# Prevalence and Factors Associated with Depression among Rural Communities in Negeri Sembilan, Peninsular Malaysia

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*Authors' contributions*

*This work was carried out in collaboration between all authors. Author NKT designed the study, wrote the protocol and wrote the draft of the manuscript. Author TKL designed the study, performed the statistical analysis, supervised the study and wrote the draft of manuscript. All authors read and approved the final manuscript.*

*Original Research Article*

## ABSTRACT

**Aims:** To determine the prevalence of depression and factors associated with depression among rural communities in Negeri Sembilan, Peninsular Malaysia.
**Study Design:** A cross-sectional study with simple random sampling.
**Place and Duration of Study:** Port Dickson, Negeri Sembilan, between June 2013 and July 2013.
**Methodology:** A total of 223 respondents participated in this study. Data were collected by face-to-face interview using a structured questionnaire. The Patient Health Questionnaire (PHQ-9) was used as a screening tool to detect the presence of depression.
**Results:** The prevalence of depression among the rural communities was 7.6%. Non-bumiputra (OR = 3.90; 95% CI: 1.25, 12.18), low education level (OR = 2.65; 95% CI: 1.18, 5.94), smoking (OR = 4.69; 95% CI: 1.69, 13.05), no alcohol consumption (OR = 8.90; 95% CI: 1.71, 46.29), practice healthy diet (OR = 4.83; 95% CI: 1.07, 21.18) and did not exercise regularly (OR = 3.07; 95% CI: 1.40, 6.73) were factors associated with depression.
**Conclusion:** Early detection of individuals with depression is crucial to initiate treatment to reduce or minimize morbidity and mortality.

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## 1. INTRODUCTION

Depression is a common mental health disorder with many undiagnosed cases even though it is treatable [1-3]. It presents with negative mood, loss of interest or appetite, insomnia, irritability, tiredness, feelings of guilty, poor concentration and suicidal ideations [4]. Over 350 million people around the world are diagnosed with depression yearly [5]. It is an epidemic outbreak of mental illness that contributes to the leading cause of worldwide morbidity and mortality [3,5]. Depression has been linked with poor bio-psychosocial outcomes and suicidal thoughts [6]. A study showed that depression is a major risk factor for severe suicidal ideation which contributes to loss of productive life-years and healthcare cost by 2030 [5,7,8]. The pathophysiology of depression is complex interactions of biological, psychological and social factors [3]. It affects people regardless of age, geographic locations, demographics, lifestyle factors or social positions [9].

World Health Organization (WHO) estimates that 1 in 20 people will suffer from depression during their lifetime in World Mental Health Survey 2011 [5]. In a study conducted by Andrade L et al. the lifetime prevalence rate of depression varies from 3% in Japan to 16.9% in United State, with the majority of countries within the range of 8% to 12% [10]. A number of European studies revealed that 4.6% to 8.8% of the general population may experience depression at any one time [11-13]. A recent study in Italy showed the prevalence rate of depression was 7.8% to 9.0% [14]. The prevalence rate of depression in Canada varies between 4% and 6% [15,16].

According to The Third National Health and Morbidity Survey (NHMS III) 2006, the prevalence of psychiatric morbidity was 11.2% for adult population in Malaysia [17]. According to Mukhtar F et al. the prevalence rate of depression for general community in Malaysia ranges between 6.3% and 18.0% [9]. However, the figures reported are in limited significances due to lack of standardized screening tool being used. Three epidemiologic studies on the prevalence rate of depression were carried out using self-assessed screening tool, Patient Health Questionnaire (PHQ-9) in Malaysia. Sherina MS et al. reported that the prevalence rate of depression was 8.3% [18]. Race, religion, education level and history of miscarriage were identified as risk factors for depression among women in Selangor [18]. Zamzam R et al. showed the prevalence rate of depression was 14.4% among adult patients in semi-urban primary healthcare setting in Malaysia [19]. Tan KL et al. documented that the prevalence rate of depression was 12.3% among urban poor area with age group <25, male gender, living in area for <4 years and not exercise regularly significantly associated with depression [20].

