Prevalence and Risk Factors of Depression among a Population of Economically-disadvantaged Fishermen in Teluk Bahang, Penang

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Authors' contributions

This work was carried out in collaboration between all authors. Authors NIM, SAA and AR designed the study. Author NIM performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors NIM and SAA managed the analyses of the study as well as the literature searches. All authors read and approved the final manuscript.

Article Information

Original Research Article

ABSTRACT

Aims: To determine the prevalence and identify the risk factors of depression among a population of economically-disadvantaged fishermen in Teluk Bahang, Penang.
Study Design: The research design for this study was analytical cross-sectional design.
Place and Duration of Study: This research was conducted at five fishing villages (Teluk Bahang, Batu Feringghi, Tanjung Bungah, Tanjung Tokong and Gurney Drive) covered by Teluk Bahang Fishermen's Association during four consecutive weekends in January 2017.
Methodology: Using simple random sampling technique, we selected 242 male fishermen from five fishing villages of Teluk Bahang, who were aged 18 to 75 years old and registered under fishermen's association to participate in this study. An interview session using a set of pre-validated questionnaire (including socio-demographic characteristics, Patient Health Questionnaire-9, and Kendler's Stressful Live Events) was conducted face-to-face with the respondents. We analyzed bivariate associations using chi-square test, and fitted multivariate

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regression models to determine predictors of depression among the study population, using SPSS version 22.

Results: The prevalence of depression in our study population was 10.7%. Multivariate logistic regression analysis revealed that the predictors of depression in this study were the level of education (aOR = 0.20, 95% CI 0.055 − 0.754, p=0.017), monthly income (aOR = 3.44, 95% CI 1.044 − 11.348, p=0.04), serious injury due to accident (aOR = 4.97, 95% CI 1.467 − 16.810, p=0.01), and serious problem at work (aOR = 0.13, 95% CI 0.041 − 0.396, p<0.001).

Conclusion: The prevalence of depression in this study was consistent with previous studies in Malaysia, and indicates that depression is a serious problem among fishermen. The findings from this study may be valuable and useful as a benchmark for the development of an effective program to raise awareness and to minimize the stigma associated with depression among the fishermen community.

1. INTRODUCTION

As indicated by the World Health Organization (WHO), depression is the second biggest influencer of years lived with a disability (YLD) and fifth greatest cause of disability-adjusted life years (DALYs) in the United States [1]. Although depression is considered as a serious problem, it is still a treatable disorder characterized by sadness, loss of intrigue or joy, sentiments of guilt or low self-esteem, disturbance in sleep patterns and appetite, poor concentration and feelings of exhaustion [2]. Depression is also a devitalizing illness that is expected to become a leading cause of worldwide disability by the year 2020. It can influence individual's emotional, physical and socioeconomic wellbeing, but it consistently goes unrecognized and untreated. It is significantly associated with lack of productivity during work time, which in turn affects work absenteeism, and mortality and morbidity globally over the previous decade [3].

Fishermen are among the group who are very important in contributing to the national economy of Malaysia. The fisheries sector plays a vital role as a major contributor and cheapest source of protein [4]. Besides, the fisheries sector has additionally provided employment opportunities for elderly as well as for youthful generation, particularly among the rural villagers. In addition, this sector also helps in the improvement and development of upstream and downstream industry based on fisheries resources such as fishing gear, boat-making industry, fish processing, and manufacture of fishery products, particularly seafood restaurants [5]. Nowadays, the demand for fish is continually growing from day to day and an increment in the population has made this group among the most important community for the development of the national economy which demonstrate a noteworthy role in contributing toward gross domestic product (GDP) in the national economy of peninsular Malaysia [6].

Although the fishermen in Malaysia are considered as a very important community, poverty remains highly prevalent amongst them, to which appropriate solutions haven't been discovered completely yet. The average salary for this community is only about RM 900 per month, which is below the 2017 minimum monthly wage of RM 1000 prescribed by the Government of Malaysia [7]. Thus, income inequalities among them is a major problem which is believed to contribute to the increment of depression [8]. At the same time, unstable financial situation is also one of the problems that is faced by the fishermen as their work relies on natural conditions, which at some point creates income uncertainty on the fisher's household. [9] Additionally, some other risk factors including loss of close relative/loved ones, having serious marital problems, family problem, etc are also believed to cause depression indirectly [10].

The World Mental Health Survey conducted in 17 countries in 2016 found that on the average, 1 in 20 individuals were reported to have a depression in the previous year [11]. There are still huge differences in the prevalence of depression across nations and regions, as it is affected by regional factors. In general, the prevalence of depression (among the general adult population) in Malaysia is about 8% to 12% [12]. However, to date in Malaysia, there are still no specific studies about depression conducted among fishermen even though they are among the extremely important group in improving our country's economy, although themselves being economically-disadvantaged. Thus, the study of

depression among the fishermen is extremely desirable as most studies of depression in Malaysia have only focused on the population of primary care, clinical, elderly and medical students. This paper aims to examine the prevalence and the risk factors of depression among fishermen in Teluk Bahang, Penang.

2. MATERIALS AND METHODS

2.1 Study Location and Context

This research was conducted at five areas/communities of fishing village that are covered by Teluk Bahang Fishermen's Association. The five fishing communities involved in this study were Teluk Bahang (5° 28' 0" N, 100° 13' 0" E), Batu Feringghi (5° 28' 15" N, 100° 14' 43" E), Tanjung Bungah (5° 27' 54" N, 100° 16' 55" E), Tanjung Tokong (5° 27' 15" N, 100° 18' 27" E) and Gurney Drive (5° 26' 22" N, 100° 18' 33" E). These areas are situated in the north-western tip of the Island of Penang. This location had been purposively chosen to obtain our study samples because it consists of a multicultural and transgenerational community including Malay, Chinese and Indian fishermen, and is believed to be one of the oldest fishing villages in Malaysia [13]. Owing to their low and unstable income (<RM 1000 minimum monthly wage), fishermen in these villages currently benefit from Malaysian Government's fuel subsidy of up to 50 litres daily or 20,000 litres monthly (depending on boat size) for their boat operations.

