

ORIGINAL ARTICLE

Depression and Its Associated Factors Among Students of a Malaysian University

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ABSTRACT

Introduction: Depression among university students is more prevalent recently. Failure identifying depression leads to academic impairments, delay graduation, and employment enrolment. The objectives of this study are to determine the prevalence of probable depression and its associated factors among a public Malaysian university students.

Materials and methods: This is a cross-sectional study utilising consecutive sampling. Demographic, medical, and social factors were gathered using self-report online questionnaires, and probable depression using the Clinical Epidemiological Symptoms of Depression (CESD). Chi-squared test and multiple logistic regression were used for statistical analysis. **Results:** Total of 853 students participated. The prevalence of probable depression was 19%, majority being female (97.3%), and from 21 to 29 years age group (68.1%). Univariate analysis showed no significant association between course and other demographic factors. Multiple logistic regression found significant association between bad and worse general health conditions (AOR 2.63, 95% CI 1.61 - 4.30), previous history of depression (AOR 4.79 95% CI 1.61-14.25), psychosis (AOR 13.75 95% CI 1.18-159.70) and bipolar disorder (AOR 32.61 95% CI 3.04-349.57), chronic illnesses (AOR 209.63 95% CI 6.35-6920.31), opinion on importance of exercise (AOR 0.46 95% CI 0.22 - 0.97), reduction in physical activity (AOR 5.54 95% CI 1.37-22.37), bad perception on eating habits (AOR 5.03 95% CI 2.22-11.39), increased eating habits (AOR 2.36 95% CI 1.33-4.19), and less family conflict (AOR 0.34 95% CI 0.20 - 0.59). **Conclusion:** Findings revealed critical links between depression with medical and social-lifestyle factors, alarming for effective mental health preventative interventions early at university level.

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INTRODUCTION

Depression is a mental health condition which emerges gradually and can cause significant impairment to an individual's productivity. It is also the commonest mental health condition among university students, as reported by a multicentre survey (1). University years are significant transition period from adolescence to adulthood. Tertiary academic enrolment is undertaken with the intention of fulfilling personal growth, but it can also precipitate psychological distress. A significant proportion of this ended up developing depression (2).

The mean depression prevalence was 30.6% in university students, and the ratios ranged between 10% and 85%

(3). In a meta-analysis involving 34 studies among medical students, the pooled prevalence of depression was 18.1% (95% CI: 14.1%, 22.1%) (4). From previous literature, its prevalence in local university students varies from 29.9% (5) to 65.2% (6).

Demographic factors such as being female (2), a sexual minority (7), education level, family structure (nucleus or joint), and marital status (8) were found to be significant contributing factors to depression. Academic-related factors such as first-year student (9), failing the academic year (10), and type of study field (2) were also predicted to cause depression in this population. However, Hoang et al. reported depressive symptoms were shown to be higher in second- and third-year students, and those with moderate and high academic expectations (11). Health and psychological factors such as history of psychiatric illness (12), and lack of external motivation to pursue tertiary education (1) were associated with depression among university students. Social factors,

namely financial difficulty (2), family conflict, loss of family members, problems with interpersonal relations (10), having a family with mental health problems (13), lifestyle changes, and unhealthy coping skills (14) were identified as probable risk factors for depression in this group.

Significant predictors of depression among Malaysian university students found from previous literature were age group (15), being female (5), origin (16), current place of living (17), academic stress (18), having other psychiatric diagnoses (19), poor self-esteem (20), dependant on parents' income (15), lack of social support (separated parents, recent loss of someone close) (21), smoking (22), and poor diet habits (23). In contrast, the protective factors for depression among these students reported in local studies were positive religious coping (24) and regular physical activity (25).

Interactions from all these factors cause academic impairment at the individual level and delay graduation and employment enrolment. Worse, severe depression can lead to the student dropping out of the university and unable to secure a job in the future. Indirectly, it will impede national productivity and put a toll on the health burden of diseases.

While research on the link between courses enrolled and depression is still limited, early evidence suggests that certain degree programs may tend to attract students who are more vulnerable to mental health challenges. Ajinkya et al reported that students enrolled in arts and humanities major in tertiary education has an odds ratio of 3.84 (95% CI, 1.18, 12.46) of developing depression compared to an undecided or interdisciplinary major (26). This finding was supported by McLafferty et al who found that students who enrolled in arts and humanities has highest prevalence of depression 20.6% and social anxiety 38.8%, whereas those studying in life and health sciences has the lowest rates of a variety of mental disorders before starting their study (27). Another research found those studying arts and humanities, social work, and the social and behavioural sciences were more probable to report psychological and drug use disorders compared to those in business or engineering programs (28). The explanation behind this was students in health-related courses have better access to knowledge and mental health services whereas those in arts and humanities, social and behavioural sciences may have predisposing psychological vulnerabilities which made them opt for such courses (27).