Studies showed that women were more prone to depression than men in all age groups and ethnic groups in European and Asian countries [3,17,21-27]. Pubertal changes and social factors are important predictors for depressed mood among women [28]. Many research papers in European and Asian countries postulated that depression was more common among older age group [21,29]. In a clinical review, the findings showed that age group over 65 had higher tendency to commit suicide than any other age groups, and most of them had depression [8].

Unfavorable socio-economic factors such as low family income, low education level and unemployment status have been recognized as predictive factors for depression

[21,26,27,29-33]. A Thai researcher reported that life stressors such as severe medical illnesses and job loss had significant impact on the onset of depression [34]. In contrast, a study done in Korea found that employed women were high risk group for depression than men due to work-related factors, along with other known social and familial factors [35]. L. Yunming et al. reported that the prevalence rate of depression was much lower in married compared to single/widowed people [33].

There are different schools of thought about exercise activity uplifts the symptoms of depression with positive boost of mood. Tan KL et al. found that people who did not exercise regularly are more likely to have depression [20]. Many journals' finding showed that exercise reduced the risk of getting depression [36-41]. Ransford CP proposed that the mechanism of exercise increases the brain aminergic synaptic transmission [42]. Serotonin and dopamine are examples of monoamines that increase during exercise to create positive mood effect, especially among depressed patients. Among the types of exercise activity, moderate exercise is proven to be better than strenuous activity for psychological benefit in a study conducted by Moses J et al. [43]. This finding was supported by an experimental study carried out by Hassmen P et al. [44].

Finding from Northwestern First Nation proved that depression was associated with smoking in a rural First Nation in British Columbia [45]. Studies documented that smokers will have higher tendency for depression compared to non-smokers [46-48]. It is believed that nicotine in cigarette can directly and indirectly stimulate the neurotransmitters that involved in mood regulation pathway to depression [47,49]. Smoking is a coping strategy of stress to mitigate negative moods [50-52]. However, Berg CJ et al. documented that there was no association between smoking status and depressive symptoms among Asians [53].

Strong correlation has been demonstrated between alcoholism and depression. 40% of alcoholics' mindset often occupied with thoughts of suicide with 30% of them diagnosed with clinical depression [54]. A study by Li N et al. revealed that light or moderate drinking can reduce the incidence of depression among rural older adults with its benefits of relaxation and mood alteration [21].

At present, there is lack of standardization in measuring depression among the population in rural communities in Malaysia. The hypothesis of study is that there is no difference in the prevalence of depression among our study and general population in Malaysia. The objectives of this study were to determine the prevalence rate of depression and factors (socio-demographic and lifestyle factors) associated with depression among general population in rural communities of Malaysia by using the Patient Health Questionnaire (PHQ-9) with the best cut-off point of 10 as depression.

## 2. METHODOLOGY

A cross sectional study was conducted in the rural area of Port Dickson in June and July 2013. We identified and labelled all the 38 housing areas in Mukim Port Dickson on the map. Then, simple random sampling of draw lots method was used to choose out the 4 selected housing areas, which are Taman Seri Bandar, Taman Mekar, Taman Kampung and Bandar Dataran Segar as our study population.

A total of 223 respondents were recruited for the study. Any local respondents aged 18 years old and above were included in the study. Foreigners, cognitive impaired individuals and medically-certified psychiatric patients were excluded from the study. Among those 4

housing areas, trained personnel knock on doors of all houses to carry out face-to-face interview by using pre-tested structured questionnaires.

The questionnaire consisted 3 sections; the first section was on socio-demographic characteristics which comprised of 8 questions, the second section was on lifestyle factors comprising 4 questions and the third part was the Patient Health Questionnaire (PHQ-9) with 9 questions. All the questionnaires were designed in Malay version because it is the mother tongue of Malaysia and nearly all respondents are well-versed with Malay language. Hence, they have no difficulty in answering the questions. PHQ-9 was chosen because it is a short and quick screening tool with acceptable validity as compared to Hamilton Depression Rating Scale, which is more appropriate for community-based studies [55,56].

