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# Depression and cognitive impairment in Malaysian elderly: insights from a nationwide study

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**ABSTRACT**

Depression and cognitive impairment are two prevalent mental health conditions among older adults. This study aimed to investigate the factors associated with cognitive impairment among older adults with depression in Malaysia. Data were drawn from the National Health and Morbidity Survey 2018, a nationwide, cross-sectional study using a two-stage stratified cluster sampling. The sample included respondents aged 50 years and above. Cognitive impairment was assessed using the identification and intervention for dementia in the elderly (IDEA) screening tool, while depression was identified using the validated Malay version of the Geriatric Depression Scale (M-GDS-14). Key variables examined included sociodemographic characteristics, physical activity levels, and social support. Bivariate and multiple logistic regression analyses were performed to identify factors significantly associated with cognitive impairment. Results indicated that cognitive impairment was significantly higher among physically inactive individuals (AOR = 2.70, 95% CI: 0.21, 0.65) and those with low to fair social support (AOR = 1.79, 95% CI: 1.12, 2.86). These findings highlight the importance of incorporating physical and social activities into care plans for elderly patients with depression, particularly those with cognitive impairments.



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## 1. INTRODUCTION

The number of people surviving until old age has been increasing worldwide. The World Health Organization [1] reported that between 2015 and 2050, the proportion of the world's population over 60 years would nearly double, from 12% to 22%, with 80% living in developing countries. In Malaysia, the proportion of the elderly continues to rise from 3.4 million (10.3%) in 2019 to 3.5 million (10.7%) by the year 2020 [2]. Thus, increasing those struggling with physical and mental health.

Mental health conditions such as depression and cognitive impairment are among the most common conditions contributing to the global burden of all diseases [1]. Over 20% of adults aged 60 suffer from a mental or neurological disorder (excluding headache disorders). The most common mental and neurological

disorders in this age group are dementia and depression. The prevalence of mental disorders in the elderly is 15%, with 10–15% of the population having clinically significant depressive symptoms [3].

Depression is marked by a persistent sad, anxious, or "empty" mood, feeling of hopelessness, decreased energy, loss of interest in once pleasurable activities, feelings of grief, and complaints of memory problems. Regarding cognitive functions, the most frequently reported symptoms include deficits in attention, executive functions, memory, and processing speed [4]. Several risk factors have been associated with depression, including grief, social isolation, impairment, and somatic diseases that are more prevalent in older age [5]. Additionally, depression in older age is either a prodromal or risk factor for later dementia [6].

Depression is frequently linked with cognitive deficits, which can complicate the clinical management of elderly patients suffering from this condition. Despite this well-established association, there is limited knowledge regarding the prevalence and contributing factors of cognitive impairment among older adults with depression in Malaysia. This study aimed to fill that gap by exploring the factors that influence cognitive impairment in this population. Specifically, it is hypothesized that physically inactive elderly individuals with depression are at greater risk of cognitive decline, and those with lower levels of social support are also more likely to experience cognitive impairment.

## 2. METHOD

This study used data set on the health of older adults from the nationwide National Health and Morbidity Survey 2018 (NHMS 2018) conducted by the Institute for Public Health, National Institutes of Health, Ministry of Health, Malaysia. The NHMS 2018 was a nationally representative health survey for older populations aged 50 years and above in Malaysia. It was a cross-sectional study using a two-stage stratified cluster sampling design. The first stage was the enumeration block (EB), and the second stage sampling unit was the living quarters (LQ). These EBs constituted the sampling frame for the NHMS 2018. The EBs were selected independently from 13 states and three federal territories in Malaysia (as primary stratum) and within urban or rural areas (as secondary stratum). The Department of Statistics, Malaysia, conducted a selection of samples, with 60 EBs in the urban areas and 50 EBs in the rural areas. The allocation of samples to the state and strata was done proportionally to the population size. Eligible respondents were those staying in the selected LQ for the past two weeks, aged more than 50 years, and able to communicate on their own or through a proxy. The detailed sampling methods of NHMS 2018 have been described in the methodology and general findings report [7].

