ORIGINAL ARTICLE

# Factors Associated With Probable Dementia Among Older People in Bau District, Sarawak

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**ABSTRACT**

**Introduction:** Dementia is a significant public health concern that affects older people and is a major cause of morbidity and mortality. A wide range of risk factors was associated with dementia. This study aims to determine the prevalence of probable dementia and its determinants among older people in Bau District, Sarawak. **Methods:** A cross-sectional study was conducted in Bau District among older residents. A multi-stage sampling was used. This research applied a structured questionnaire covering sociodemographics, mental health, behaviours, and medical conditions. The Elderly Cognitive Assessment Questionnaire (ECAQ) was used to measure the probable dementia. Data were collected through researcheradministered interviews. SPSS version 27 was used for data entry and analysis, including descriptive statistics, Chi-Square tests, and binary logistic regression to identify predictors of probable dementia. **Results:** 382 respondents completed the questionnaires, with an 86.2% response rate. Probable dementia prevalence was 15.4%, with significant associations found for age, gender, marital status, education, occupation, alcohol use, physical activity, gambling, and depression. Binary logistic regression analysis identified older age (OR=27.676, 95% CI=8.250, 92.841; p <.001), lack of formal education (OR=25.204, 95% CI=4.490, 141.499; p <.001), and the presence of depression (OR=3.189, 95% CI=1.451, 7.101; p=.004) as significant predictors of probable dementia. **Conclusion:** This research identified probable dementia prevalence and associated factors among older adults in Bau District, Sarawak, providing insights for targeted health interventions. Further studies should explore detection strategies and prevention across diverse rural and urban populations.
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## INTRODUCTION

Dementia is a significant public health concern that affects older people and is a major cause of morbidity and mortality (1). It is a broad term encompassing a range of cognitive impairments, such as diminished cognitive abilities, memory deficits, compromised decisionmaking skills, and reduced attention span. It does not refer to a specific disease but rather denotes a general deterioration in cognitive functioning (2). According to the World Health Organization (WHO), there are over 55 million dementia cases worldwide, with 10 million new cases each year. From 2030 to 2050, cases are predicted to rise from 78 million to 139 million due to population growth and ageing (3). The prevalence of dementia varies worldwide, with higher prevalence in low- to middle-income countries associated with rapid ageing (4). The variation in the global prevalence of dementia can be attributed to differences in sociodemographic background, study tools, and narrated definitions. It was reported that the prevalence of dementia in Northern Portugal was 1.3%, at which screening was done using the Mini-Mental State Examination (MMSE) and the Montreal Cognitive Assessment (MoCA) (5). In Australia, a self-reported study was conducted, and it was reported that the prevalence of dementia among those aged 65 and older was 5.3% (6). However, MMSE and MoCA may have limitations when used among older people living in Bau, Sarawak, due to potential cultural and linguistic differences and variations in education levels. Age, gender, and family history of dementia are considered non-modifiable risk factors for the development of dementia (7). It was reported that the modifiable risk factors associated with dementia were educational attainment, hearing loss, traumatic brain injury (TBI), hypertension, excessive alcohol use, and obesity (8). Additionally, in the later stages of life, several modifiable risk factors were discovered, including smoking, depression, social isolation, physical inactivity, diabetes, and air pollution. The presence of depression was found to be significantly associated with a 2.5-fold greater risk of developing dementia (9). Most worldwide studies have been centred on documenting the prevalence of dementia, while a limited number of studies have specifically examined the prevalence

of probable dementia. The diagnosis of probable dementia is established when the patient fulfils the criteria for dementia, characterised by the progressive development of symptoms spanning from months to years, accompanied by apparent cognitive deterioration as observed by healthcare professionals (10). Lack of probable dementia detection leads to missed opportunities to treat patients, improve their quality of life (e.g., with medications and referrals), reduce patient and family burden, and reduce hospitalisation, institutionalisation, and healthcare costs (10).