In this study, bumiputra refers to Malay ethnic; whereas non-bumiputra refers to Chinese and Indian ethnic. Healthy diet was defined as consuming either vegetables or fruits on daily basis. For exercise, it defined as number of times exercise with its duration more than 30 minutes per week. In education level, it was categorized into two, which were poor-educated (none or completed primary school level) and well-educated (completed secondary or tertiary level). Alcohol consumption was defined as any amount of alcohol intake within the last 3 months.

The Patient Health Questionnaire (PHQ-9) was designed by Dr Robert LS and colleagues from the Primary Care Evaluation of Mental Disorders Patient Health Questionnaire (PRIME-MD PHQ) [57]. It is a self-assessed screening test with 9 questions to identify depression symptoms for the last two weeks. Trained personnel facilitated the respondents in understanding the questions without interfere the answers of respondents. The questions were derived from the depression symptoms stated under the guideline of Diagnostic and Statistical Manual of Mental Disorders (DSM-IV). The Malay version of PHQ-9 was used in this study, which was validated by Azah MNN et al. [55]. So far, we did not encounter any problem in our study regarding the Malay version PHQ-9. According to Kroenke K et al. using the clinical interview as the criterion standard, an English version PHQ-9 score of 10 or more has a sensitivity of 88% and a specificity of 88% for major depression [56]. Similarly, Azah MNN reported that the best cut-off score for severe depression in Malay version PHQ-9 was 10 with sensitivity of 60.9%, specificity of 80.7% with positive predictive value of 38.6% [55]. Hence, cut-off point of 10 was used to indicate depression in this study.

Using the Power and Sample Size Calculator, a sample size of 223 respondents should be interviewed in order to gain a 95% of confidence interval, with a maximum allowable difference of 0.05 in detecting the depression proportions in the population.

All data were entered and analyzed with Statistical Product and Service Solutions (SPSS) version 21.0. Descriptive statistics were used for all variables studied. Univariate associations between variables and depression were estimated using binary logistic regression model, Odds Ratio and the 95% Confidence interval with the level of significance sets at 0.05. Variables that were significantly associated with depression in the univariate analyses were included in the multivariate model. Variables were excluded from the final logistic model if they were not associated with depression and their removal from the model did not materially affect the association of other variables in the model based on the algorithm proposed by Hosmer and Lemeshow [58]. The receiver operating characteristic curve was performed based on the multivariate model.

## 3. RESULTS

Table 1 shows the socio-demographic characteristics of the respondents. Majority of respondents were female (59.2%), aged less than 59 (76.7%), non-bumiputra (74.9%) and education level as secondary and above (71.3%). Over half of them were unemployed (57.4%), household income less than RM2999 (65.5%), married (81.6%) and lived less than 19 years in Port Dickson (64.6%). More than three quarter of respondents were non-smokers (82.5%), did not consume alcohol (85.2%) and did practice healthy diet (86.1%). About 56% of the respondents did practice exercise at least 30 minutes per week.
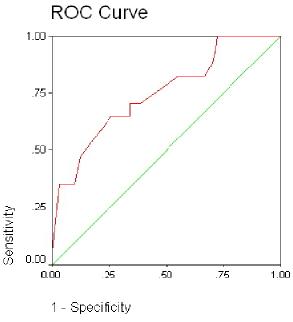
**Table 1. Profile on socio-demographic characteristics and lifestyle factors among the respondent (n = 223)**