2.2 Study Design and Sample

The research design for this study was analytical cross-sectional design. This study design was the most suitable for this research because it allowed examination of relationship between the prevalence of depression and risk factors of depression. We estimated from Stata 13.0 using formula for two proportions in hypothesis testing, that a sample size of 218 would provide 80% power to detect a 15% difference in prevalence of depression in our study population (compared to 12% in general adult population of Malaysia [8]), assuming a two-tailed test and type 1 error rate of 5%. We increased the sample size to 242 to adjust for non-response rate of approximately 12%. Eligible participants were fishermen conducting their fishing business in any of the above-mentioned five fishing villages. This was almost entirely a population of male fishermen (only one female fisherwoman was available in

the study location), hence we included male participants aged 18 to 75 years and registered under the Teluk Bahang Fishermen Association. Non-Malaysians, those with significant cognitive impairment or mental disabilities, and those unable to communicate in English, Malay or Tamil were excluded. From an adjusted sampling frame containing names of 321 fishermen, we applied simple random sampling technique based on a random number list generated from OpenEpi software to select the required number of participants for this study. Fig. 1 below shows the summary of information on the study process.

2.3 Data Collection and Analysis

After ethical approval from Penang Medical College Institutional Review and Ethics Committee (PMC IREC) was obtained and informed consent from participants was signed, an interview session with each of the 242 participants using pre-validated questionnaire that comprised of three parts (Part A was for sociodemographic information, Part B was the Patient Health Questionnaire-9 [14] and Part C was the Stressful Life Event Questionnaire by Kendler [10]) was conducted face-to-face to ensure consistency and legitimacy of data collected. Presence or absence of depression – the main outcome of this study - was determined using the PHQ-9 questionnaire. The PHQ-9 has been validated for use in primary care and shown to be a valid and reliable tool (Cronbach's α of 0.89) for establishing diagnosis of depressive disorder as well as grading depressive symptoms severity among several populations around the world [14]. It scores each of the nine DSM-IV criteria as "0" (not at all) to "3" (nearly every day), with the results in the range of 0 to 27. Higher scores indicate higher severity level of depression, and showed an optimal sensitivity of 88% and specificity of 88% in detecting depression at a cut-off score of 10. Due to the nature of the fishermen' occupation which often involved extensive stay at sea, data collection was scheduled and conducted over four consecutive weekends in January 2017. Collected data was entered and organized based on the data dictionary in a Microsoft Excel table. The data was then imported into The Statistical Package for the Social Science (SPSS) for analysis. Based on the score obtained from the PHQ-9 items, we categorized respondents into depressed (score of ≥10) and not depressed (score of <10). Chi square test was used to determine the association between the
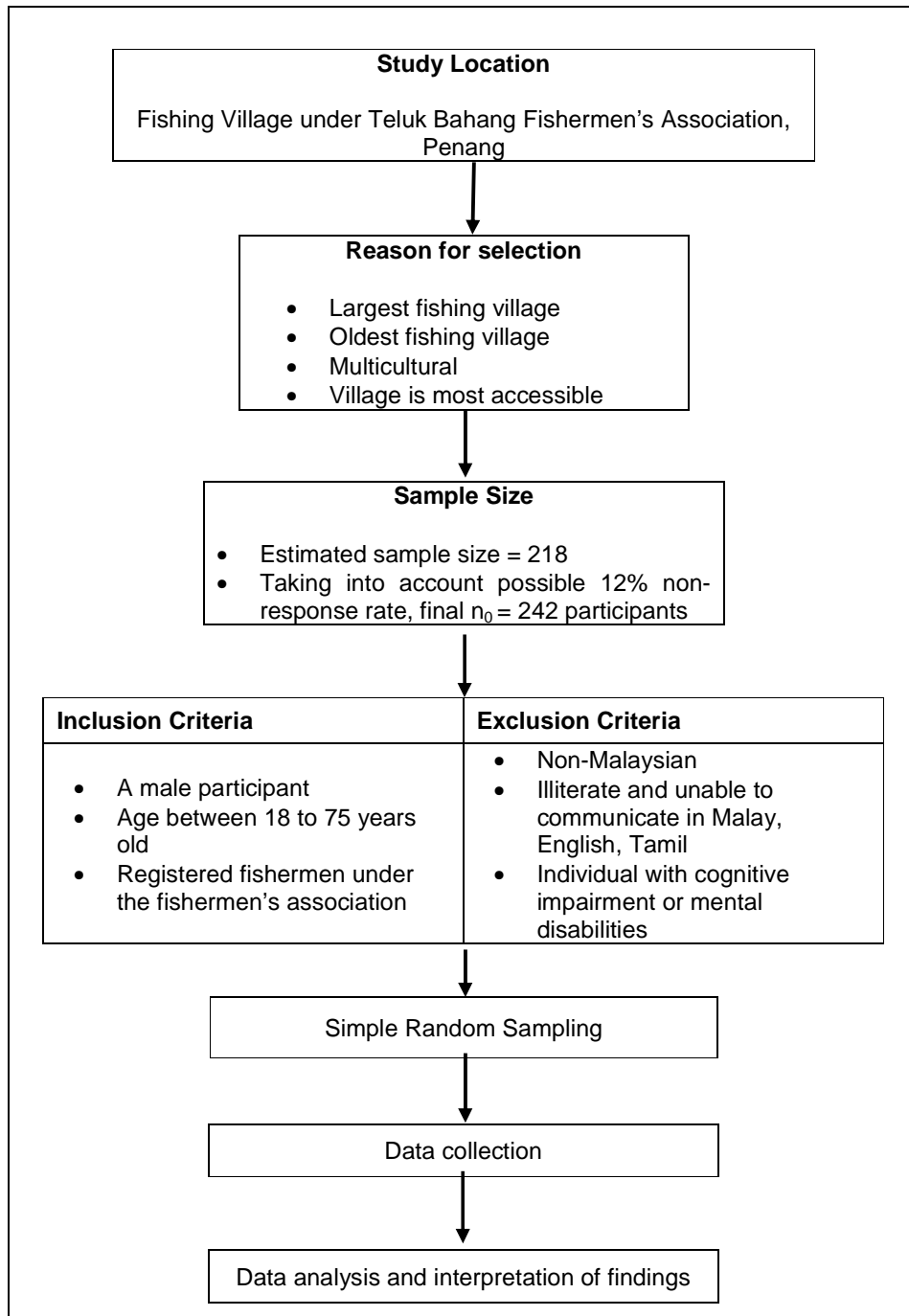
Study Location

Fishing Village under Teluk Bahang Fishermen's Association, Penang

Reason for selection

- Largest fishing village
- Oldest fishing village
- Multicultural
- Village is most accessible

Sample Size

- Estimated sample size = 218
- Taking into account possible 12% non-response rate, final n_0 = 242 participants

Inclusion Criteria	**Exclusion Criteria**
- A male participant - Age between 18 to 75 years old - Registered fishermen under the fishermen's association	- Non-Malaysian - Illiterate and unable to communicate in Malay, English, Tamil - Individual with cognitive impairment or mental disabilities

Simple Random Sampling

Data collection

Data analysis and interpretation of findings

Fig. 1. Study process

independent categorical variables and depression. Where more than 20% of the cells in the cross tabulation had expected frequencies less than 5, Fisher's exact test was interpreted instead of the Chi square test. Odd ratios (OR) with 95% CI from bivariate logistic regression analysis was reported to determine the strength of association and the potential factors associated with depression. Finally, all variables that showed bivariate association with depression at $p < 0.25$ (Hosmer-Lemeshow) in Simple/bivariate binary Logistic Regression were

considered for inclusion into the Multivariate binary Logistic Regression model. The model was computed using the backward Wald method to examine predictors of depression among fishermen in Teluk Bahang.

