We aimed to identify how gender process and react to emotionally both social and non-social fear evoked stimuli and as well as its source of localisation of N200 and P300 in the emotional processing of the male and female. ERP recording was conducted on 38 healthy adult participants.

Methods: The research method involved recruiting 38 participants (n = 19 for male and n = 19 for female) aged 18 years old-59 years old from the USM Health Campus, Kubang Kerian and Kota Bharu area through the use of convenience sampling method. Regarding the images utilised, 16 pictures (8 social, 8 non-social, 34 Neutral) were randomly selected from the International Affective Picture System (IAPS) based on the IAPS normative value (low valence and high arousal). The event-related potential (ERP) recording was conducted on participants using the 128 HydroCel Geodesic Sensor Net while they actively viewed social and non-social visual stimuli.

Results: A 2×3 mixed ANOVA results showed that there was a significant difference in the main effect (the effect of types of pictures, regardless of gender) in the central, temporal and occipital area on the latency N200, and a significant difference in the main effect of the amplitude N200 in the frontoparietal, frontal, central, temporal and occipital where P < 0.05. There was a significant difference in the main effect P300 latency and P300 amplitude in frontoparietal, frontal, central, temporal, occipital and parietal area on the P < 0.05. The data analysis of interaction effect (the effect of gender, regardless types of pictures) on P300 latency and P300 amplitude were found not statistically different between gender and visual stimuli in area of frontoparietal, frontal, parietal, temporal and occipital. The source of localisation for both N200 and P300 lies in three main lobes. The most common lobe was the occipital lobe, as this study is based on visual perception, followed by the frontal lobe and temporal lobe. In this study, four different Broadmann areas (B.A) were identified for the source of localisation for N200 and P300 in male and female, which is B.A 11, 17, 39 and 37. The specific areas identified are orbital

gyrus, lingual gyrus, middle temporal gyrus and middle occipital gyrus.

Conclusion: The study found significant genderrelated differences in neural responses to fear-inducing stimuli, both social and non-social. The research showed that females exhibited distinct ERP patterns in response to social fear-evoked stimuli compared to males. These differences may indicate variations in socioemotional processing, empathy or threat assessment between genders. The study revealed that all genders showed unique neural signatures in response to non-social fear-evoked stimuli. This suggests that gender plays a role in the way individuals perceive and react to threats that are not socially oriented.

Supervisor:

Dr. Mohd Nasir Che Mohd Yusoff

Co-Supervisor: Dr. Hafidah Umar

EYE MOVEMENT CHANGES DURING VISUO-SPATIAL IMAGERY TASK FOLLOWING ONE-TIME BRIEF MINDFULNESS EXERCISE: EYE TRACKING STUDY

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Introduction: Mental imagery is the ability of our minds to recall and create imagery for various purposes and is strongly associated with our emotions, cognition and behaviour. Mindfulness exercises, a type of cognitive intervention, have become popular in treating psychological distress, enhancing interpersonal skills, preventing depression and reducing anxiety. Research suggests that brief mindfulness may influence mental imagery and improve cognitive performance, but it may not equally affect all cognitive performance.

Objective: This study sought to find the effect of onetime brief mindfulness on eye movement changes. This study is sought to find the effect of intervention on mental imagery by one-time brief mindfulness exercise and audiobook listening activity. Also sought to find the difference in visual intake time and visual intake count of looking-at-nothing effect between the mindfulness group and the audiobook group. This study also sought to find the difference in the response accuracy during the image inspection task between the mindfulness group and the audiobook group. Also sought determined to find the difference in the vividness rating during the vividness rating task between the mindfulness group and the audiobook group.