A nationwide survey was conducted among older Malaysian people using the Identification and Intervention for Dementia in Elderly Africans (IDEA) Cognitive Screen, and the study reported that the prevalence of probable dementia was 8.5% (11). The IDEA Cognitive Screen, designed for low-literacy African populations, may be applicable in Bau District but requires cultural and linguistic adaptation and local validation. The finding was similar to the Malaysian NHMS 2018, which used a similar IDEA Cognitive Screen tool and reported that the overall prevalence of probable dementia was 8.5% (12). In another study conducted involving all states in Malaysia, the prevalence of dementia was 14.3%, further supported by another systemic review (13, 14). The study used the Geriatric Mental State (GMS) B3 survey alongside AGECAT software, which integrates a questionnaire, interviews, and computer-based diagnosis. While GMS-AGECAT is a comprehensive tool, its applicability in Bau District may be limited without cultural and linguistic adaptation. In Sarawak, a study done among older Melanau people in Mukah representing the Indigenous population showed that the prevalence of probable dementia and dementia were 27.3% and 10.5%, respectively (15). In that study, dementia assessment was conducted using the Elderly Cognitive Assessment Questionnaire (ECAQ), which was appropriate for older individuals with lower literacy levels. Those who screened positive for probable dementia underwent further evaluation by a psychiatrist to confirm the diagnosis. In a study conducted among older adults in Kuching, Sarawak, the prevalence of probable dementia was 40.0% when assessed using the Elderly Dementia Questionnaire (EDQ) (16). The EDQ showed a sensitivity of 71.2% and a relatively low specificity of 59.5%, which may have contributed to an overestimation of probable dementia prevalence among older adults in Kuching. However, this was a validation study with a limited sample size, therefore, it was not designed to provide an accurate prevalence estimate.

These previous studies on dementia among older populations in Sarawak have provided valuable insights into its prevalence and associated factors. However, these studies were conducted in different regions with distinct socio-cultural and environmental contexts. While the study conducted in Mukah among Melanau older adults shares notable similarities with this research, key differences were considered. The Bidayuh and Melanau are indigenous groups in Sarawak, Malaysia, with distinct linguistic, cultural, and historical backgrounds. The Bidayuh, primarily found in Kuching and Serian, speak the Bidayuh languages (multiple dialects), whereas the Melanau, residing in Mukah and Dalat, are coastal dwellers who speak the Melanau language (17, 18). Furthermore, national estimates may not accurately reflect the situation in specific rural or indigenous communities like Bau. Bau District, with its unique demographic composition, has not been specifically studied in this regard. Given potential variations in genetic predisposition, lifestyle factors, healthcare access, and cultural perceptions of aging and cognitive decline, a localized assessment is necessary. By replicating the previous studies in Bau District, we aim to better understand dementia prevalence in this population, identify region-specific risk factors, and inform locally relevant public health strategies to enhance dementia care and prevention efforts.

Early clinical identification of dementia is challenging in the primary care setting due to the limited accessible options. Hence, using dementia screening methods to detect probable dementia at an earlier stage is advantageous for prompt intervention and subsequent development of rehabilitation strategies (1). A study was conducted to investigate the health disparities that exist in rural Malaysia. The difficult geographical features and rural landscape of East Malaysia were reported to be the challenges in developing medical infrastructure. Additionally, hospitals were distant from rural residences, and service quality impeded access to healthcare in rural areas (19). Low economic status, high healthcare costs, a lack of advanced equipment in rural hospitals, insufficient physicians, other medical staff shortages, and inadequate home care in rural areas all contribute to older people's limited access to good health. As a result, the increased problems they face in rural areas may raise the likelihood of cognitive decline progressing to probable dementia.

The primary objective of this study was to determine the prevalence and factors associated with probable dementia among older Dayak people in Bau District, Sarawak. The specific objective was to determine the relationships between the respondent's sociodemographic background, behavioural risks, medical-related risks, and probable dementia. This study also aimed to increase awareness of probable dementia and its causes among the Bau District communities. Implementing effective risk management strategies could help delay the onset of dementia.