3. RESULTS

3.1 Socio-demographic Characteristics of Fishermen in Teluk Bahang, Penang

Table 1 provides a summary of the socio-demographic characteristics of the fishermen included in this study. Of the 242 fishermen included in this study, majority were Malay (69.8%), Muslims (70.2%), married (92.1%), and had a primary education (65.3%). The mean income of the fishermen was RM 938.51 ± 412.5 (SD). The mean duration of work was 37.98 ± 12.4 (SD) years, with about two-thirds haven worked for between 31 to 60 years, while the remaining one-thirds had worked for between 1 to 30 years. One hundred and eleven participants (45.9%) were coastal fishermen while only 24 participants (9.9%) were deep-sea fishermen, and the rest were fishermen engaged in both types of fishing which accounted for about 44.2%. The major differences between coastal and deep-sea fishermen were in terms of time they spent at sea and also the depth of the water in which fishing activities were carried out. Deep-sea fishing normally involves fishermen being at sea for up to several days (8 to 72 hours) at a water depth of 30 meters or more. Of the 242 participants, only 23 participants (9.5%) were having additional occupation while the vast majority were full-time fishermen (90.5%). The mean age of participants was 55.87 ± 10.7 years, and ranged from 18 to 75 years. Majority of the fishermen included in this study were 50 years old and above (72.3%). The mean time spent at sea (days) was 5.53 ± 1.3 days per week while the mean time spent at sea (hours) was 6.40 ± 2.2 hours per day.

3.2 Distribution of Responses to PHQ-9 Items and the Prevalence of Depression among Fishermen in Teluk Bahang, Penang

Level of depression was assessed by using the self-rating Patient Health Questionnaire-9 (PHQ-9) depression score. Table 2 shows the distribution of responses to PHQ-9 items. About 36.4% of the study population reported having a little interest or pleasure in doing things for 'more

than a week'. One hundred and forty-one (58.3%) participants experienced the feeling of being down, depressed or hopeless for 'several days', while 60.3% also reported having sleeping problems for 'several days'. More than half of the participants (61.6%) also reported feeling tired or having little energy in going through their life for 'several days' in the past 2 weeks. However, most of them (55.0%) had 'never' experienced any problems related to poor appetite or overeating problem. Similarly, more than three quarter (88.8%) of the respondents reported 'never' feeling bad about themselves, in the other words, they never felt they had failed themselves nor had a feeling that they have disappointed themselves or their families.

Besides, majority of the participants (74.0%) 'never' had trouble in concentrating on things such as reading the newspaper or watching television. About 78.1% reported 'never' moving or speaking so slowly (or the opposite) until the others noticed those changes, although the remaining 22% reported having felt so for several days. Lastly, all of the participants still had a high sense of sanity, as 100% of them reported 'never' having a thought that they would be better off dead or of hurting themselves in some way. The vast majority of participants (89.3%) with no depressive disorder had a PHQ-9 score of less than 10, while twenty-six participants (10.7%) expressed depression symptoms with PHQ-9 total score equal to or greater than 10. Cut off point of 10 was chosen because it demonstrates an optimal cut-off for detecting depression with a sensitivity of 88% and specificity of 88%. [14] Overall, the prevalence of depression among the fishermen in Teluk Bahang was 10.7%.

3.3 Association of Socio-Demographic Profiles with Depression among Fishermen in Teluk Bahang, Penang

To determine the association between socio-demographic profiles and depression, Chi-square test was performed. However, where more than 20% of the expected cell frequencies was less than 5, p-value of Fisher's exact test (FET) was taken into account in interpreting the results. Among 11 variables in the socio-demographic profiles, only one variable, monthly income, was found to be significantly associated with depression (X^2 (df = 1) = 14.371, p<0.001), as shown in Table 3. The results revealed that depression was more prevalent among those who had a low monthly income below RM 900

(73.1%) compared to those who had higher monthly income of more than RM 900 (26.9%). Although race (X^2 (df = 2) = 3.001, p = 0.223), religion (FET, p = 0.662) and marital status (FET, p = 0.820) had a great potential to be associated with depression, the results were not statistically significant enough to prove those variables were associated with depression. No other socio-demographic variables were significantly associated with depression.

Table 1. Socio-demographic characteristics of fishermen in Teluk Bahang, Penang (n=242)

Variables	Frequency (n=242)	Percentage (%)
Race		
Malay	169	69.8
Chinese	53	21.9
Indian	20	8.3
Religion		
Islam	170	70.2
Buddhist	49	20.2
Hindu	6	2.5
Christian	5	2.1
Others	12	5.0
Marital status		
Married	223	92.1
Single	13	5.4
Divorced	6	2.5
Highest education		
None	28	11.6
Primary	158	65.3
Secondary	56	23.1
Income (RM / Month)		
	938.5 ± 412.5*	
<900	94	38.8
≥ 900	148	61.2
Duration of work (Years)		
	38.0 ± 12.4*	
1–30 Years	80	33.1
31–60 Years	159	65.7
> 60 Years	3	1.2
Type of fishing		
Coastal	111	45.9
Deep-sea	24	9.9
Both	107	44.2
Additional occupation		
Yes	23	9.5
No	219	90.5
Age (Years)	55.9 ± 10.7*	
< 50 Years Old	67	27.7
≥ 50 Years Old	175	72.3
Time Spent at Sea		
(a) (Times / Week) (Days)	5.5 ± 1.3*	
< 6 Days	113	46.7
≥ 6 Days	129	53.3
(b) (Hours / Day) (Hours)	6.4 ± 2.2*	
< 6 Hours	79	32.6
≥ 6 Hours	163	67.4

Mean ± SD; RM = Ringgit Malaysia

Table 2. Distribution of responses to PHQ-9 items and prevalence of depression among fishermen in Teluk Bahang, Penang (n=242)