Methods: This study recruited 34 participants between the ages of 19 years old-34 years old who possessed normal or corrected to normal vision. No participants reported familiar with mindfulness exercises such as mindful breathing, mindful eating, mindful listening or any mindful activities or having eye movement abnormalities such as lazy eye, nystagmus, and strabismus, or have been diagnosed with epilepsy or have been diagnosed with attention deficit

disorder. Participants were randomly assigned to either the brief mindfulness exercise or the audiobook listening group. Both groups performed two phases of experiments: Encoding phase and imagery phase. During imagery phase, participants completed image generation task, image inspection task and vividness rating task with blank screen paradigm. Participants' performances were recorded manually and eye movements were tracked by using eye-tracking device.

Results: Thirty-four participants were included in this study. The results showed no significant difference in visual intake time with P = 0.456. However, there was a significant difference in visual intake count between mindfulness exercise group and audiobook listening group with P = 0.021. In behavioural data findings, the results showed no significant difference in image inspection accuracy and vividness rating between two groups with respectfully P = 0.522 and P = 0.456.

Conclusion: In conclusion, there is a difference in visual intake count between the mindfulness group and audiobook group. A 15-min one-time brief mindfulness exercise did increase participants' cognitive performance in visual intake count of looking-at-nothing effect.

Supervisor: Dr. Hafidah Umar

Co-Supervisors: Dr. Aini Ismafairus Abd Hamid Dr. Anis Ghazali Kausar

THE EFFECTS OF COLOURING MANDALA ON ALPHA BRAIN ACTIVITY AND THE LEVEL OF ANXIETY SCORES AMONG UNIVERSITY STUDENTS

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Introduction: University students are often reported to have low levels of mindfulness when experiencing stressful events. Mandala colouring is beginning to attract attention as a form of art therapy to reduce anxiety. We hypothesised that colouring mandala is one of the methods for improving the anxiety symptoms reflected in brain activity.

Objective: This study aims to investigate alpha brain activity and anxiety levels before and after colouring mandala among university students.

Methods: An experiment study was conducted among 60 students with moderate and high levels of anxiety at Universiti Sains Malaysia. The recruited participants were randomly assigned into either: i) the intervention group or ii) the control group. Both groups spent approximately 20 min per session colouring a mandala with a madala pattern or colouring a blank circle on A4 paper. Beck Anxiety Inventory (BAI) in the Malay version to assess the anxiety level of the students before and after the colouring session. Additionally, electroencephalography (EEG) g.Nautilus was used to measure the students' alpha brain activity before and after the colouring session. **Results:** There is a significant increase in alpha power before and after colouring activity both in intervention and control group. An intervention group showed a significant change in alpha power at frontal area (z = -3.383, P = 0.001). A control group demonstrated a significant increase in alpha power at frontal and central region with Cz (z = -1.985, P = 0.047) and Fz (z = -2.417, P = 0.016). Also, the anxiety scores are significantly lower in both colouring conditions (z = -4.310, P < 0.001; z = -4.402, P = < 0.001).

Conclusion: Colouring activity provide university students a practical and engaging tool for improving their mental well- being and quality of life. Both colouring activities serve as effective, safe and one of the alternatives in managing anxiety symptoms among university students. This finding found that the process of colouring contributes to relaxation and increase their focus attention as shown by changes in alpha activity.

Supervisor: Dr. Mohd Faizal Mohd Zulkifly

Co-Supervisors: Associate Professor Dr. Azizah Othman Dr. Tetriana Ahmed Fauzi Dr. Mohd Nasir Che Mohd Yusoff

EXPLORING BRAIN ACTIVATION AND MEMORY PERFORMANCE OF SINGLE-DIGIT AND DOUBLE-DIGIT IN FAMILIAR AND UNFAMILIAR NUMERALS IN MALAYSIAN CHINESE YOUNG ADULTS: A FUNCTIONAL MRI STUDY

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Introduction: The ability to symbolise numbers using numerals is unique to humans and needs to be acquired via learning. The number form area (NFA), located in the ventral occipitotemporal gyrus, has been suggested to be involved in visual number symbols processing. The acquisition of the semantic information of the numerical symbols is suggested be a prerequisite for the NFA activation; however, much of its semantic information remains unknown.