Unfortunately, the previous local studies were confined to specific courses, such as medicine (6, 25) and allied health sciences (24, 29), or the research sample was limited to a smaller locality (30). There is a lack of data available on probable depression across different courses. Delay in seeking mental health assistance can lead to deterioration in academic performance,

hopelessness, and affects interpersonal relationships in university students (31).

Hence the objectives of this research are to determine the prevalence of probable depression and its associated risk factors among students of a public Malaysian university from the perspective of demographic, medical and social factors particularly looking at factor on different type of courses enrolled. This could aid the university in developing targeted strategies to support current students who are struggling with depression, by giving more attention to courses with high prevalence of probable depression thereby improving their chances of progressing and successfully graduating.

MATERIALS AND METHODS

Study design and sampling method

This was a cross-sectional study utilising consecutive sampling which involves collecting data via online survey to determine the prevalence of probable depression and its associated factors among undergraduate students of a public Malaysian university located in a sub-urban area of the state of Selangor. Data were collected during the university's mental health awareness program which was held from 26th November to 10th October 2022.

Selection criteria

Our study included participants who gave implied consent to participate in the study, were undergraduate students of a public Malaysian university aged 18 years old and above, understood either English or Malay language and were able to complete online questionnaires. The only exclusion criteria were incomplete student identification number.

Sample size

Sample size estimation was based on findings of a previous study by Ngin et al. (32) and calculated using OpenEpi. Prior data indicate that the proportion of depression among university students was 50.1% and the population size was 168,000. After considering Type I error probability and precision are both 0.05, the samples needed are 767 students. With an additional 10% attrition rate, the final sample size needed is 850 students. The data that fulfilled the above criteria comprised of 853 samples, all of which were included.

Measurement tools

The Centre for Epidemiological Studies of Depression (CESD) questionnaire was used to measure probable depression. CESD has been used in Malaysia and has good validity and reliability to measure depression. The Malay version of CESD by Ghazali et al. (2024) indicated that Cronbach's alpha coefficient was 0.75, with test-retest reliability measured by Pearson's correlation was 0.69 (33). Following this study, participants were classified as having significant depression when the total score is more than 27. The remaining participants were

classified as no depression.

The independent factors of interest were divided into three categories; i) Demographic factors (age, gender, previous residential area, household number, total number of siblings, number of co-habitants, number of close friends who are also confidantes, and current course enrolled); ii) Medical factors (general health condition, presence of chronic illness, significant past psychiatry history, and ongoing psychiatry treatment) and iii) Psychosocial factors (presence of family conflict, routine daily care, financial difficulty, exercise, eating habits, and changes in body weight).

We provided self-constructed pro forma questionnaires to assess the demographic, medical and psychosocial factors. General health conditions and social factors were asked using the Likert scores. The participants were asked about their general health condition (score: 1 to 5), the presence of family conflict (score: 1 to 5), routine daily care (score: 1 to 5), financial difficulty (score: 1 to 5), the importance of exercise (score: 1 to 5), frequency and intensity of physical exercise (score: 1 to 4), eating habit (score: 1 to 3), and changes in body weight (score: 1 to 5).

Data collection

Data collection was done via online survey using Google Form which was disseminated via social media platforms Facebook and Instagram. Potential participants who received the invitation or promotion regarding the study would click on the Participant Information Sheet, which described the procedures, benefits, and risks of the studies. Those who fulfilled the selection criteria would click the next pages of questionnaires if they agreed to participate in the study. Implied consent was considered when the participants agreed to be enrolled in the study and moved to the next pages to answer the questionnaires. For the respondent to participate in the survey, the student's identification number is required to ensure the entry was by students from the university. However, no further information pertaining to student's personal information was obtained. The questionnaires began with questions related to demographic data, then medical, and psychosocial factors. It took about 15 minutes to answer all the questions.

Statistical analysis

All data was analysed using the Statistical Package for Social Science (SPSS) version 28.0. Frequency and percentage were used to describe the demographic, medical, and social characteristics of the samples.

The outcome variable was categorised into two categories: presence or absence of probable depression. The proportion of probable depression in the CESD score was calculated using frequency and percentage.

The Chi-square test was used to explore the relationship between the categorical variables and the outcomes, using Pearson and Exact Fisher's tests. The Cronbach's alpha for CESD in this study is 0.88 based on the participants responses.