Variables	Frequency (n=242)	Percentage (%)
Little interest or pleasure in doing things		
Never	54	22.3
Several Days	32	13.2
More than half the days	88	36.4
Nearly everyday	68	28.1
Feeling down, depressed or hopeless		
Never	87	36.0
Several Days	141	58.3
More than half the days	13	5.4
Nearly everyday	1	0.4
Trouble falling or staying asleep, or sleeping too much		
Never	66	27.3
Several Days	146	60.3
More than half the days	23	9.5
Nearly everyday	7	2.9
Feeling tired or having little energy		
Never	48	19.8
Several Days	149	61.6
More than half the days	18	7.4
Nearly everyday	27	11.2
Poor appetite or overeating		
Never	133	55.0
Several Days	100	41.3
More than half the days	7	2.9
Nearly everyday	2	0.8
Feeling bad about yourself – or that you are a failure or have let yourself or your family down		
Never	215	88.8
Several Days	27	11.2
More than half the days	0	0
Nearly everyday	0	0
Trouble concentrating on things, such as reading the newspaper or watching television		
Never	179	74.0
Several Days	57	23.6
More than half the days	6	2.5
Nearly everyday	0	0
Moving or speaking so slowly that other people could have noticed? Or the opposite		
Never	189	78.1
Several Days	53	21.9
More than half the days	0	0
Nearly everyday	0	0
Thoughts that you were better off dead or of hurting yourself in some way		
Never	242	100
Several Days	0	0
More than half the days	0	0
Nearly everyday	0	0
Prevalence of Depression		
Presence of depression	26	10.7
Absence of depression	216	89.3

Table 3. Association of socio-demographic profiles with depression among fishermen in Teluk Bahang, Penang (n=242)

Variables	Presence of depression (PHQ-9 ≥ 10) n (%)	Absence of depression (PHQ-9 < 10) n (%)	Test statistic	p-value
Race				
Malay	21 (80.8)	148 (68.5)	3.001[a]	0.223
Chinese	5 (19.2)	48 (22.2)		
Indian	0 (0)	20 (9.3)		
Religion				
Islam	22 (84.6)	148 (68.5)	FET	0.662
Buddhist	4 (15.4)	45 (20.8)		
Hindu	0 (0)	6 (2.8)		
Christian	0 (0)	5 (2.3)		
Others	0 (0)	12 (5.6)		
Marital Status				
Married	24 (92.3)	199 (92.1)	FET	0.820
Single	2 (7.7)	11 (5.1)		
Divorced	0 (0)	6 (2.8)		
Highest Education				
None	4 (15.4)	24 (11.1)	3.067[a]	0.216
Primary	13 (50.0)	145 (67.1)		
Secondary	9 (34.6)	47 (21.8)		
Income (RM / Month)				
<900	19 (73.1)	75 (34.7)	14.371[a]	0.001*
≥ 900	7 (26.9)	141 (65.3)		
Duration of Work (Years)				
1–30 Years	11 (42.3)	69 (31.9)	FET	0.559
31–60 Years	15 (57.7)	144 (66.7)		
> 60 Years	0 (0)	3 (1.4)		
Type of Fishing				
Coastal	12 (46.2)	99 (45.8)	0.171[a]	0.918
Deep-sea	2 (7.7)	22 (10.2)		
Both	12 (46.2)	95 (44.0)		
Additional Occupation				
Yes	3 (11.5)	20 (9.3)	FET	0.722
No	23 (88.5)	196 (90.7)		
Age (Years)				
< 50 Years Old	9 (34.6)	58 (26.9)	0.699[a]	0.403
≥ 50 Years Old	17 (65.4)	158 (73.1)		
Time Spent at Sea				
(a) (Times / Week) (Days)				
< 6 Days	9 (34.6)	70 (32.4)	0.051[a]	0.821
≥ 6 Days	17 (65.4)	146 (67.6)		
(b) (Hours / Day) (Hours)				
< 6 Hours	12 (46.2)	101 (46.8)	0.003[a]	0.953
≥ 6 Hours	14 (53.8)	115 (53.2)		

*[a] Chi Square Test; FET = Fisher's Exact Test; * Significant at p<0.05*

3.4 Association of Stressful Life Events with Depression among Fishermen in Teluk Bahang, Penang

To examine the association between stressful Life Events and depression, Chi-square test was performed. However, p-value of Fisher's exact test was taken into account where more than 20% of the expected cell frequencies was less than 5. Based on results displayed in Table 4, using a combination of Chi-squared test and Fisher's exact test, there were nine statistically significant stressful life events associated with depression. Having serious illness was

significantly associated with depression (X^2 (df = 1) = 14.037, p<0.001). Most of the participants that suffered a serious injury due to accident (80.8%) were depressed, compared to those who did not, and this association showed a statistical significance (X^2 (df = 1) = 37.166, p<0.001). In addition, loss of someone very close (X^2 (df = 1) = 7.623, p<0.006) and having a serious financial problem (X^2 (df = 1) = 20.416, p<0.001) showed a significant association with depression. Other stressful life event variables that showed a significant association with depression based on Fisher's Exact test included abused during childhood (p<0.001, Fisher's exact test), being an orphan before age 10 (p<0.001, Fisher's Exact test), serious family problem (p<0.001, Fisher's Exact test), serious problem at work (p<0.001, Fisher's Exact test) and feeling satisfied with their job (p<0.001, Fisher's Exact test). None of the other stressful life events examined in this study showed any statistically significant association with depression.

3.5 Bivariate Binary Logistic Regression of Socio-Demographic Profiles on Depression among Fishermen in Teluk Bahang, Penang

A bivariate binary logistic regression analysis (using the 'Enter Method') was conducted to further explore the association of each socio-demographic variable with depression. The results in Table 5 showed that of all the variables explored, only monthly income was statistically significantly associated with depression. The results indicated that participants who had income less than RM 900 had more than 5 times higher odds of depression than those who had income more than RM 900 (OR = 5.10, 95% CI 2. 053 – 12.686, p<0.001). Respondents whose highest level of education was primary school had about 47% or twice lower odds of being depressed compared to those who attained secondary education (OR = 0.47, 95% CI 0.188 – 1.165, p=0.103), although this association did not reach statistical significance. Similarly, for every unit increase in hours spent at sea per day, the odds for depression declined by 81% (OR = 0.81, 95% CI 0.626 – 1.044, p=0.103). Respondents who were Chinese (OR = 0.73, 95% CI 0.263 – 2.053, p=0.556), Buddhists (OR = 0.60, 95% CI 0.196 – 1.826, p=0.367) and deep-sea fishermen (OR = 0.72, 95% CI 0.150 – 3.449, p=0.681) were respectively about 73%, 60% and 72% less likely to have depression, although these associations did not reach statistical significance. Participants who were

single had 1.5 times higher odds of getting depression as compared to married participants (OR = 1.51, 95% CI 0.315 – 7.210, p=0.607). Similarly, participants who were engaged in an additional occupation had 28% higher odds of getting depression as compared to full time fishermen (OR = 1.28, 95% CI 0.353 – 4.635, p=0.709). Age (years) (OR = 1.00, 95% CI 0.964 – 1.041, p=0.933) and duration of work (years) (OR = 0.99, 95% CI 0.960 – 1.025, p=0.611) both appeared to have no association with depression among fishermen.