Objective: The present study aims to explore the brain activation associated with familiar and unfamiliar single-digit and double-digit numerals.

Methods: Twelve Malaysian Chinese young adults with a mean age of 22.83 years old (SD = 1.47) were recruited. Participants were presented with both familiar (Chinese) and unfamiliar (Arabic) single-digit and double-digit numerals. They were then asked to complete a forced-choice memory task during functional magnetic resonance imaging measurements. This study employed within-subjects

experimental study design, incorporating two factors: type of familiarity (familiar versus unfamiliar) and the number of digits (single-digit versus double-digit). These factors were used to measure the reaction time and brain activations in all experimental conditions.

Results: A significantly shorter mean reaction time was observed with familiar numerals compared to unfamiliar numerals (P < 0.001), as well as with single-digit compared to double-digit numerals that were familiar (P = 0.008). Right fusiform gyrus showed significant activation during the encoding of unfamiliar numerals. Several regions, including the bilateral fusiform gyrus, bilateral superior parietal gyrus, left angular gyrus, right pars opercularis and left associative visual cortex exhibited significant activation during the retrieving phase of unfamiliar numerals.

Conclusion: The results indicate significantly better memory performances for familiar numerals compared to unfamiliar ones. Differential neuronal activations patterns were observed in the encoding and retrieval phases of unfamiliar numerals compared to familiar numerals. Familiarity emerged as an important factor affecting memory performance, with greater activation in the working memoryrelated regions when processing unfamiliar numerals.

Supervisor: Mohd Harizal Senik

Co-Supervisor: Aini Ismafairus Abd Hamid

ATTENTION AMONG CHILDREN WITH LETTER REVERSAL WRITING: AN EVENT-RELATED POTENTIAL OF N100, P300 AND N170 COMPONENTS

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Introduction: Letter reversals sometimes are referred to as mirror writing which means writing alphabets or numbers backwards or upside down. Experts believe children would diminish that letter reversals by 7 and 1/2 years old. However, some children might not outgrow reversing letters in primary school's standards 2 and 3.

Objective: Our study aims to examine their aspects of attentional abilities (alerting, orienting and inhibition) compared to normal letter-writing children using Children's Version of Attention Network Test (ANT-C)

Methods: Neuroimaging, which is event-related potentials (ERP), is used in this study. Thirty-two children participated in the study were evaluated with the ANT-C to assess the attentional constructs (alerting, orienting and inhibition). ANT-C is adapted to be more child-friendly by replacing the flanker in the adult version ANT with five fish. The mean ages and standard deviations for the 16-letter reversal writing (RW) children and 16 normal letter writing (NW) children were 9.02 ±.60 and 8.99 ±.58.

Results: Our study demonstrates distinct outcomes in the alerting, orienting and inhibitory networks when

comparing letter reversals children and normal letter writing children. A notable interaction effect was seen between the invalid cue and group (P = 0.004). Children who write letters reversal displayed a smaller mean amplitude of N170 in relation to invalid stimuli. A significant main effect also identified in the P300 component (P = 0.012). Letter reversal writing children showed a greater P300 amplitude in response to incongruent stimuli at Cz, O1 and O2. Researchers suggest that children who exhibit letter reversal in their writing may possess different mechanisms for allocating orienting attentional and inhibition resources compared to normal letter children.

Conclusion: Regarding this aspect, the present study's findings suggest that letter reversal writing children portray an atypical orienting and inhibition attentional processing of visual information. The current research contributes significantly to our understanding of the behavioural RT performances and neural bases of attentional networks in normal and letter-reversal children.