## METHODS

### Setting, study populations and sample size

In this research, a cross-sectional study design was employed. This study utilised a questionnaire-based

approach with a descriptive design. The study was conducted in Bau, a district in the Kuching Division of Sarawak in Malaysia. The distance between Bau Bazaar and Kuching is roughly 34.3 kilometres or 41 minutes by car. The majority of residents in Bau District are Bidayuh. Bau district is considered a rural area with less modern public services due to its location. There are nine administrative zones with a total of 104 villages in Bau District, as updated in 2016 (20). The multi-stage sampling method was used in this study. It involved the selection of the Bau District as the study area. Subsequently, all the nine administrative zones in Bau District were selected, followed by the selection of three to four villages with the highest population numbers from each zone. Systematic sampling was applied to select around 15 households from every village, and the sample will be selected using universal sampling with a minimum of one respondent per house.

The inclusion criteria for this study consisted of individuals aged 60 years and above living in the Bau District, regardless of duration of residence. Older people who chose not to participate were not included in the study. The sample size was determined using OpenEpi software, considering a population of 8,200, an expected prevalence of 14.3% (13), a 95% confidence interval, a 5% margin of error, and a design effect of 2. After accounting for a 20% attrition rate, the final sample size required was 450 participants. This study enrolled 382 participants in total, with an 86.2% response rate. The research was conducted from October 2022 to August 2023.

**Instrument development and data collection**

This study included various independent variables, encompassing sociodemographic factors (age, gender, ethnicity, religion, marital status, education level, occupation, household income, and living arrangement status), behavioural risk factors (smoking, alcohol consumption, physical activity, and gambling habits), and medical-related factors (diabetes or hypertension, body mass index (BMI), the presence of depression, a family history of dementia, and a history of head injury). The dependent variable for this study was probable dementia.

A structured questionnaire with five sections was developed based on literature reviews. Section A contained nine socio-demographic questions, and Section B focused on assessing mental health and had two subsections. Section B1 included a cognitive assessment to measure the dependent variable, probable dementia, using the Elderly Cognitive Assessment Questionnaire (ECAQ). Section B2 consisted of the Geriatric Depression Scale (GDS) (Short Form), an instrument for geriatric depression screening. Section C consisted of the physical activity assessment using the short form of the International Physical Activity Questionnaire (IPAQ). Section D contained questions designed to measure respondents' behaviours and habits, including smoking, alcohol consumption, and gambling. Section E included questions on medical-related risk factors, namely diabetes mellitus, hypertension, a history of dementia in the family, and a history of head injury.

Data was collected via house-to-house visits and structured interviews, where researcheradministered questionnaires were given to each participant. The questionnaire was administered in standard Malay language instead of using Sarawak Malay language. Training was given to all interviewers before data collection to ensure the standardised administration of the questionnaire.

All of the respondents understood the questions well as the interviewer read all the questions from the questionnaire, and in some cases, family members from the same household occasionally assisted in clarifying questions. Each interview lasted approximately 25 to 30 minutes.

**Measurement**

Dementia: Dementia is a general term for loss of memory and other mental abilities severe enough to interfere with daily life caused by physical changes in the brain. It is not a specific disease but rather a general term for the declining cognitive abilities of remembering, thinking, or making decisions that interfere with everyday activities. We used the Elderly Cognitive Assessment Questionnaire (ECAQ), recommended by the Psychiatric Team at Hospital Sentosa, Sarawak. The tool had ten questions derived from the Mini-Mental State Examination and the Geriatric Mental State Schedule (21). The use of this assessment tool has shown a high degree of reliability when employed to evaluate cognitive impairment in individuals residing in rural regions characterised by limited educational attainment. The ECAQ screening tool comprised ten items. Each item was assigned a score of 0 for an incorrect response and 1 for a correct response. Individuals scoring less than six points were classified as having probable dementia (score <6), while those scoring six or more points were considered to have a normal cognitive assessment (score ≥6). The ECAQ tool demonstrates optimal diagnostic performance at a cut-off score of 5/6, whereby scores of 5 or lower are most effective in identifying individuals with probable dementia. At this threshold, the instrument yields a sensitivity of 85.3% and a specificity of 95.1%, indicating a high level of accuracy in distinguishing between normal and probable dementia (21).