| Characteristics | Mean (sd) | n (%) |
|---|---|---|
| **Socio-demographic characteristics** | | |
| Age (years) | 46.7 (15.46) | |
| ≥ 60 | | 52 (23.3) |
| ≤ 59 | | 171 (76.7) |
| Gender | | |
| Male | | 91 (40.8) |
| Female | | 132 (59.2) |
| Ethnicity | | |
| Bumiputra | | 56 (25.1) |
| Non-bumiputra | | 167 (74.9) |
| Education Level | | |
| Secondary and above | | 159 (71.3) |
| Primary and below | | 64 (28.7) |
| Employment Status | | |
| Unemployed | | 128 (57.4) |
| Employed | | 95 (42.6) |
| Monthly Household Income | 2789.0 (1089.40) | |
| ≤ RM2,999 | | 146 (65.5) |
| ≥ RM3,000 | | 77 (34.5) |
| Marital Status | | |
| Married | | 182 (81.6) |
| Single/ Divorced/ Widow | | 41 (18.4) |
| Years Lived (years) | 16.8 (14.87) | |
| ≤ 19 | | 144 (64.6) |
| ≥ 20 | | 79 (35.4) |
| **Lifestyle factors** | | |
| Smoking | | |
| No | | 184 (82.5) |
| Yes | | 39 (17.5) |
| Alcohol | | |
| Yes | | 33 (14.8) |
| No | | 190 (85.2) |
| Practice Health Diet | | |
| No | | 31 (13.9) |
| Yes | | 192 (86.1) |
| Exercise Regularly | | |
| Yes | | 124 (55.6) |
| No | | 99 (44.4) |

*Socio-demographic characteristics and lifestyle factors*

The prevalence of depression among the respondents was 7.6% (95% CI: 4.81, 11.86). In multivariate analysis (Table 2), non-bumiputra was four times more likely to have depression compared to bumiputra (OR = 3.9; 95% CI: 1.25, 12.18). Respondents with low education level of primary or below were 2.5 times higher risk to suffer from depression compared to high education level of secondary and above (OR = 2.65; 95% CI: 1.18, 5.94). Smokers were 4.5 times more likely to have depression compared to non-smoker (OR = 4.65; 95% CI: 1.69, 13.05) while those who did not drink alcohol were almost 9 times more likely to have depression compared to alcohol drinkers (OR = 8.9; 95% CI: 1.71, 46.29). Respondents who practiced healthy diet were approximately 4.5 times more likely to have depression compared to those who did not practice healthy diet (OR = 4.83; 95% CI: 1.07, 21.18). Subjects who did not exercise regularly were three times more likely to suffer from depression than those who did exercise (OR = 3.07; 95% CI: 1.40, 6.73).

A receiver operating characteristic curve was performed on the multivariate final model (Fig. 1). The model has an area under the curve of 0.75 (95% CI: 0.660, 0.838), which indicates that the final model discriminates moderately well between the stated variables [59].



**Fig. 1. Receiving Operating Characteristic (ROC) curve for final predictive model of depression**

**Area under the Curve**

Test Result Variable(s): Predicted Value

| Area | Std. error | *P*-value | Asymptotic 95% Confidence Interval | |
|------|-----------|-----------|-----------------------------------|--|
| | | | **Lower Bound** | **Upper Bound** |
| 0.749 | 0.045 | < 0.001 | 0.660 | 0.838 |