Supervisor: Dr. Jong Hui Ying

Co-Supervisors: Associate Professor Dr.Low Hui Min Associate Professor Dr. Nor Azila Noh

THE EFFECTS OF OUTDOOR ACTIVITIES ON P300 COGNITIVE COMPONENT AMONG ADULT ONLINE LEARNERS

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Introduction: Since the COVID-19 pandemic, online learning courses have become the new norm in higher education and soft skills training. Recent results of a systematic review show that outdoor activities such as walking, hiking or outdoor sports have significant cognitive effects in terms of selective attention, sustained attention and working memory.

Objective: In this study, we aimed to achieve two objectives: i) to compare the difference in the P300 component between groups with and without outdoor activities; ii) to compare the difference in reaction time and behavioural performance (i.e. correct and incorrect response on congruent and incongruent trials) between the groups.

Methods: This was a cross-sectional study consisting of two independent groups. This study was conducted at Reskills Online Learning hub based in Klang Valley from 1 March 2023 to 30 March 2023 from 11 a.m. till 4 p.m. The study included two groups: ii) outdoor activity participants, n = 13 and ii) non-outdoor activity participants, n = 11. Participants were selected based on their lifestyle, which includes routine outdoor activities such as nature exercises pertaining to outdoor walking, hiking, jogging and outdoor sports, and participants those who do not engage in outdoor activities. Both groups are also routinely involved in online learning, a term defining instructional learning that is

electronically delivered through a variety of multimedia and Internet platforms and applications. Other words like 'webbased learning,' 'e-learning,' 'computer-assisted education' and 'internet-based learning'. The selected participants performed a visual Stroop colour word task while wearing the EEG cap on their head to learn more about their P300 cognitive component, reaction time and comparison of behavioural patterns between these groups.

Results: The participants aged from 26 years old–40 years old with highest percentage of 17% respondents from 27 years old. Total 13 male participants of 54.2% compared to 11 females took part in this study. The SPSS independent *t*-test for P300 of the outdoor activity group showed significant P = of < 0.05, with mean = 58.11; SD = 22.76 µV. The reaction time rendered a mean = 1.74; SD =1.86 ms compared to the non-outdoor activity group. We found a significant difference in the P300 component between outdoor and non-outdoor groups, *t* (10.29) = –11.18, P < 0.05. The magnitude of mean differences = –595, with 95% CI: –713.62, –477.20, less than 'o' rendered significant too. However, there is no significant difference in the reaction time, *t* (22) = –0.40, P = 0.99 (> 0.05) and behavioural performance between group, *t* (22) = –0.99, P = 0.07 (> 0.05).

Conclusion: This study explores the relationship between outdoor activities and the P300 component, aiming to measure attention span among online and soft skills learners. The results obtained by analysing the raw data from the EEG device indicate that outdoor activities can improve the attention span of online academic and soft skill learners, thus improving the overall learning experience of users.

Supervisor: Dr. Mohd Faizal Mohd Zulkifly

Co-Supervisors:

Dr. Mohd Nasir Che Mohd Yusoff Dr. Jamilah Al-Muhammady Mohammad

THE OCCURRENCE OF EXPRESSED ANGER IN INDIVIDUALS SUFFERING FROM ANXIETY AND DEPRESSION

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Introduction: The common diagnosis of anxiety and depression calls for continuous extensive study on the disorders, including topics of anger, to ensure more accurate and precise addressing of treatment plans. In the Malaysian context, anger has primarily been explored in terms of aggression, rather than other subdomains.

Objectives: The current study was conducted to investigate the occurrence of anger expression among individuals diagnosed with anxiety and depression, as well as the differences between the disorders.

Methods: Through purposive sampling, samples were based on diagnosed subjects registered in the Psychiatric Clinic of Hospital Universiti Sains Malaysia, with the administrations conducted via physical administration or online survey. A total of 36 subjects were finalised in the study, 21 of which belonged to the anxiety group and 15 to the depression group.

Results: The findings of the study reported individuals from both groups had a higher tendency to internalise their anger with anxiety group having an average score of 2.95 (SD = 3.81) and depression having average score of 23.47 (SD = 4.22). Moreover, both diagnosis groups reported no significant difference in the context of expressed anger with reported *P*-value of 0.831 (P > 0.05).