Depression: Geriatric depression is a mental and emotional disorder that affects older adults aged 60 years and over, characterised by persistent feelings of sadness and occasional "blue" moods. To measure depression, we used a Malay version of the Geriatric Depression Scale (GDS) (Short Form) screening tool (22). The normal scores ranged from 0 to 4, while scores of 5 to 8 indicated mild depression, 9 to 11 indicated

moderate depression, and scores of 12 to 15 indicated severe depression.

Physical activity: Physical activity was assessed using the International Physical Activity Questionnaire (IPAQ). This study used the IPAQ short form since it is more appropriate when interviewing elderly respondents. This tool assessed the respondents' physical activity over the past seven days. The respondents were asked about their participation in various activities, including vigorous, moderate, low, and sedentary activities such as walking and sitting. The number of days and hours/minutes of activities were also recorded to calculate the metabolic equivalent (MET) minutes per week.

For the analysis of IPAQ data, the following values were used: Walking = 3.3 METs, Moderate PA = 4.0 METs and Vigorous PA = 8.0 METs. Walking activity was measured by multiplying 3.3 METs with the total minutes spent walking per day and the number of walking days per week. Moderate-intensity activity was calculated by multiplying 4.0 METs with the total minutes of moderate-intensity activity and the number of moderate-intensity days per week. Vigorous-intensity activity was determined by multiplying 8.0 METs with the total minutes of vigorous-intensity activity and the number of vigorous-intensity days per week. The total physical activity MET-minutes per week was obtained by summing the scores from walking, moderate-intensity, and vigorous-intensity activities. Participants were categorised into three groups based on their overall MET minutes: High, Moderate, and Low levels of Physical Activity (23).

**Ethical Considerations**

Informed consent was obtained, and participants were informed about the study's objectives, procedures, and outcomes. Per applicable laws and regulations, survey data was kept confidential, with respondents' identities not disclosed in publications or presentations. Ethical clearance was granted by the UNIMAS Ethical Review Committee (approval number UNIMAS/TNC(PI)/09-65/02 (28)). Respondents were assured of confidentiality and their right to withdraw at any time without consequences. Those identified with probable dementia or depression were referred to the nearest clinic for further management.

**Data Analysis**

The data was manually checked for completeness and then manually entered into Statistical Package for Social Sciences (SPSS), version 27. The completeness of data was ensured by checking for missing values and imputing them accordingly. Descriptive data analysis was conducted with categorical variables in frequencies and percentages, while continuous variables were presented as means with corresponding standard deviations. Eight variables were regrouped into two categories—ethnicity (Bidayuh/Non-Bidayuh), religion (Christian/Non-Christian), marital status (married/others), education (no formal/with formal), household income (B40/M40), physical activity (sedentary/active), depression (yes/no), and BMI (normal/abnormal), and occupation status was categorized into three: currently working, retiree, and unemployed to allow meaningful comparisons. The relationships between the categorical variables were determined using the Chi Square test. Binary logistic regression was used to assess the potential predictors of dementia. The dependent variable, probable dementia, was measured on a dichotomous scale in this research. From the factors that had been identified from the chi-square independent test, the factors with statistically significant p-values were selected as the most critical variables to be entered in the logistic regression model. All the identified variables were entered simultaneously into the model. This research used the traditional p-value of $< .05$ as the cutoff point.

## RESULTS

Three hundred eighty-two participants were enrolled in the study, resulting in a response rate of 86.2%.