3.6 Bivariate Binary Logistic Regression of Stressful Life Events on Depression among Fishermen in Teluk Bahang, Penang

Stressful life events were believed to increase the risk of depression. As shown in Table 6, there were nine of the independent variables that were significantly and independently associated with depression (Serious Illness, Abused during Childhood, Serious Injury due to Accident, Being an Orphan before Age 10, Loss of Someone Very Close, Serious Family Problem, Serious Financial Problem, Serious Problem at Work and Satisfied with Job). Participants that had an experience of serious illness recorded an odds ratio of 4.54. This indicated that participants who had serious illness were over 4 times more likely to have depression than those who had no serious illness (OR = 4.54, 95% CI 1.953 – 10.548, p<0.001). Participants that were abused during childhood had about 8 folds higher odds of having depression compared to participants that had not been abused during their childhood time (OR = 7.80, 95% CI 2.461 – 24.725, p<0.001). One of the strongest predictors of depression in this study was serious injury due to accident, recording an odd ratio of 13.94. This indicated that participants who had serious injury due to accident were about 14 times more likely to have depression than those who did not experience serious injury due to accidents (OR = 13.94, 95% CI 5.002 – 38.874, p<0.001).

The participants who reported being an orphan before age 10 had 6.6 times higher odds of depression compared to those orphaned after age 10 (OR = 6.55, 95% CI 2.726 – 15.733, p<0.001). Participants who had lost someone very close had over 4 times higher odds of depression compared to participants who did not experience that situation in the past one year (OR = 4.24, 95% CI 1.412 - 12.715, p<0.010). Participants that faced a serious family problem

had 7.6 times higher odds for depression as compared to those who did not experience serious family problem (OR = 7.56, 95% CI 3.109 – 18.373, p<0.001). Those participants that had serious financial problem had about 11 folds higher odds of getting depression when compared to participants who were financially stable (OR = 10.73, 95% CI 3.127 – 36.837, p<0.001). The odds of depression was reduced by about 95% if the participants did not experience any serious problem in the workplace as compared to those who experienced serious problems at work (OR = 0.05, 95% CI 0.018 – 0.117, p<0.001). Participants that were not satisfied with their job had significantly higher odds of depression as compared to participants that were satisfied with their work as fishermen (OR = 20.89, 95% CI 8.107 – 53.844, p<0.001). None of the other variables showed any statistically significant association with depression.

Table 4. Association of stressful life events with depression among fishermen in Teluk Bahang, Penang (n=242)

Variables	Presence of depression (PHQ-9 ≥ 10) n (%)	Absence of depression (PHQ-9 < 10) n (%)	Test statistic	p-value
Attacked				
Yes	0 (0)	6 (2.8)	FET	1.000
No	26 (100.0)	210 (97.2)		
Serious Illness				
Yes	13 (50.0)	39 (18.1)	14.037[a]	0.001*
No	13 (50.0)	177 (81.9)		
Abused during childhood				
Yes	6 (23.1)	8 (3.7)	FET	0.001*
No	20 (76.9)	208 (96.3)		
Serious Injury due to accident				
Yes	21 (80.8)	50 (23.1)	37.166[a]	0.001*
No	5 (19.2)	166 (76.9)		
Being an Orphan before age 10				
Yes	12 (46.2)	25 (11.6)	FET	0.001*
No	14 (53.8)	191 (88.4)		
Loss of someone very close				
Yes	22 (84.6)	122 (56.5)	7.623[a]	0.006*
No	4 (15.4)	94 (43.5)		
Serious marital problem				
Yes	3 (11.5)	21 (9.7)	FET	0.730
No	23 (88.5)	195 (90.3)		
Serious family problem				
Yes	12 (46.2)	22 (10.2)	FET	0.001*
No	14 (53.8)	19 (89.8)		
Serious financial problem				
Yes	23 (88.5)	90 (41.7)	20.416[a]	0.001*
No	3 (11.5)	126 (58.3)		
Serious housing problem				
Yes	10 (38.5)	48 (22.2)	3.358[a]	0.067
No	16 (61.5)	168 (77.8)		
Serious problem at work				
Yes	18 (69.2)	20 (9.3)	FET	0.001*
No	8 (30.8)	196 (90.7)		
Lost job				
Yes	0 (0)	3 (1.4)	FET	1.000
No	26 (100.0)	213 (98.6)		
Legal problem				
Yes	0 (0)	10 (4.6)	FET	0.606
No	26 (100.0)	206 (95.4)		

Variables	Presence of depression (PHQ-9 ≥ 10) n (%)	Absence of depression (PHQ-9 < 10) n (%)	Test statistic	p-value
Happy relationship (Spouse)				
Yes	23 (88.5)	187 (86.6)	FET	1.000
No	3 (11.5)	29 (13.4)		
Happy relationship (Children)				
Yes	24 (92.3)	197 (91.2)	FET	1.000
No	2 (7.7)	19 (8.8)		
Happy relationship (Family)				
Yes	0 (0)	211 (97.7)	FET	1.000
No	26 (100.0)	5 (2.3)		
Satisfied with job				
Yes	8 (30.8)	195 (90.3)	FET	0.001*
No	18 (69.2)	21 (9.7)		

*FET = Fisher's Exact Test; ^{a}Chi Square Test; *significant at p<0.05*

Table 5. Bivariate binary logistic regression of socio-demographic variables on depression among fishermen in Teluk Bahang, Penang (n=242)

Variables	OR	95% CI	p-value
Race			
Chinese	0.73	0.263-2.053	0.556
Indian	-	-	0.998
Malay	Reference		
Religion			
Buddhist	0.60	0.196-1.826	0.367
Hindu	-	-	0.999
Christian	-	-	0.999
Others	-	-	0.999
Islam	Reference		
Marital status			
Single	1.51	0.315-7.210	0.607
Divorced	-	-	0.999
Married	Reference		
Highest education			
None	0.87	0.243-3.119	0.831
Primary	0.47	0.188-1.165	0.103
Secondary	Reference		
Income (RM / Month)			
<900	5.10	2.053-12.686	0.001*
≥ 900	Reference		
Duration of work (Years)	0.99	0.960-1.025	0.611
Type of fishing			
Coastal	0.96	0.411-2.241	0.924
Deep-sea	0.72	0.150-3.449	0.681
Both	Reference		
Additional occupation			
Yes	1.28	0.353-4.635	0.709
No	Reference		
Age (Years)	1.00	0.964-1.041	0.933
Time Spent at Sea			
Times / Week (Days)	0.81	0.626-1.044	0.103
Hours / Day (Hours)	0.96	0.703-1.303	0.780