Conclusion: The study indicated a general proneness of individuals, specifically those diagnosed with either anxiety or depressive disorder, towards internalising their anger. Acknowledging the limitations present including the small sample size and time constraints, the findings of the study are hoped to contribute to the initiation of empirical studies on anxiety, depression and anger expression. Consequently, the study will hopefully contribute to better planning and management of future therapies to be conducted.

Supervisor: Professor Dr. Muhammad Tahir Khalily

Co-Supervisors: Associate Professor Dr. Azizah Othman Dr. Nor Asuikin Fadzil

THE MEDIATING EFFECTS OF COPING MECHANISMS AND PERCEIVED SOCIAL SUPPORT ON THE RELATIONSHIP BETWEEN BURNOUT AND QUALITY OF LIFE AMONG HEALTHCARE WORKERS

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Introduction: Burnout is an occupational hazard that adversely affects the individuals' quality of life. This is especially true among healthcare workers whose job are demanding and people oriented.

Objective: The aim of this study was to examine the mediating roles of coping mechanisms and perceived social support in the relationship between burnout and QOL among HCWs.

Methods: An online survey was conducted involving 181 participants, recruited through snowball and purposive sampling techniques. The Copenhagen Burnout Inventory (CBI), Brief Coping Oriented to Problem Experience Inventory (BRIEF COPE), Meaning-Centred Coping Scale (MCCS), Multidimensional Scale of Perceived Social Support (MSPSS) and World Health Organization Quality-of-Life Scale (WHOQOL-BREF) in English and Malay languages were distributed to the participants to assess their burnout level, level of coping style, perceived social support level and their quality of life.

Results: Using Structural Equation Modelling analysis with copings (including problem-focused, emotion-focused and meaning-centred copings) and perceived social support as mediator, the findings showed reasonable model fit

(DF = 1.862; GFI = 0.936; NFI = 0.933; CFI = 0.967; TLI = 0.950; RMSEA = 0.073). Specifically, perceived social support partially mediates the relationship between burnout and quality of life (β = -0.11, *P* < 0.001; Indirect β = -0.11, *P* < 0.001). Furthermore, burnout also positively predicts emotion-focused coping (β = 0.44, *P* < 0.001) and negatively predicts meaning-centred coping (β = -0.46, *P* < 0.001) and perceived social support (β = -0.31, *P* < 0.001). In addition, problem-focused coping positively predicts meaning-centred coping (β = 0.32, *P* < 0.001) while perceived social support also positively predicts meaning-centred coping (β = 0.32, *P* < 0.001).

Conclusion: Current findings revealed the complex interplays of coping mechanisms, perceived social support in the context of burnout. The findings call for equipping healthcare workers with the appropriate coping mechanisms and sufficient social support to prevent and manage burnout.

Supervisor: Professor Dr. Hairul Anuar Hashim

Co-Supervisor: Associate Professor Dr. Azizah Othman

ATTENTIONAL BIAS TO HIGH CALORIC FOODS AND LOW CALORIC FOODS IN HIGH AND HEALTHY BODY MASS INDEX ADULTS VIA EYE-TRACKING AND VISUAL SEARCH TASK

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Introduction: Contemporary obesogenic environment poses a heightened risk for individuals with high body mass index (BMI), rendering them more susceptible to the hedonic effects of high-caloric foods (HCF), as elucidated in the incentive sensitisation theory of addiction. This thereby contributes to long-term physical and psychological health complications.

Objectives: The objective of the current study was to ascertain the presence of AB towards both HCF and low-caloric foods (LCF) cues among Malaysian adults with varying BMI categories, employing an eye-tracking device with a visual search task. Specifically, this investigation sought to examine eye-tracking parameters, including fixation count, total fixation duration, time to first fixation and first fixation duration, as indicators of AB.