**Socio-demographic characteristics**

The respondents ranged from 60 to 94 years old, with a mean age of 69.87 years, SD=7.371. The majority of respondents were aged 60-69 years (54.7%), followed by 70-79 years (33.2%) and ≥80 years (12.0%). Among the 382 respondents, 56.0% were women, and 44.0% were men. Almost all respondents were Bidayuh (96.8%), followed by Chinese (2.4%), Iban (0.5%), and others (0.3%). Most respondents (94.7%) were Christians. About half (55.8%) had primary (28.8%), secondary (25.7%), and tertiary (1.3%) education, while 44.2% had no formal education (Table I).

**Table I: Characteristics of Bau elderly adults (N=382)**

| Characteristics | n | % | Mean | SD |
|---|---|---|---|---|
| Age (years) | | | | |
| 60 – 69 | 209 | 54.7 | 69.87 | 7.371 |
| 70 – 79 | 127 | 33.2 | | |
| ≥80 | 46 | 12.0 | | |
| Gender | | | | |
| Male | 168 | 44.0 | | |
| Female | 214 | 56.0 | | |
| Ethnic Group | | | | |
| Bidayuh | 370 | 96.8 | | |
| Iban | 2 | 0.5 | | |
| Chinese | 9 | 2.4 | | |
| Others* | 1 | 0.3 | | |
| Religion | | | | |
| Christian | 362 | 94.7 | | |
| Islam | 5 | 1.3 | | |
| Buddhist | 6 | 1.6 | | |
| Others** | 9 | 2.4 | | |
| Marital Status | | | | |
| Married | 265 | 69.4 | | |
| Single | 16 | 4.2 | | |
| Widowed | 89 | 23.3 | | |
| Divorced | 12 | 3.1 | | |
| Educational Level | | | | |
| No formal education | 169 | 44.2 | | |
| Primary | 110 | 28.8 | | |
| Secondary | 98 | 25.7 | | |
| Tertiary | 5 | 1.3 | | |
| Occupation Status | | | | |
| Gov. servant/Private | 4 | 1.0 | | |
| Self-employed | 76 | 19.9 | | |
| Retiree | 79 | 20.7 | | |
| Housewife | 166 | 43.5 | | |
| Not Working | 57 | 14.9 | | |
| Household income/month (Malaysian Ringgit) | | | | |
| ≤ 2,500 (B40) | 299 | 78.2 | | |
| 2,501 - 4,850 (B40) | 53 | 13.9 | | |
| 4,851 - 10,970 (M40) | 29 | 7.6 | | |
| 10,971 - RM15,040 (T20) | 1 | 0.3 | | |
| Living arrangement | | | | |
| Living alone | 23 | 6.0 | | |
| Living with family/friends | 359 | 94.0 | | |

* Melanau, **Pagan

## Behavioural risk factors

The majority of participants did not smoke (87.2%), while just over one-fifth (20.9%) reported consuming alcohol on an occasional or frequent basis. According to the IPAQ scoring system, more than half of the respondents (54.0%) engaged in moderate to high levels of physical activity, while (46.0%) had low levels of physical activity. Approximately 25.1% of the participants were involved in gambling activities (Table II).

**Table II: Behavioural factors of the older people in Bau District (N=382)**

| Description | n | % |
|---|---|---|
| Smoking | | |
| Yes | 49 | 12.8 |
| No | 333 | 87.2 |
| Alcohol | | |
| Yes | 80 | 20.9 |
| No | 302 | 79.1 |
| Physical Activity | | |
| High | 69 | 18.1 |
| Moderate | 137 | 35.9 |
| Low | 176 | 46.0 |
| Gambling | | |
| Yes | 96 | 25.1 |
| No | 286 | 74.9 |

## Medical-related Risk Factors

Participants' depression levels were measured using the Geriatric Depression Scale (Short Form). Nearly half (43.5%, n=166) experienced depression, with 33.8% (n=129) having mild depression, 7.3% (n=28) having moderate depression, and 2.4% (n=9) having severe depression. Participants' BMIs were computed using their self-reported weight and height. Malaysia's newest categorisation categorised BMI into four categories: Underweight (<18.5 kg/m2), Normal (18.5-25.9), Overweight (23.0-27.4), and Obese (>27.5 kg/m2). This study indicated that 36.7% (n=140) of respondents were overweight, 27.2% (n=104) were obese, and 30.5% (n=117) had normal BMI. Only 5.5% (n=21) were underweight. Most respondents (90.1%) had no family history of dementia. (Table III).