*Significant at p<0.05; OR = Odds Ratio

Table 6. Bivariate binary logistic regression of stressful life events on depression among fishermen in Teluk Bahang, Penang (n=242)

Variables	OR	95% CI	p-value
Serious illness			
Yes	4.54	1.953-10.548	0.001*
No	Reference		
Abused during childhood			
Yes	7.80	2.461-24.725	0.001*
No	Reference		
Serious injury due to accident			
Yes	13.94	5.002-38.874	0.001*
No	Reference		
Being an Orphan before age 10			
Yes	6.55	2.726-15.733	0.001*
No	Reference		
Loss of someone very close			
Yes	4.24	1.412-12.715	0.010*
No	Reference		
Serious marital problem			
Yes	1.21	0.335-4.376	0.770
No	Reference		
Serious family problem			
Yes	7.56	3.109-18.373	0.001*
No	Reference		
Serious financial problem			
Yes	10.73	3.127-36.837	0.001*
No	Reference		
Serious housing problem			
Yes	2.19	0.932-5.132	0.072
No	Reference		
Serious problem at work			
Yes	0.05	0.018-0.117	0.001*
No	Reference		
Happy relationship (Spouse)			
Yes	1.19	0.336-4.213	0.789
No	Reference		
Happy relationship (Children)			
Yes	1.16	0.254-5.278	0.850
No	Reference		
Satisfied with job			
Yes	20.89	8.107-53.844	0.001*
No	Reference		

Significant at p<0.05

Note: Attacked, Lost Job, Legal problem, and Happy relationship (family) are omitted from this Table because OR was not generated due to termination of iteration

3.7 Multivariate Binary Logistic Regression of Socio-demographic variables and Stressful Life Events on Depression among Fishermen in Teluk Bahang, Penang

Multivariate binary logistic regression was conducted to examine predictors of depression among fishermen in Teluk Bahang. Variable selection into the multivariate model was based on principle of fit and parsimony. All variables that showed a bivariate association with depression at p<0.25 (Hosmer-Lemeshow) were considered for inclusion into the multivariate model. The model was computed using the Enter, forward Wald and backward Wald methods. Overall, the backward Wald method produced the most parsimonious model and explained the largest variance in depression. The final multivariate logistic regression model was

statistically significant (X^2 = 74.724, df = 7, p<0.001). The model explained 53.7% of the variance in depression among fishermen and predicted 94.2% of depression category correctly.

The final multivariate logistic regression analysis revealed four statistically significant predictors of depression which were 'Highest Education', 'Income per Month (RM)', 'Serious Injury due to an Accident' and 'Serious Problem at Work' (Table 7). After adjusting for other variables in the model, the adjusted odds of having depression was 3.4 times higher among participants who had income less than RM 900 as compared to participants whose income was more than RM 900 (aOR = 3.44, 95% CI 1.044 – 11.348, p=0.042). Participants who had serious injury due to accident were about 5 times more likely to develop depression as compared to participants who did not experience serious injury due to accident (aOR = 4.97, 95% CI 1.467 – 16.810, p=0.010).

There were two protective factors identified in this study. The adjusted odds of depression was significantly reduced by 80% if the participants had a primary level of education as compared to those who attained secondary education (aOR = 0.20, 95% CI 0.055 – 0.754, p=0.017). The adjusted odds of depression was significantly reduced by 87% if the participants did not

experience any serious problem in the workplace as compared to those who experienced serious problems at work (aOR = 0.13, 95% CI 0.041 – 0.396, p<0.001). However, the remaining two variables showed a non-significant contribution to the model, which were abused during childhood (aOR = 4.73, 95% CI 0.998 – 22.441, p=0.050) and serious financial problem (aOR = 3.71, 95% CI 0.839 – 16.385, p=0.084).

4. DISCUSSION

4.1 Study Population

All 242 male fishermen required from our sample size calculation were successfully reached during the study period, hence, giving an overall response rate of 100%. This high response rate is indicative of the great cooperation and participation of fishermen in this study. Despite a slight restriction of upper age limit to 75 years to be included in the current study, the mean age of respondents in this study was similar to that of a study conducted among the general adult population of Malaysia. [12] In terms of gender, both sexes of male and female were represented in the study of depression among general adult population of Malaysia while in this study, only male fishermen were included as the number of women fisherman was very small under the Teluk Bahang Fishermen's Association. However, in terms of ethnicity, our study

Table 7. Multivariate binary logistic regression (Backward Wald) of socio-demographic and stressful life events with depression among fishermen in Teluk Bahang, Penang (n=242)

Variables	Crude OR	Adjusted OR	95% CI	p-value
Highest education				
None	0.87	0.23	0.041-1.331	0.101
Primary	0.47	0.20	0.055-0.754	0.017*
Secondary	Reference			
Income (RM / Month)				
< 900	5.10	3.44	1.044-11.348	0.042*
≥ 900	Reference			
Abused during childhood				
Yes	7.80	4.73	0.998-22.441	0.050
No	Reference			
Serious injury due to accident				
Yes	13.94	4.97	1.467-16.810	0.010*
No	Reference			
Serious financial problem				
Yes	10.73	3.71	0.839-16.385	0.084
No	Reference			
Serious problem at work				
No	0.05	0.13	0.041-0.396	0.001*
Yes	Reference			

Significant at p<0.05

population reflects the overall ethnic distribution in Malaysia, where Malays constitute more than 60% and Indians less than 10%.

4.2 Summary of Main Findings

This study is the first epidemiological study on depression that had been conducted among a representative sample of fishermen in Malaysia. This under-studied population is generally a low-income group with potentially high risk of depression. The prevalence of depressive symptoms in our study population was 10.7%. Based on multivariate logistic regression analysis, the predictors of depression in this study were the level of education, income (RM / month), serious injury due to accident and serious problem at work.

4.3 Comparison of Prevalence of Depression with Existing Literature

The prevalence of depressive symptoms among the cohort of fishermen in our study was 10.7%, which was similar to a 2014 review that was conducted by Ng which reported that the prevalence of depression among the general adult population in Malaysia fall between the ranges of 8% to 12% [12]. This indicates that depression is equally a serious problem among fishermen which should be emphasized, as this issue has a major effect on the quality of life of the patient and their relatives, particularly children.