Methods: This study was set up as a cross-sectional, quasi experimental research design with two groups investigating the relationship between levels of BMI and the four eye-tracking parameters (i.e. fixation count, total fixation duration, time to first fixation and first fixation duration) in detecting food cues using a visual search task. Incorporating non-probability sampling techniques like convenience, purposive, and snowball sampling, this study was conducted among 38 students and staffs in Hospital Universiti Sains Malaysia. **Results:** Findings of this study revealed no significant differences in AB patterns between individuals with high and healthy BMI in response to both HCF and LCF cues.

Conclusion: This lack of significant findings can be largely attributed to the study's sample population, inconsistencies in methodological approaches across studies, as well as the intricate nature of attentional mechanisms, thereby rendering cross-study comparisons inconclusive. Future research should incorporate more objective measures and rigorous methodologies to unravel the complexities inherent in this intricate cognitive mechanism.

Supervisor:

Dr. Mohamed Faiz Mohamed Mustafar

Co-Supervisor: Dr. Asma Perveen

THE MODERATING EFFECTS OF MEANING-CENTRED COPING ON THE RELATIONSHIP BETWEEN DEPRESSIVE SYMPTOMS AND DEFICITS IN WORKING MEMORY DURING COMPLICATED GRIEF

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Introduction: Grief is a natural response to loss, and while most individuals gradually adapt and heal over time, some may experience complicated grief (CG) characterised by persistent low mood, intense distress and cognitive impairment. Coping strategies are essential for managing grief, and meaning-centred coping appears particularly beneficial, leading to positive emotions and improved cognitive functioning. Emotion-focused coping may exacerbate depressive symptoms and working memory impairments, while problem-focused coping may offer limited benefits.

Objectives: This study aimed to explore coping strategies utilised by bereaved individuals facing complicated grief and how these strategies may predict better psychological and cognitive outcomes.

Methods: A total of 20 bereaved individuals (male = 5, female= 15) aged between 27 years old and 65 years old (mean = 42.25, SD= 9.30) were recruited from Hospital Universiti Sains Malaysia (HUSM) following the loss of a loved one due to physical illness. Participants were screened for complicated grief and subsequently completed self-report assessments of coping strategies and depressive symptoms using Brief Grief Questionnaire (BGQ), Brief COPE Questionnaire, Meaning-Centred Coping Scale (MCCS) and Patient Health Questionnaire-9 Items (PHQ-9). Additionally, participants underwent a neurocognitive assessment of working memory using the n-Back Task.

Results: The results of this study demonstrated caregivers with complicated grief suffered from moderate severity of depressive symptoms (mean = 17.45, SD = 4.43) as they coping with the losses. Furthermore, the findings showed that that meaning-centred coping

significantly predicted lower levels of depressive symptoms ($\beta = -0.50$, t(16) = -2.25, P = .039), even when accounting for the variances of problem-focused and emotion-focused coping strategies. However, none of the coping strategies demonstrated a significant effect on accuracy of working memory (R2 = 0.20, F(3, 16) = 1.32, P = 0.303) and response time of working memory (R2 = 0.20, F(3, 16) = 1.36, P = 0.291). Moreover, meaning-centred coping was not found to moderate the relationship between depressive symptoms and working memory (b < 0.00, t(16) = 0.21, P = 0.834).

Conclusion: These findings emphasise the potential benefits of meaning-centred coping in alleviating depressive symptoms among bereaved individuals, contributing to the existing literature on grief studies. They also indicate the potential applicability of meaning-centred techniques in developing grief interventions for bereaved individuals at risk for developing psychopathology.