Cognitive impairment status among depressed elderly was the outcome of this study. The cognitive screen of identification and intervention for dementia in the African elderly (IDEA) has been used as a cognitive assessment tool to screen for dementia in Malaysia [8], [9]. Depression was identified using a validated Malay version of the Geriatric Depression Scale (M-GDS-14), with those who scored ≥6 categorized as having depression. This screening tool has been validated with high sensitivity (Sn) and specificity (Sp) (Sn = 95.5%, Sp = 84.2% for clinically significant depression and Sn = 100%, Sp = 92.0% for major depression) [10].

The independent variables included in this study were sociodemographic variables comprising age (60-69 and ≥70 years), gender (male and female), ethnicity (Malay, Chinese, Indian, Bumiputera Sabah, Bumiputera Sarawak and others), education (no formal education, primary, secondary and tertiary education), marital status (married and others: never married/separated/divorced/widowed), occupation (private, self-employed, retiree, homemaker and unemployed). Factors like physical activity (active and inactive) and social support (low-fair and high-very-high) were also included in this study. Physical activity is any bodily movement produced by skeletal muscles that requires energy expenditure [7], [11]. Assessment and guidelines of physical activity and sedentary behavior are according to the Global Physical Activity Questionnaire (GPAQ) [7], [12], [13]. Social support is an exchange of resources between at least two individuals perceived by the provider or the recipient to be intended to enhance the well-being of the recipient [7], [14]. The NHMS 2018 used Duke Social Support Index (DSSI) with 11-item module as an instrument to measure social support in the elderly [7], [15]–[17]. The DSSI examines four significant dimensions: social network, social interaction, subjective support, and instrumental support.

Descriptive statistics were applied to describe the prevalence of sociodemographic profiles, physical activity, and social support. Bivariate analysis was performed to determine the association between cognitive impairment status and each possible factor using a complex sample logistic regression. All variables with a p-value less than 0.25 or variables with clinically significant values in univariate analysis, and variables known to be associated with cognitive impairment from published articles will be included further with multiple logistic analysis by controlling all the confounding variables. The risk estimation was carried out using the odds ratio (OR) and 95% confidence intervals (CI), and the p-value of less than 0.05 was significant. Interaction and multi-collinearity tests were checked before decisions were made on the final

model. For the final model, a p-value less than 0.05 was considered significant. The finding association for each factor was reported using crude and adjusted OR (AOR). The classification table and Nagelkerke $R^2$ were also reported. The participant with missing data was removed from the analysis. All the statistical analyses were performed using the Statistical Package For The Social Sciences [18].

## 3. RESULTS AND DISCUSSION

A total of 479 older adults aged ≥60 years who were diagnosed with depression were involved in this study. The sociodemographic characteristics of the study participants are presented in Table 1. Most of the participants were adults aged 60-69 years (52.9%), female (53.1%), married (52.4%), attended primary school (49.6%), unemployed (48.6%), and Malay (63.4%).

Table 1. Sociodemographic characteristics of elderly with depression identified from NHMS 2018

| Socio-demographic data | | Estimated population | No. (%) |
|---|---|---|---|
| Age group | 60-69 | 179,830 | 249 (52.9) |
| | 70+ | 159,936 | 230 (47.1) |
| Gender | Male | 159,197 | 226 (46.9) |
| | Female | 180,569 | 253 (53.1) |
| Marital status | Others* | 161,630 | 221 (47.6) |
| | Married | 178,136 | 258 (52.4) |
| Highest education | No formal education | 85,200 | 154 (25.1) |
| | Primary | 168,426 | 243 (49.6) |
| | Secondary | 73,979 | 69 (21.8) |
| | Tertiary | 12,162 | 13 (3.6) |
| Occupation | Private employee | 13,432 | 15 (4.0) |
| | Self-employed | 36,728 | 74 (10.8) |
| | Retiree | 52,355 | 50 (15.4) |
| | Homemaker | 72,124 | 97 (21.2) |
| | Unemployed | 165,127 | 243 (48.6) |
| Ethnicity | Malay | 215,473 | 304 (63.4) |
| | Chinese | 56,724 | 61 (16.7) |
| | Indian | 15,585 | 11 (4.6) |
| | Bumiputera Sabah | 20,382 | 52 (6.0) |
| | Bumiputera Sarawak | 23,465 | 31 (6.9) |
| | Others | 8,137 | 20 (2.4) |
| CI status | Yes | 91,534 | 158 (26.9) |
| | No | 248,232 | 321 (73.1) |