The result of this study is also consistent with the findings of a community study conducted by Maideen et al. [15] which revealed that the prevalence of depression among adults in Selangor, Malaysia was 10.3% based on the PHQ-9 score cut-off point of 10 and above. Furthermore, our result is also consistent with reports of a national survey conducted by United States' Centers for Disease Control and Prevention (CDC) which demonstrated that the prevalence of depression among adults was 9.1% [16]. However, data from the 2008 National Health and Nutrition Examination Survey (NHANES) had demonstrated a higher prevalence of 21.6% among US adults [16]. This difference in prevalence is mainly due to the utilization of a lower cut-off point in which the score of more than 5 had been classified as depression in the latter US study. If the cut-off point was increased to 10 and above as used in the current study, the authors observed the point prevalence would have decrease to 6.8% only [17].

In contrast, the findings of a 2007 review conducted by WHO World Health Survey (WHS) which gathered data in regard to depression among adults aged 18 years and older from 60 countries across all regions of the world, had uncovered that depressive symptoms alone had a prevalence of 3.2% which is particularly lower and not consistent with our study [18]. The findings of the current study also contrast with reports from other ASEAN countries such as Singapore in which a lower prevalence of 5.8% [19] was reported. However, report of a study in Thailand demonstrated a slightly higher prevalence, apparently because the study was conducted among adults who were involved with the tragedy of tsunami, with the prevalence of depression being about 16.7% among displaced persons and 14.3% among non-displaced persons [20]. In any case, a much higher prevalence (51%) than the findings of the current study was reported in another ASEAN country – Cambodia, where many studies had been conducted among refugees who had a variety of trauma such as losing a friend or family member, witnessing the death of their own family members and also confronting starvation which are important risk factors of depression [21].

When compared with other countries of South Asia such as India, the overall prevalence of depression among adults in alarge urban South Indian population was slightly higher (15.1%) than that of the current study [22]. Additionally, a study of depression that was conducted by Nisar et al. [23], on a group of adult women in a Pakistan fishing community had revealed a prevalence of 7.5%. Generally, the prevalence will vary depending on the methods and measures used by a study. In spite of the fact that there were numerous depression studies conducted in Malaysia, focused studies on mental health status among fishermen had been disregarded and overlooked. Taking everything into account, the current prevalence of depression in our study revealed that the program of prevention, screening, treatment and consultation are truly needed to reduce this serious issue, as there is no health without mental health.

4.4 Association of Socio-demographic Profiles with Depression

In our findings from Chi-square analysis, among the socio-demographic profiles, only income (RM / month) reported a statistically significant association with depression among fishermen.

This finding was consistent with the majority of the studies in the literature [24-27].

According to the study conducted by Lund et al. [28], the authors reported that the lower the income earned by an individual, the higher the risk of getting depression. Among existing psychiatric disorders, depression is a problem that clearly demonstrated association with low income or poverty. In a 2010 systematic review by Lund et al. [28], it was reported that about 80% of 115 studies conducted in 33 countries across the developed and developing world demonstrated that low income and poverty is intimately linked to mental problems such as depression. Relatedly, the same review found that the rate of depression in poor countries is substantially higher when compared with rich countries. This statement was in accordance with a recent study by Haushofer and Shapiro which found that some families in Kenya reported more elevated levels of life satisfaction and lower level of depression after getting a cash grant help averaging $700 (the amount of $700 is double the usual amount spent by a person per year). This suggests that help in terms of financial / monetary support would assist them to survive and at the same time, it stimulates a better mental health. However, not only poverty can lead to depression, indeed depression itself can also lead to poverty as a result of physical changes in someone which also lowers their quality of life [29].

With the exception of income (and education level as shown by our regression analysis), the current study failed to demonstrate any significant association between depression and other socio-demographic characteristics of fishermen. In contrast, a previous study in Malaysia which was led by Maideen et al. [15], found that marital status and ethnicity showed a significant association with depression. In any case, both of these variables were not significant in this study. This may have been due to the small number of Chinese and Indian participants relative to Malay participants which had considerably higher number [30] in the current study. Additionally, even though the prevalence of depression varied with marital status (married participants were more prone to depression), yet this variable was still not statistically associated with depression in this study. This unexpected finding may have been due to gender restriction of this study which only focused on fishing community of men. Unlike the current study, most of the previous studies which showed statistically significant association of marital status with depression were conducted amongst women, and women are more likely to suffer from uncontrollable stress which act as a risk factor of depression [31].

4.5 Association of Stressful Life Events with Depression

With regards to stressful life events (by Kendler), current findings revealed a significant association between a substantial number of stressful life events during the latest 12 months in the life of the participants. These events included 'serious illness', 'abused during childhood', 'serious injury due to accident', 'being orphan before age 10', 'loss of someone very close', 'serious family problem', 'serious financial problem', 'serious problem at work' and 'satisfied with job'. These findings are also consistent with the previous literature which suggests that these stressful life events had an association with the occurrence of depression [10].

First of all, 'serious illnesses' are associated with depression, especially when these conditions prompted a decrease in a quality of life, led to a major change in way of life and limited the movement of a person. Numerous individuals who have suffered from serious illness often developed chronic depression. Furthermore, a study by Mikkelsen et al. [32], found that the problem of depression is the most widely recognized complication in a variety of serious illnesses. This assertion was upheld by a statement issued by the National Institute of Mental Health (NIMH) which expressed that it is normal that a person feel sad, hopeless and demoralized after experiencing problems of heart attack, cancer or other serious illness problems. However, that vibe of sorrow and distress due to particular illness will lead to depression if prolonged enough, because it could affect a person's self-confidence and likewise restrict their daily activities [33].

The findings of the current study also indicate a significant association between being 'abused during childhood' and depression. This happens not only when they are abused physically, but also following mental abuse during childhood. The results of the current study is consistent with the findings of a study led by Brown et al., which found that abuse during childhood can damage the emotional and psychological status of an individual, which in turn cause a negative impact on their mental health when growing up. Thus,

the authors suggested that the issue of abuse cases was extremely very important and should be emphasized as it affects the risk of depression [34]. According to Chapman et al., early prevention against abuse during childhood and early treatment of individuals who have been exposed to this problem will be able to reduce the serious burden of depression [35].

In addition, 'serious injury due to accident' was likewise associated with depression, where it is believed to bring about prolonged stress in a person which eventually leads to depression [36]. A study conducted in Britain reported that one-third of the victims involved in accidents suffered symptoms of depression in a period of one year after the accident and this also includes individuals who do not suffer any serious injuries that restrict their everyday movement. Hence, this shows how a serious accident could trigger serious depression particularly in individuals who are being traumatized and not able to control their emotions [37].