**Table III: Medical-related risk factors of the older people in Bau District (N=382)**

| Description | Mean | SD | n | % |
|---|---|---|---|---|
| Diabetes Mellitus | | | | |
| Yes | | | 79 | 20.7 |
| No | | | 303 | 79.3 |
| Hypertension | | | | |
| Yes | | | 234 | 61.3 |
| No | | | 148 | 38.7 |
| Depression | | | | |
| Normal | | | 216 | 56.5 |
| Mild | | | 129 | 33.8 |
| Moderate | | | 28 | 7.3 |
| Severe | | | 9 | 2.4 |
| Head Injury | | | | |
| Yes | | | 47 | 12.3 |
| No | | | 335 | 87.7 |
| BMI | | | | |
| Underweight | | | 21 | 5.5 |
| Normal | | | 117 | 30.6 |
| Overweight | | | 140 | 36.7 |
| Obese | | | 104 | 27.2 |
| Weight (kg) | 60.30 | 13.13 | 382 | |
| Height (m) | 1.55 | .09 | 382 | |
| Family history of dementia | | | | |
| Yes | | | 38 | 9.9 |
| No | | | 344 | 90.1 |

### Probable Dementia

The probable dementia was assessed using the Elderly Cognitive Assessment Questionnaire (ECAQ). The study found a prevalence of probable dementia in 15.4% of participants (n=59), with a mean score of 7.69, SD = 2.054. Most respondents, 84.6% (n=323), demonstrated a normal cognitive assessment (Fig. 1).

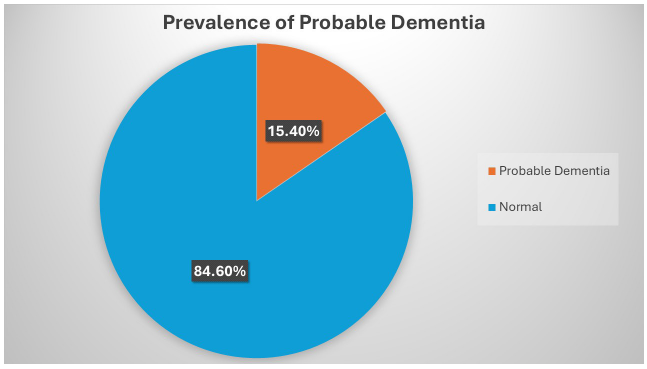


**Fig. 1: Prevalence of probable dementia among Dayak older people in Bau District (N=382). Cognitive assessment was conducted using the Elderly Cognitive Assessment Questionnaire. Of the population assessed, 15.40% were identified as having probable dementia, while the remaining 84.60% had normal cognitive function.**

### Factors Associated with Probable Dementia: Binary logistic regression analysis

Nine factors were entered simultaneously into the binary logistic regression model: age group, gender, marital status, educational level, occupation status, alcohol consumption, physical activity, gambling, and depression. The Hosmer-Lemeshow test yielded non-significant results, indicating good model fit ($\chi2(8)$ = 1.490, p = .993). The model accounted for 32.8% (Cox & Snell R2) to 56.8% (Nagelkerke R2) of the variance and accurately classified 88.2% of cases of probable dementia.