Note: * unmarried/separated/divorcee/widow/er

Table 2 shows the associated factors to cognitive impairment participants by multivariable logistic regression. In univariate analysis, using a p-value of <0.25 as cut off, the significant variables identified include physical activity and social support. The multivariable logistic regression showed that cognitive impairment status was significantly higher among physically inactive people with an adjusted odds ratio of 2.70 (95% CI: 0.21, 0.65) and those with low-fair social support with AOR = 1.79 (95% CI: 1.12, 2.86).

This study is part of an extensive nationwide morbidity and mortality survey of the general population in Malaysia. We focused on the depressed elderly group and studied the relationship between depression and cognitive impairment in this group. The prevalence of cognitive impairment among depressed elderly was 26.9 %. It is almost three times higher than the prevalence reported in Iran, 9.5% [19]. It is also higher than 7.48% to 17.31% prevalence according to age range, rural or urban setting in India [20], and 12.6% prevalence from a similar study in China [21]. This difference may be because our data is extracted from an extensive nationwide survey compared to previous studies, and the different scales used to measure cognitive impairment.

Our study showed no significant associations between age, gender, marital status, education, or employment with cognitive impairment in depressed elderly. Previous studies also failed to demonstrate a significant association between cognitive impairment and age [20]–[22], gender, and marital status [19], [21]–[23]. Most studies showed a significant association between low education levels and unemployment. Still, our result was similar to other research by Bomfim *et al.* [24], which showed a lack of association. The similarity could be due to most of our study subjects having lower education levels than previous studies done in higher-income countries with higher levels of education.

Table 2. Factors influencing participants' cognitive impairment by multivariate logistic regression

| Characteristic | | Depression | | | | | |
|---|---|---|---|---|---|---|---|
| | | | Crude | | | Adjusted | |
| | | OR | (95% CI) | *P value* | OR | (95% CI) | p-value |
| Age (years) | 60-69 | 0.46 | 0.22, 0.97 | 0.043 | | - | |
| | 70+ | 1 | | | | | |
| Gender | Male | 1.42 | 0.76, 2.64 | 0.271 | | - | |
| | Female | 1 | | | | | |
| Marital status | Others* | 1.19 | 0.59, 2.42 | 0.623 | | - | |
| | Married | 1 | | | | | |
| Education | No formal education | 3.97 | 0.45, 35.28 | 0.214 | | | |
| | Primary | 1.69 | 0.19, 15.17 | 0.634 | | - | |
| | Secondary | 2.08 | 0.21, 20.93 | 0.531 | | | |
| | Tertiary | 1 | | | | | |
| Occupation | Private employee | 1.25 | 0.37, 4.26 | 0.717 | | | |
| | Self-employed | 1.22 | 0.61, 2.46 | 0.571 | | - | |
| | Retiree | 0.65 | 0.26, 1.62 | 0.350 | | | |
| | Homemaker | 0.75 | 0.37, 1.53 | 0.429 | | | |
| | Unemployed | 1 | | | | | |
| Ethnic | Malay | 0.80 | 0.32, 2.02 | 0.630 | | | |
| | Chinese | 1 | | | | | |
| | Indian | 1.40 | 0.39, 4.99 | 0.603 | | | |
| | Bumiputera Sabah | 1.82 | 0.63, 5.21 | 0.264 | | - | |
| | Bumiputera Sarawak | 0.46 | 0.14, 1.48 | 0.189 | | | |
| | Others | 0.45 | 0.12, 1.71 | 0.238 | | | |
| Physical activity | Active | 1 | | | 1 | | |
| | Inactive | 2.70 | 1.55, 4.74 | <0.001[1] | 2.70 | 1.55, 4.74 | 0.016 |
| Social support | Low - fair | 1.79 | 1.12, 2.86 | 0.001[1] | 1.79 | 1.12, 2.86 | 0.001 |
| | High - very high | 1 | | | 1 | | |