**Table 2. Logistic Regression of determinants of depression (n = 223)**

| Characteristics | Depression | | *P*-value* | Univariate | | Multivariate | |
|---|---|---|---|---|---|---|---|
| | Yes [n = 17] n (%) | No [n = 206] n (%) | | Crude OR | 95% CI | Adj OR | 95% CI |
| Age (years) | | | 0.064 | | | | n/s |
| ≥ 60 | 3 (5.8) | 49 (94.2) | | 1 | - | | |
| ≤ 59 | 14 (8.2) | 157 (91.8) | | 2.79 | 0.94 , 8.26 | | |
| Gender | | | 0.530 | | | | n/s |
| Male | 6 (6.6) | 85 (93.4) | | 1 | - | | |
| Female | 11 (8.3) | 121 (91.7) | | 1.43 | 0.47 , 4.38 | | |
| Ethnicity | | | 0.022 | | | | |
| Bumiputra | 2 (3.6) | 54 (96.4) | | 1 | - | 1 | |
| Non-bumiputra | 15 (9.0) | 152 (91.0) | | 4.07 | 1.23 , 13.50 | 3.90 | 1.25 , 12.18 |
| Education Level | | | 0.014 | | | | |
| Secondary and above | 9 (5.7) | 150 (94.3) | | 1 | - | 1 | |
| Primary and below | 8 (12.5) | 56 (87.5) | | 3.02 | 1.26 , 7.24 | 2.65 | 1.18 , 5.94 |
| Employment Status | | | 0.623 | | | | n/s |
| Unemployed | 10 (7.8) | 118 (92.2) | | 1 | - | | |
| Employed | 7 (7.4) | 88 (92.6) | | 1.26 | 0.50 , 3.19 | | |
| Monthly Household Income | | | 0.521 | | | | n/s |
| ≤ RM2,999 | 12 (8.2) | 134 (91.8) | | 1 | - | | |
| ≥ RM3,000 | 5 (6.5) | 72 (93.5) | | 1.34 | 0.55 , 3.29 | | |
| Marital Status | | | 0.164 | | | | n/s |
| Married | 13 (7.1) | 169 (92.9) | | 1 | - | | |
| Single/ Divorced/ Widow | 4 (9.8) | 37 (90.2) | | 1.92 | 0.77 , 4.83 | | |
| Years Lived (years) | | | 0.163 | | | | n/s |
| ≤ 19 | 10 (6.9) | 134 (93.1) | | 1 | - | | |
| ≥ 20 | 7 (8.9) | 72 (91.1) | | 1.76 | 0.79 , 3.91 | | |

**Table 2 Continued……**

| | | | | OR | CI | Adj OR | CI |
|---|---|---|---|---|---|---|---|
| Smoking | | | 0.006 | | | | |
| No | 13 (7.1) | 171 (92.9) | | 1 | - | 1 | - |
| Yes | 4 (10.3) | 35 (89.7) | | 6.63 | 1.70 , 25.84 | 4.69 | 1.69 , 13.05 |
| Alcohol | | | 0.009 | | | | |
| Yes | 1 (3.0) | 32 (97.0) | | 1 | - | 1 | - |
| No | 16 (8.4) | 174 (91.6) | | 9.54 | 1.78 , 51.18 | 8.90 | 1.71 , 46.29 |
| Practice Healthy Diet | | | 0.032 | | | | |
| No | 1 (3.2) | 30 (96.8) | | 1 | - | 1 | - |
| Yes | 16 (8.3) | 176 (91.7) | | 5.26 | 1.15 , 24.04 | 4.83 | 1.07 , 21.81 |
| Exercise Regularly | | | 0.004 | | | | |
| Yes | 6 (4.8) | 118 (95.2) | | 1 | - | 1 | - |
| No | 11 (11.1) | 88 (88.9) | | 3.39 | 1.49 , 7.69 | 3.07 | 1.40 , 6.73 |

OR, Odds Ratio; CI, Confidence Interval
n/s, not significant
*Adj OR: Adjusted Odds Ratio; adjusted for age, gender, ethnicity, education level, employment status, monthly household income, marital status, years lived, smoking, alcohol consumption, practice healthy diet and exercise regularly.*
*P -value computed using binary logistic regression*

## 4. DISCUSSION

The prevalence rate of depression in Malaysia was between 6.3% and 18.0% [9]. In this study, the prevalence rate of depression was 7.6%, which fall within the range of estimated prevalence rate. Journals showed that the prevalence rate of depression in urban area was higher than rural area [11,60-65]. Compared with Tan KL et al.'s findings using Malay version PHQ-9, the prevalence rate of depression in urban poor area in Malaysia was 12.3%, in comparison with 7.6% in this study [20]. Besides, the finding of this study was lower compared with other studies in Asian countries 18-[21,66]. Port Dickson is well-known as a famous tourism spot with beautiful beaches and sea scenery in Malaysia [67]. Therefore, strategic tourism spot with minimal environmental pollution are among the reasons that contribute to low prevalence rate of depression in rural communities in Port Dickson. However, poor health-care services make rural residents more vulnerable to depression compared with urban residents [25].