The significant predictors identified were age group, educational level, and depression severity. The analysis revealed that compared to the youngest-old group (60-69 years), middle-old individuals (70-79 years) were 28 times more likely to have probable dementia (OR=27.676, 95% CI=8.250, 92.841; p <.001), while the old-old group (over 80 years) were five times more likely (OR=4.650, 95% CI=1.955, 11.063; p <.001). Additionally, those without formal education had significantly higher odds of having probable dementia (OR=25.204, 95% CI=4.490, 141.499; p <.001), and older people with depression were three times more likely to have probable dementia (OR=3.189, 95% CI=1.451, 7.101; p .004) compared to those without depression. (Table IV).

**Table IV: Factors Associated with dementia: Binary logistic regression analysis**

| Factors | B | SE | p-value | AOR | 95% CI | |
|---|---|---|---|---|---|---|
| | | | | | LL | UL |
| Age | | | | | | |
| 60 – 69 | | | | 1 | | |
| 70 – 79 | 3.321 | .618 | <.001 | 27.676 | 8.250 | 92.841 |
| ≥80 | 1.537 | .442 | <.001 | 4.650 | 1.955 | 11.063 |
| Gender | | | | | | |
| Male | | | | 1 | | |
| Female | -.198 | .640 | .756 | .820 | .234 | 2.874 |
| Marital Status | | | | | | |
| Married | | | | 1 | | |
| Others | .383 | .404 | .344 | 1.466 | .664 | 3.237 |
| Educational Level | | | | | | |
| No formal education | 3.227 | .880 | <.001 | 25.204 | 4.490 | 141.499 |
| With formal Education | | | | 1 | | |
| Occupation Status | | | | | | |
| Currently working | | | | 1 | | |
| Pensioner | .315 | .701 | .653 | 1.370 | .347 | 5.408 |
| Unemployed | .016 | 1.148 | .989 | 1.016 | .107 | 9.642 |
| Alcohol | | | | | | |
| Yes | | | | 1 | | |
| No | -.084 | .649 | .896 | .919 | .258 | 3.277 |
| Level of Physical Activity | | | | | | |
| Sedentary Lifestyle | | | | 1 | | |
| Active Lifestyle | -.022 | .420 | .958 | .978 | .429 | 2.228 |
| Gambling | | | | | | |
| Yes | | | | 1 | | |
| No | .676 | .713 | .343 | 1.966 | .486 | 7.954 |
| Depression | | | | | | |
| Normal | | | | 1 | | |
| Having Depression | 1.160 | .402 | .004 | 3.189 | 1.451 | 7.010 |
| Model Chi-square (df, N) | 1.490 (8,382) | | | | | |
| Hosmer & Lemeshow Test | $p > 0.05$ | | | | | |

B= beta coefficient, SE= standard error, AOR= adjusted odd ratio, CI = confidence interval; LL=Lower limit of 95% confidence interval, UL= Uper limit of 95% confidence interval

## DISCUSSION

In this population-based study in Bau District, Sarawak, 15.4% of older people were identified as having probable dementia. A similar prevalence of probable dementia, around 13.4%, was found in another study conducted in Muar, Johor, using the same ECAQ screening instrument, which closely resembles the findings of this study (24). The findings differed from the nationwide study by (25), which reported a much higher prevalence of probable dementia at 68.0%. Previous research in Malaysia involved diverse ethnic groups, while this study primarily focused on the Bidayuh ethnic group in the Bau District. However, our results were comparable to a meta-analysis study estimating a 15.4% prevalence of probable dementia among older individuals in China (26). Variations in dementia prevalence across studies

may be influenced by differences in sampling strategies, study populations, and assessment tools employed. The higher prevalence reported in the nationwide study likely reflects a more diverse demographic composition, encompassing a broader range of ethnic and socioeconomic backgrounds, which may contribute to variations in dementia risk. Conversely, this study primarily examined a Bidayuh population, where genetic predispositions, lifestyle behaviours, and environmental factors may influence prevalence estimates. Furthermore, the utilization of the ECAQ screening tool facilitates comparison with studies such as the one conducted in Muar, Johor; however, discrepancies in methodological approaches and population characteristics must be considered when interpreting the findings.