Note: * Unmarried, /separated/divorcee/widow/er
[1] Significant at p value <0.25
Classification table 73%, Nagelkerke R square: 9.3%

### 3.1. Social support and cognitive impairment among depressive elderly

Social support has been defined as "the support accessible to an individual through social ties to other individuals, groups, and the larger community" [25]. Social support has been found to predict mental health, health-related quality of life, and daily function [26]. Our study found that the depressed elderly with low social support had almost double the risk of having cognitive impairment when compared to depressed elderly with high social support. There is increasing evidence showing the protective role of social support against cognitive impairment. Similar findings were seen in MacArthur Studies of Successful Aging, where baseline social support predicted cognitive function 7.5 years later [27]. A meta-analysis reported that social support lowers levels of stress which in turn is associated with better global cognition and memory performance in healthy older adults [28]. Aged people view cognitive impairment as a threat to life's meaning, identities, and overall well-being. Support from family at this point becomes crucial in lowering the psychosocial effects experienced by those with impaired cognition [29]. Hence, this could explain the relationship between social support and cognitive impairment seen among depressed elderly in Malaysia.

### 3.2. Physical activity

Our results showed that being physically inactive was associated with the presence of cognitive impairment in older persons with depressive symptoms. The previous systematic review has shown that sedentary behavior is associated with reduced cognitive function [30]. Physical inactivity was listed as one of the 12 potentially modifiable risk factors for dementia in the 2020 report of the Lancet Commission [31]. Maintaining frequent exercise increases and maintains cognitive reserve. Physical activity protects brain health and fuels neuroplasticity by reducing the likelihood of vascular diseases and improving cerebral perfusion, improving respiratory function, stimulating growth factors, particularly brain-derived neurotrophic factor (BDNF) and insulin-like growth factor-1, and downregulating oxidative stress and inflammatory responses. It also reduces the brain's exposure to neurotoxic factors, including beta-amyloid and excessive glucose [32]. Physical activity and exercise have also improved cognition in patients with Alzheimer's disease [33]. A meta-analysis has shown that exercise is associated with the improved mood in older persons [34].

### 3.3. Strength and limitation

This research study has a few strengths and limitations. Using NHMS data derived from a large-scale population survey ensures the validity of the results in generalizing it to the Malaysian population of

interest due to the appropriate sample size and high response rate obtained. Using validated tools coupled with trained evaluators in measuring the variables also enhanced the validity of the data collected. The multivariable analysis of important factors, including sociodemographic, physical activity, and social support, further strengthens the study.

However, due to the study's cross-sectional nature, the causal relationship between identified factors and cognitive impaired status among depressed elderly cannot be established. Secondly, certain variables, such as physical activity and social support, were obtained through the self-reported mechanism. This mechanism can lead to recall bias or social desirability response, leading to over or underestimation of the levels of these variables. Lastly, using screening tools to determine the cognitive and depression level without diagnostic confirmation would also expose the findings to misclassification bias to a certain extent.

## 4. CONCLUSION

Healthcare professionals must lower their threshold in suspecting cognitive impairment among the elderly as early detection and treatment will help to reduce complications among this population. As physical activity and social support are crucial factors in reducing the odds of depression, healthcare professionals need to consciously incorporate these recommendations into their elderly patients and careers, particularly those with cognitive impairment. From a broader perspective, the study has demonstrated the need to ensure mechanisms to facilitate lifestyle practices among the elderly, particularly those at risk of depression, to ensure their physical activities and social support are enabled. These would include providing information and education to individuals and family members through various channels and policies that will enhance a coordinated approach from various agencies relevant to providing a healthy environment to the elderly population.

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## AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

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C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

## CONFLICT OF INTEREST STATEMENT

The authors state no conflict of interest.

## INFORMED CONSENT

We have obtained informed consent from all individuals included in this study.