Supervisor: Dr. Mohd Faizal Mohd Zulkifly

Co-Supervisor: Dr. Mohamed Faiz Mohamed Mustafar

THE EFFECTS OF DRAWING ON MOOD REGULATIONS AMONG PAEDIATRIC HEALTHCARE WORKERS

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Introduction: The paediatric healthcare workers experience higher risk of emotional burnout due to the emotional attachment involved in their work. The exposure to traumatic experiences has a cumulative effect on healthcare workers, leading to higher levels of symptomatic distress. This can lead to decreased efficiency and quality of work, affecting every aspect of life. Hence, emotion regulation, a goal-directed mechanism, is crucial in regulating negative emotions such as stress. Two attention deployment strategies for emotion regulation are distraction and expression. Research has shown that drawing to distract and drawing to express can improve mood, suggesting an alternative to adaptive coping strategies for healthcare workers dealing with work stressors.

Objectives: The study aimed to examine the effects of drawing to express versus drawing to distract in mood regulation among paediatric healthcare providers.

Methods: The study used an experimental design, with randomised subjects, pre-test-post-test control group design. A total of 61 paediatric healthcare workers from Hospital Universiti Sains Malaysia signed up to participate, however only 55 (N = 55) was eligible and recruited, after screening using Perceived Stress Scale (PSS). Upon signed consent, all participants were guided through a 3-min imagery task

meant to induce negative emotion. Then, pre-assessment was done to measure the participants' current mood using the Positive and Negative Affect Scale (PANAS). Then, they were randomly assigned into one of three condition groups: drawing to express, drawing to distract and symbol task scanning, served as an active control condition. After one session of doing the activities designated to each condition, PANAS was re-administered for the second time. After 4 consecutive days of doing the activities, they answered the PANAS again for the third time.

Results: The study found that there are significant effects of both drawing groups (drawing to express and drawing to distract) and non-drawing group on increasing positive affect (P < 0.001), as well as on decreasing negative affect (P < 0.001) among paediatric healthcare workers. However, there is no significant difference in the effectiveness of increasing positive affect among the three condition groups (P = 0.83), but there is a significant difference in the effectiveness of decreasing negative affect among the three condition groups (P = 0.02). In addition, in both drawing groups, drawing after four sessions improves positive affect (as indicated by a negative contrast score) more than just one drawing session.

Conclusion: The study explored the use of drawing as an emotion regulation strategy among paediatric healthcare workers. The findings suggest that drawing can enhance emotional well-being and may contribute to occupational health practices. The benefits of drawing are more evident when employed for a period of time, suggesting that various healthcare professionals who experience emotionally demanding tasks may benefit from using this self-help tool.

Supervisor: Associate Professor Dr. Azizah Othman

Co-Supervisors: Dr. Mohamed Faiz Mohamed Mustafar Dr. Fahisham Taib

A LAHORE BIRTH COHORT STUDY: ANALYSIS OF THE GROWTH AND DEVELOPMENT OF PAKISTANI INFANTS IN RELATION TO THE NUTRITIONAL STATUS OF THEIR MOTHER AND ASSOCIATED RISK FACTORS AFTER BIRTH

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Introduction: In Pakistan, the prevalence of child malnutrition is higher than in other developing countries. This study analysed the association between the health and growth of Pakistani infants with maternal nutritional status, depression and dietary patterns after delivery.

Objective: This study aimed to analyse the the growth if infants and its association with infant feeding practice, maternal nutritional status, psychological status and socioeconomic factors.

Methods: The LBCS was a 2-year prospective cohort study that recruits Pakistani infants after their birth from the Punjab Medical Centre Lahore Pakistan. The mother's postpartum information was collected from the hospital records and via a per-structured questionnaire. Collected data included sociodemographic features, anthropometrics of newborns and mothers, dietary intake of mothers during pregnancy, infant feeding practices after birth, and 2.5 months along with breastfeeding and weaning practices at the age of 9 months.