Many studies postulated that poor socio-economic factors, included low family income, low education level and unemployment status were strong predictors of depression [21,26,27,29-33]. In this study, people with low education level were more likely to get depression compared to those who had high education level. Low monthly household income and unemployment status were not significant in this study. In Korea, Kim JM *et al.* showed that lower socio-economic status influences the access to education, thus higher depression rate among those who are not well-educated [66]. Low education level could be the main factor to depression, where it contributes to unemployment status and it indirectly can cause low monthly household income.

In this study, depression was almost three times more likely to affect people who did not exercise regularly. This finding is consistent with many studies, showing a reciprocal relationship between exercise and depression. Cross-sectional study conducted by St-Hilaire S et al. indicated that individuals who exercise regularly had lower tendency for depressive symptoms [38]. Ransford CP documented that the exercise increases the secretion of monoamine neurotransmitters such as serotonin and dopamine, which act on the pleasure centre in brain to uplift the mood [42]. Tan KL et al. proposed that the symptoms of depression can be alleviated by endorphins, a chemical which is released during exercise [20]. Moderate intensity of exercise was proved to have the most benefit to prevent early onset of depression [43,44]. A study conducted in rural setting of Northwestern United State showed that vigorous exercise will increases the incidence of depression with interruptive illnesses [38]. However, a study conducted by Chalder M et al. disclosed that facilitated physical activity was not helpful in improving depression outcomes or reduce use of anti-depressants compared to usual care alone [68].

In this study, smokers were 4.5 times more likely to have depression compared to non-smokers. Study among rural First Nation in British Columbia suggested that depression was strongly associated with smoking [45]. Theorists commented that smoking is one of the ways to cope with stress or problems to uplift the mood [50-52]. Depressed people are more likely to choose smoking to relief their stress. Smokers have higher tendency to suffer from depression compare to non-smokers [46-48]. Hall SM et al. pointed that nicotine in cigarette was the culprit of depression that alters the mood regulation pathway to depression [47]. On the contrary, Berg CJ et al. proposed a contradicted finding as there was no association between smoking and depression among Asians [53].

In this study, non-alcoholic drinkers were potentially a strong risk factor for depression compared with alcohol drinkers. It is almost 9 times more likely for non-alcohol drinkers to get depression than alcohol drinkers. In contrast, numerous studies suggested that alcoholism was strongly related to depression [69-71]. Kaplan HT et al. reported that as many as 40% of alcoholic had suicidal mindset with 30% of them were diagnosed with clinical depression [54]. In supporting our finding, one literature review depicted that alcohol abstainers tended to have higher level of depression and anxiety compared to moderate drinkers [72]. In Li N et al.'s study, light or moderate drinking can reduce depression incidences by relaxation and mood alteration [21].

People who practiced healthy diet were almost 5 times more prevalent for depression than those who did not practice healthy diet. However, numerous recent research papers' findings revealed that balanced diet is one of the key factors to reduce to risk of depression [73-75]. Balanced diet could provide sufficient amounts of amino acids (phenylalanine, tyrosine, tryptophan), omega 3, minerals (magnesium) and vitamins (B1, B3, folic acid) to maintain mental health [73].

## 5. CONCLUSION

The prevalence rate of depression among people aged 18 years and above in the rural communities in Port Dickson, Negeri Sembilan was 7.6% and significantly associated with ethnicity, education level, smoking status, alcohol consumption, healthy diet and exercise. More studies in different areas among the rural communities in Malaysia are needed to estimate the prevalence rate and factors associated with depression.

Early detection of individuals with depression is important for treatment to reduce or minimize morbidity and mortality. This study provides useful information on factors that increases the risk of getting depression among the rural communities. More educational campaigns and health promotions can be carried out to minimize the incidence of depression.

## CONSENT

All authors declare that written informed consent was obtained from the respondents for publication. Confidentiality of data and privacy were respected at all times.

## ETHICAL APPROVAL

The project received ethical approval from the International Medical University Research (Department) Committee.

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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