## ETHICAL APPROVAL

This study involving human participants was conducted in accordance with the tenets of the Helsinki Declaration and complied with all relevant national regulations and institutional policies. The research was approved by the Medical Research and Ethics Committee, Ministry of Health Malaysia (NMRR-20-2169-55538) and the UiTM Ethics Research Committee (REC/09/2020 – MR/277). All participants provided written informed consent before participating in the study.

## DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author, [NJNR], upon reasonable request. Due to ethical and privacy restrictions, the data are not publicly available.

## REFERENCES

[1] World Health Organization, "World health statistics 2018: Monitoring health for the SDGs, sustainable development goals." https://www.who.int/publications/i/item/9789241565585 (accessed May 15, 2024).
[2] D. of S. Malaysia, "Department of statistics Malaysia, official portal." https://www.dosm.gov.my/v1 (accessed May 15, 2024).
[3] R. M. Kok and C. F. Reynolds, *Management of depression in older adults: A review*, vol. 317, no. 20, 2017, doi: 10.1001/jama.2017.5706.
[4] R. S. McIntyre *et al.*, "The prevalence, measurement, and treatment of the cognitive dimension/domain in major depressive disorder," *CNS Drugs*, vol. 29, no. 7. 2015. doi: 10.1007/s40263-015-0263-x.
[5] S. Weyerer *et al.*, "Incidence and predictors of depression in non-demented primary care attenders aged 75 years and older: results from a 3-year follow-up study," *Age and Ageing*, vol. 42, no. 2, pp. 173–180, Mar. 2013, doi: 10.1093/ageing/afs184.
[6] J. Da Silva, M. Gonçalves-Pereira, M. Xavier, and E. B. Mukaetova-Ladinska, "Affective disorders and risk of developing dementia: Systematic review," *British Journal of Psychiatry*, vol. 202, no. 3, pp. 177–186, 2013, doi: 10.1192/bjp.bp.111.101931.
[7] NIH, *National health and morbidity survey 2018- elderly health*. 2018. [Online]. Available: https://iku.moh.gov.my/images/IKU/Document/REPORT/NHMS2018/NHMS2018ElderlyHealthVolume1.pdf (accessed May 15, 2024).
[8] S.-M. Paddick *et al.*, "Validation of the identification and intervention for dementia in elderly Africans (IDEA) cognitive screen in Nigeria and Tanzania," *BMC Geriatrics*, vol. 15, no. 1, p. 53, Dec. 2015, doi: 10.1186/s12877-015-0040-1.
[9] R. Rosli, M. P. Tan, W. K. Gray, P. Subramanian, N. N. Mohd Hairi, and A. V. Chin, "How can we best screen for cognitive impairment in Malaysia? a pilot of the idea cognitive screen and picture-based memory impairment scale and comparison of criterion validity with the mini mental state examination," *Clinical Gerontologist*, vol. 40, no. 4. 2017, doi: 10.1080/07317115.2017.1311978.
[10] C. I. Hasanah and E. Eow Teh, "Validation of Malay version of Geriatric Depression Scale among elderly inpatients," *Age*, vol. 17. 2004.
[11] World Health Organization, "Global action plan on physical activity 2018-2030: more active people for a healthier world." [Online]. Available: https://www.who.int/publications/i/item/9789241514187 (accessed May 15, 2024).
[12] A. M. Win, L. W. Yen, K. H. Tan, R. B. T. Lim, K. S. Chia, and F. Mueller-Riemenschneider, "Patterns of physical activity and sedentary behavior in a representative sample of a multi-ethnic South-East Asian population: A cross-sectional study," B*MC Public Health*, vol. 15, no. 1. 2015. doi: 10.1186/s12889-015-1668-7.
[13] World Health Organization, *Global physical activity questionnaire (GPAQ) analysis guide*. 2012.
[14] S. A. Shumaker and A. Brownell, "Toward a theory of social support: Closing conceptual gaps," *Journal of Social Issues*, vol. 40, no. 4, pp. 11–36, 1984, doi: 10.1111/j.1540-4560.1984.tb01105.x.
[15] Koenig *et al.*, "Abbreviating the Duke Social Support Index for use in chronically ill elderly individuals," *Psychosomatics*, vol. 34, no. 1, pp. 61–69, 1993.
[16] B. Goodger, "An examination of social support among older Australians," Thesis, University of Newcastle, 2000.
[17] B. Goodger, B. Julie, H. Nick, and M. Gita, "Assessment of a short scale to measure social support among older people," *Australian and New Zealand Journal of Public Health*, vol. 23, no. 3, pp. 260–265, 1999.
[18] S. Inc, "Corp Ibm SPSS statistics for windows, version 26.0. Armonk, NY: IBM Corp." https://www.ibm.com/support/pages/how-cite-ibm-spss-statistics-or-earlier-versions-spss (accessed May 15, 2024).
[19] Z. Aajami, L. Kazazi, M. Toroski, M. Bahrami, and V. Borhaninejad, "Relationship between depression and cognitive impairment among elderly: A cross-sectional study," *Journal of Caring Sciences*, vol. 9, no. 3, pp. 148–153, 2020, doi: 10.34172/jcs.2020.022.
[20] T. Muhammad and T. Meher, "Association of late-life depression with cognitive impairment: evidence from a cross-sectional study among older adults in India," *BMC Geriatrics*, vol. 21, no. 1, 2021, doi: 10.1186/s12877-021-02314-7.
[21] C Khaw, C Teo, and A Rashid, "Cognitive impairment and depression among residents of an elderly care home in Penang, Malaysia," *The Internet Journal of Psychiatry*, vol. 1, no. 1, 2009, doi: 10.5580/ea6.
[22] A. K. Rashid, A. M. Azizah, and S. Rohana, "Cognitive impairment among the elderly Malays living in rural Malaysia," *Medical Journal of Malaysia*, vol. 67, no. 2, pp. 186–189, 2012.