Results: Findings indicate that maternal factors such as postpartum depression (P < 0.017) and mother's occupation (P < 0.04) have a great association with the infant's growth and development. It was also determined that breastfeeding (P < 0.018), bread and cereals (P < 0.00), dairy and dairy products (P < 0.015), other milk (P < 0.00), and meat and meat substitutes (P < 0.00) also has a potentially significant association between the variables at 9 months. There was a significant correlation between breastfeeding and infant anthropometric measurements at 2.5 months and 9 months of age, including length, weight for age and head circumference percentile.

Conclusion: In conclusion, the findings emphasise the persistent and intensifying impact of breastfeeding, guiding health care recommendations and underlining the need for infant health in the Pakistani context.

Supervisor: Professor Hamid Jan Bin Jan Mohamed

Co-Supervisor: Soo Kah Leng

TRANSCRIPTOME ANALYSIS OF ISCHEMIC STROKE RECOVERY INDUCED BY NEURAL STEM CELL PRECONDITIONED WITH BAICALEIN-ENRICHED FRACTION OF OROXYLUM INDICUM

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Introduction: Ischaemic stroke is one of the leading causes of death and a major contributor to adult disability worldwide. Transplantation of regenerative stem cells preconditioned with natural products was applied to restore the damaged neural circuity after an attack of ischemic stroke. However, the key regulators and pathways underlying such recovery are still mainly unknown.

Objectives: In this study, neural stem cells (NSCs) preconditioned with baicalein enriched fraction (BEF), a neuroprotective active compound extracted from a local medicinal plant known as *Oroxylum indicum* (*O. indicum*), was transplanted into an ischaemic stroke rat model and a transcriptome analysis was applied to profile the brain total ribonucleic acid (RNA) expression to identify the key genes and pathways underlying the ischaemic stroke recovery induced by the preconditioned NSC transplantation

Methods: A total of 15 Sprague-Dawley (SD) rats were injected with endothelin-1 (ET-1) to occlude the middle cerebral artery (MCA) blood vessel inside the brain, mimicking the ischaemic stroke disease in human. The ET-1 induced ischaemic stroke rat models were randomly assigned into three subgroups, namely Group 1: non-treated (control group, n = 5), Group 2: treated with non-preconditioned NSCs (n = 5) and Group 3: treated with BEF-preconditioned NSCs (n = 5). The animal neurological behaviours were monitored and scored based on modified neurological severity score (mNSS) test, cylinder test and grid-walking test for 14 days. After 14 days, all the rats were sacrificed by intraperitoneal injection of ketamine (200 mg/kg) and xylazine (20 mg/kg). The brain tissues were harvested and snap-frozen using liquid nitrogen to homogenise the brain tissue for RNA extraction. The extracted RNA was analysed using microarray assay to reveal differentially expressed genes (DEGs), gene ontology (GO) and biological pathways related to neurological behaviour improvement of the rats.

Results: The results revealed that the experimental rats treated with NSCs preconditioned with BEF at 3.125 µg/mL for 48 h improved neurological behavioural function as fast as just 24 h after the treatment (*P*-value < 0.05), compared to rats treated with non-preconditioned NSCs and non-treated group. Furthermore, based on microarray result showed the expression of GABRA6, NGF, JAKMIP1, DRD3, STAT6, NF-κβ, SLC6A3 and IL-1RN were significantly identified based on the top 10 of DEGs (P-value < 0.05), Gene Ontology (P-value < 0.05) and biological pathways using KEGG pathways analysis (P-value < 0.05). The key regulated pathways such as cAMP signaling pathway, toll-like receptor signaling pathway, B-cell receptor signaling pathway and Fc gamma R-mediated phagocytosis were associated with the improvement of neurological behaviour in the ischemic stroke rat model.

Conclusion: In brief, this study provides new knowledge regarding the mechanism of BEF-preconditioned NSCs therapy to treat ischemic stroke based on the significant main expression of genes using microarray analysis.

Supervisor: Dr. Tan Suat Cheng

Co-Supervisors: Associate Professor Dr. Badrul Hisyam Yahaya Dr. Mohd Zulkifli Mustafa