Furthermore, 'being orphan before age 10' was significantly associated with depression among fishermen in this study. According to Sengendo and Nambi, individuals who live and grow up together with widowed father / mother or who live alone without their parents were significantly more depressed due to the burden of life without the support from their mother or father [38]. Similarly, Behrendt and Mbaye in a study that was conducted in North West Region of Cameroon, reported that depression among individuals who become orphans before the age of 10 occurred when the experience of losing their mother and father were believed to enhance the risk of suicide among them if they did not have any support from people around them, as they feel hopeless and had a thought that life and the future are meaningless without their lovely parents [39].

In this study, 'loss of someone very close' was also associated with depression. The problem occurs when someone begins to feel the loss of hope associated with the loss of their loved ones (family, friends or spouse) who are very close to them. The loss of this relationship could contribute to depression. A study that was conducted by The Harvard Medical School Family Health Guide expresses that the feelings of despair and hope will be accompanied by the feelings of worthlessness. This situation will bring about a drastic reduction in emotion and those persons who suffered from prolonged sadness

had a potential to get into depression, for which they require early treatment and counseling so that the situation will not be protracted and deteriorating [40].

The other stressful life event that demonstrated significant association with depression in the current study is 'serious family problem'. Generally, the problem of depression will arise when there is a conflict in the family. For instance, this may arise when individuals are physically, emotionally and sexually abused, and at the same time their welfare was neglected by their family. Similarly, getting poor or inadequate attention and being treated badly in the family would cause a person to see themselves as an individual who is worthless and useless in the future, which in turn will cause them to live in prolonged grief and subsequently lead to depression [41].

Having 'serious financial problems' was also associated with depression, in such a way that individuals that often had financial issues almost always have a tendency to get involved with the debt problem. A study that was conducted by Meltzer et al., found that the pressure in terms of poor financial health became a major contributor to the problem of depression. The latest analysis of data by personal loan Payoff company discovered that as many as 23% of the participants experienced symptoms of depression because of serious financial problem arising from their difficulty to support daily expenses [42]. This statement was also consistent with the findings reported by the American Psychological Association which found that, among 3,000 participants involved in the survey, 72% said that they felt depressed with financial problems in the past and 50% said that they did not receive any moral support, both factors of which led to depression. In addition, not only can serious financial problem cause depression, but more importantly, it can also lead to suicidal ideation and attempts among individuals who experienced it [43].

Finally, from our findings, 'serious problem at work' and 'satisfied with job' were highly correlated with each other and also associated with depression. Having a serious problem at work will cause a person to experience perpetual stress and if that particular stress was not resolved in a healthy and right way, this will definitely lead to depression. Also, this situation will arise when there is a high demand for productivity gains, but at the same time

inadequate number of support staff to achieve the desired productivity. Hence, due to the insufficient staff, it will generally add stress and strain on existing staff, which at the end will also lead to depression [44].

4.6 Predictors of Depression

Our multivariate regression model demonstrated four statistically significant main predictors of depression which were 'Highest Education', 'Income per month', "Serious Injury due to Accident' and 'Serious Problem at Work'.

So far, the association between depression and stressful life events has been shown extensively in various studies including ours. Our findings were also supported by results of a previous research conducted by Maideen et al. [15], which discovered similar outcomes. Other reviews have additionally discovered financial problems as a reason for depression [45]. Having a low income per month as a predictor of depression was in accordance with the study led by Poongothai et al. [22], which was conducted among South Indian population. Similarly, these findings are consistent with a study conducted by Stoetzer et al. [46], which reported serious problem in the workplace as one of the causes of depression. Additionally, the findings of our study revealed serious injury to accident as a predictor of depression, and this was consistent with another study conducted among patients who were injured in the hospital [47]. Finally, our findings which uncovered higher education as a predictor of depression was also supported by a study that was conducted by Price et al. [48], in which the authors reported that persons with lower level of education demonstrated a tendency to suffer from depression than the individuals who received higher education.

5. STRENGTHS

This study is the first epidemiological study on depression that had been conducted among a representative sample of economically-disadvantaged fishermen in Malaysia. Our findings call to attention the potentially high prevalence and risk factors associated with depression among this important community. The use of internationally-acclaimed and validated PHQ-9 and Kendler's stressful life events questionnaire allowed comparability of our findings with other local and international studies, and assured internal validity of our study estimates.

6. LIMITATIONS

One important limitation of this study was its inability to determine temporal relationship between risk factors and prevalence of depression due to time and design constraints, as cross-sectional study is a one-time observational study. Additionally, there was a likelihood of recall bias (from self-reports) as this study used a structured questionnaire in which respondents particularly recall about their past stressful events. This study did not include any female participants because the number of female fisherman is extremely small in the population (1 out of 333 registered fishermen under fishermen's association). Lastly, given the well documented social desirability bias with questionnaire surveys, authors attempted to mitigate the potential for social desirability bias by requesting participants to give an honest response and think thoroughly in-depth during the interview session. We did not estimate the severity of depressive symptoms in this population as doing so might have yielded no meaningful result – given that we were unsure of how prevalent depression was among them ab-initio – especially if prevalence turned out to be extremely low.

7. CONCLUSION

In conclusion, this study revealed a high prevalence of depression among fishermen which was consistent with other local and international studies (10.7%) and exposed the risk factors of depression among fishermen in Teluk Bahang, Penang to include education and income level, having 'serious injury due to accident' and 'serious problem at work'. Generally, these findings could be used as a benchmark for the development of an effective program to raise awareness and to minimize the stigma associated with depression among fishermen community. It also highlights the need for additional attention to fishermen in terms of economic empowerment and poverty alleviation programmes. Capacity building of health care workers from the government sector as well as other responsible parties regarding the mental health issue is required to forestall and mitigate potential negative consequences of depression if not addressed immediately. In the meantime, Teluk Bahang Fishermen's Association should consider a variety of interesting activities or promote education campaigns such as 'Depression Awareness Campaign' with a specific end goal to raise awareness among

fishermen and minimize the stigma about depression problem.

CONSENT

An informed consent form was provided to each participant before filling out the questionnaire. The participants were informed about the details of the study and their anonymity was preserved to guarantee there was no breach of confidentially. The study was conducted with the agreement from all participants based on their signed consent forms.

ETHICAL APPROVAL

This study was conducted in line with ethical principles detailed in the Declaration of Helsinki. Ethical approval to conduct this study was obtained from Penang Medical College Institutional Research Ethics Committee (PMC IREC).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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