[23] A. E. Villarreal, S. Grajales, L. Lopez, G. B. Britton, and P. A. R. Initiative, "Cognitive impairment, depression, and cooccurrence of both among the elderly in Panama: Differential associations with multimorbidity and functional limitations," *BioMed Research International*, vol. 2015, 2015, doi: 10.1155/2015/718701.
[24] A. J. De Lima Bomfim, N. M. De Souza Chagas, L. R. Leal, R. M. De Paula Pessoa, B. L. C. Ferreira, and M. H. N. Chagas, "Cognitive performance of older adults with a low level of education with and without depression," *Dementia e Neuropsychologia*, vol. 15, no. 1, pp. 121–127, 2021, doi: 10.1590/1980-57642021dn15-010013.
[25] N. Lin, W. M. Ensel, R. S. Simeone, and W. Kuo, "Social support, stressful life events, and illness: A model and an empirical test," *Journal of Health and Social Behavior*, vol. 20, no. 2, pp. 108–119, 1979, doi: 10.2307/2136433.
[26] L. F. Berkman, T. Glass, I. Brissette, and T. E. Seeman, "From social integration to health: Durkheim in the new millennium," *The Sociology of Health and Illness: A Reader*, pp. 99–111, 2013, doi: 10.4324/9781315013015-18.
[27] T. E. Seeman, T. M. Lusignolo, M. Albert, and L. Berkman, "Social relationships, social support, and patterns of cognitive aging in healthy, high-functioning older adults: MacArthur Studies of Successful Aging," *Health Psychology*, vol. 20, no. 4, pp. 243–255, 2001, doi: 10.1037//0278-6133.20.4.243.
[28] M. E. Kelly *et al.*, "The impact of social activities, social networks, social support, and social relationships on the cognitive functioning of healthy older adults: A systematic review," *Systematic Reviews*, vol. 6, no. 1, 2017, doi: 10.1186/s13643-017-0632-2.
[29] S. Yang *et al.*, "Predictors of perceived social support for patients with dementia: A mixed-methods study," *Clinical Interventions in Aging*, vol. 15, pp. 595–607, 2020, doi: 10.2147/CIA.S249223.
[30] R. S. Falck, J. C. Davis, and T. Liu-Ambrose, "What is the association between sedentary behaviour and cognitive function? A systematic review," *British Journal of Sports Medicine*, vol. 51, no. 10, pp. 800–811, 2017, doi: 10.1136/bjsports-2015-095551.
[31] G. Livingston *et al.*, "Dementia prevention, intervention, and care: 2020 report of the Lancet Commission," *The Lancet*, vol. 396, no. 10248, pp. 413–446, 2020, doi: 10.1016/S0140-6736(20)30367-6.
[32] Cheng S. T., "Cognitive reserve and the prevention of dementia: The role of physical and cognitive activities.," *Current Psychiatry Reports*, vol. 18, no. 9, p. 85, 2016.
[33] R. X. Jia, J. H. Liang, Y. Xu, and Y. Q. Wang, "Effects of physical activity and exercise on the cognitive function of patients with Alzheimer disease: A meta-analysis," *BMC Geriatrics*, vol. 19, no. 1, 2019, doi: 10.1186/s12877-019-1175-2.
[34] S. M. Arent, D. M. Landers, and J. L. Etnier, "The effects of exercise on mood in older adults: A meta-analytic review," *Journal of Aging and Physical Activity*, vol. 8, no. 4, pp. 407–430, 2000, doi: 10.1123/japa.8.4.407.