Dementia results from damage to neurons and their connections, leading to cognitive decline that exceeds normal age-related changes (10). The most common types include Alzheimer's disease, linked to amyloid plaques and tau tangles, and vascular dementia, caused by cerebrovascular disorders like strokes, hypertension, and diabetes (27). Other forms, such as Lewy body dementia, frontotemporal dementia, and mixed dementia, have distinct pathological features, while some dementia-like symptoms may arise from reversible conditions like medication side effects, vitamin deficiencies, and thyroid imbalances (10). This study found a significant association between probable dementia and socioeconomic factors such as age. This result suggested a greater likelihood of dementia with increasing age, a trend supported by a systematic review covering population-based studies across the Americas, Europe, and Australia (28). As people age, there is a noticeable reduction in brain mass, especially in the frontal and hippocampal areas, which are vital for cognitive functions.

Older individuals often experience cortex thinning, leading to slower cognitive processing. Advancing age is a well-established risk factor for both Alzheimer's disease and vascular dementia, with the latter closely linked to cerebrovascular disease and a history of stroke. This study also revealed that educational background was a protective factor against probable dementia, with only 0.9% of educated respondents affected. In contrast, those without formal education showed a higher likelihood of probable dementia, with a prevalence rate of 33.7%.

Multivariate analysis conducted in this research further supported this, showing that educated older individuals had 96% lower odds of developing dementia compared to those without formal education. This finding was corroborated by a study conducted by a group of researchers, which showed that education was associated with a decreased likelihood of developing dementia among older people (29). Moreover, the acquisition of education not only served as a protective factor against the onset of dementia but also exhibited the potential to reduce the likelihood of subsequent cognitive decline among those who had manifested mild cognitive impairment (30).

Additionally, another research team utilised imaging techniques to explore the link between educational attainment and amyloid deposits in the brain associated with dementia development. They suggested that early intellectual stimulation might protect against dementia in later life (31). As this study did not distinguish between dementia subtypes, the potential influence of vascular factors on prevalence estimates warrants careful consideration, underscoring the need for future research incorporating neuroimaging or biomarker analysis to better delineate the contributions of vascular and neurodegenerative mechanisms.

There was a significant link between probable dementia and the presence of depression ($p < .001$). Among older individuals, those diagnosed with depression had a higher prevalence of probable dementia (25.3%) compared to those without depression (7.9%). Additionally, depression was identified as a significant predictor for dementia, with older adults with underlying depression being three times more likely to have probable dementia (OR=3.189, 95% CI=1.451, 7.101; $p = .004$) than those without depression. Another study explored the connection between dementia and depression, focusing on the cortisol-hippocampal pathway (32). It is suggested that increased cortisol production during a depressive episode might adversely affect the hippocampus, leading to its atrophy and subsequent cognitive decline.

The high proportion of respondents (90.1%) reporting no family history of dementia may be influenced by recall bias, as undiagnosed cases could lead to underreporting. Limited awareness and stigma surrounding dementia in certain communities may also affect recognition and disclosure (33). Additionally, genetic predisposition in the predominantly Bidayuh population may differ from other ethnic groups, while lifestyle and environmental factors could play a more significant role in dementia risk, potentially overshadowing familial influences.

## CONCLUSION

The 15.4% prevalence of probable dementia highlights a significant burden, emphasizing the need for early screening and targeted interventions, particularly for older adults, those with low education levels, and individuals with depression. Findings also suggest that dementia risk is influenced by sociodemographic and lifestyle factors, underscoring the importance of holistic prevention strategies, mental health integration, and policy interventions to promote mental wellness. Malaysia lacks specific legislation on healthcare rights for older adults, highlighting the need for protection against neglect and abuse. Improving elderly health requires

better screening, cognitive assessments, comprehensive healthcare worker training, community-level initiatives, and establishing more facilities like Pusat Aktiviti Warga Emas (PAWE) in rural areas through federal and state collaboration.

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