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**Nor Jannah Nasution Raduan** is a psychiatrist. She has been in mental health field since 12 years and received her medical degree in 2007 and master's degree in Psychiatry in 2016 and is registered with Malaysian National Specialist Registry. She is a Consultant Psychiatrist in UiTM Private Specialist Centre (UPSC) and Senior Lecturer in Faculty of Medicine, Universiti Teknologi MARA and an invited trainer in field of mental health and psychological wellbeing workshops for adults & corporate companies. She was involved in psychosocial support programs for MH370 and MH17 catastrophe. Hence with many practices and encounters in the field of mental health, she is indeed a warm psychiatrist with many therapeutic experiences. She can be contacted at email: norjannah@uitm.edu.my.

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**Nor Farahdila Hairoman** is a statistician with a degree in Economics from the University of Malaya, class of 2005. After gaining over 12 years of experience at the Ministry of International Trade and Industry, she joined the Biostatistics and Data Repository sector at the National Institutes of Health (NIH) in 2020. She has a passion for working with numbers and enjoys challenging herself with infographics while preparing posters for public health conferences, combining data analysis with creative design. She can be contacted at email: farahdila.h@moh.gov.my.

**Muhd Zulfadli Hafiz Ismail** earned his medical degree from Barts and the London, Queen Mary University in 2010 and gained clinical experience in Malaysia before joining the Institute for Health Systems Research under the NIH in 2014. He pursued his passion for public health by completing his Master of Public Health (MPH) in 2017 and Doctor of Public Health (DrPH) in 2020 at the University of Malaya. Currently serving as a public health medicine specialist in the sector for biostatistics & data repository at the NIH, He is committed to promoting open science and is an active member of the Malaysian Open Science Alliance (MOSA). He plays a pivotal role in developing a big data ecosystem at NIH, spearheading initiatives such as cloud computing solutions for researchers, the NIH data repository system (NIH-DaRS), and providing training in big data analytics and AI, supporting the ministry's research efforts. He can be contacted at email: m.zulfadli@moh.gov.my.

**Tengku Mohd Saifuddin Tengku Kamarulbahri** is a dedicated psychiatrist who has made significant contributions to the field of mental health in Malaysia. He completed his Bachelor of Medicine, Bachelor of Surgery (MBBS) from the International Islamic University Malaysia (IIUM), where he developed a strong foundation in medical sciences and a passion for mental health care. Pursuing further specialization, He undertook postgraduate studies at Universiti Teknologi MARA (UiTM), enhancing his expertise and skills in psychiatry. His rigorous training and commitment to the field have equipped him with the knowledge and capabilities to provide exceptional mental health care. Currently, he serves as a psychiatrist at Universiti Sultan Zainal Abidin (UniSZA), within the Faculty of Medicine and Health Sciences. He can be contacted at email: tgsaifuddin@unisza.edu.my.