Binary logistic regressions were used to determine the factors associated with probable depression among the participants. Initially, simple logistic regressions were performed, and then, only variables with significant crude odds ratios (OR) were included in multiple logistic regression to obtain their adjusted odds ratios (AOR). Subsequently, multi-collinearity and goodness-of-fit were tested using the Hosmer and Lemeshow Test. However, the multivariate logistic regression analysis did not focus on reporting the R-value because the primary objective was to identify statistically significant predictors and estimate the magnitude of their associations through AOR. While the R value (or pseudo R-squared) could provide an indication of model fit or explained variance, it is less commonly emphasized in logistic regression studies focused on identifying factors associated with an outcome. Statistical significance was set at 0.05.

Ethical Clearance

Ethical approval has been obtained from the Universiti Teknologi MARA (UiTM) Research Ethics Committee (REC/06/2020 (MR/109)).

RESULTS

Demographic, medical, and social characteristics

Out of the 853 participants recruited in the study (Table I), 63.1 % belongs to the age group 21 to 29 years old. Majority of them are female (96.2%), mostly residing in the suburban to rural area (34.7%) and have more than four siblings (65.1%). 71.6% lives with five persons including respondent at previous residential area and 75.6% lives with five persons or more during current study period. Most of these students have two confidantes (26.3%) but 10.1% reported not having any. Most of the respondents are from Business and Commerce courses (40.7%), followed by Medicine and Allied Health Sciences (31.4%) and Teaching, Education and Language (14.2%).

Table I also shows the characteristics of medical and social factors among the respondents. 1.9% reported their general health condition for the past month as bad, and 3% have chronic illness, of which the majority is asthma (2%). Among those who reported having a previous psychiatry history, 10.7% had anxiety, followed by depression 6.2%. Among respondents who are currently undergoing psychiatry treatment, 1.8% received psychotherapy, and 1.4% are on antidepressants.

Table 1: Demographic, medical, and social characteristics of the participants (n:853)

Demographic Factors	<i>n</i>	(%)
Age in years		
18-20	294	34.5
21 -29	538	63.1
Gender		
Male	29	3.4
Female	821	96.2
Place of stay prior to enrolling in current study		
Capital City	97	11.4
City > 1 million residents	91	10.7
City (100000 - 1 million residents)	84	9.8
City (20000 - 100000 residents)	176	20.6
City (<20000 residents)	109	12.8
Suburban - Rural	296	34.7
Total number of siblings		
0 (I don't have sibling)	42	4.9
1 sibling	16	1.9
2 siblings	72	8.4
3 siblings	168	19.7
4 siblings or more	555	65.1
Number of people living together including respondent at previous place of living		
1 (I'm living alone)	3	0.4
2 persons	13	1.5
3 persons	84	9.8
4 persons	142	16.6
5 person or more	611	71.6
Number of people living together with respondent during current study period		
1	21	2.5
2	166	19.5
3	4	0.5
4	15	1.8
5 or more	645	75.6
Number of close friend(s) who are also a confidante to the respondent		
0	86	10.1
1	165	19.3
2	224	26.3
3	165	19.3
4	80	9.4
5 or more	131	15.4
Course		
Life Science	63	7.4
Physical Science	12	1.4
Medicine and Allied Health Science	268	31.4
Business and Commerce	347	40.7
Teaching, Education and Language	121	14.2
Technical and Engineering	1	0.1
Arts and Architecture	22	2.6
Sociology	3	0.4
Others	16	1.9
Medical Factors	<i>n</i>	(%)
Respondent's general health condition during the past one month		
Bad	16	1.9
Good	419	49.1
Average	169	19.8
Very Good	186	21.8
Excellent	63	7.4

CONTINUE

Table 1: Demographic, medical, and social characteristics of the participants (n:853) (CONT.)

Medical Factors	<i>n</i>	(%)
Presence of chronic illness		
No	827	97
Yes	26	3
Diagnosis of chronic illness		
No	827	97
Asthma	17	2
Thyroid Disorders	2	0.2
Hypertension	2	0.2
Dyslipidaemia	1	0.1
Multiple Illness	3	0.4
Previous Psychiatric History		
No	744	87.2
Anxiety	87	10.2
Depression	53	6.2
Psychosis	5	0.6
Bipolar Disorder	9	1.1
Others	14	1.6
Ongoing Psychiatric Treatment		
No	829	97.2
Psychotherapy	15	1.8
Antipsychotic	0	0
Antidepressant	12	1.4
Antiepileptic agent	4	0.5
Lithium	1	0.1
Anxiolytics	6	0.7
Social Factors	<i>n</i>	(%)
Presence of conflict within respondent's family during current study period		
Less	220	25.8
Slightly less	461	54
No change	122	14.3
More than usual	40	4.7
A lot of change	10	1.2
The ability to maintain basic daily routine after pursuing study		
Followed routine	76	8.9
In general, yes	403	47.2
Sometimes, but not always	328	38.5
Not at all	46	5.4
Financial condition during the period of study		
Way easier than before	12	1.4
Easier	45	5.3
About the same	345	40.4
More difficult than before	361	42.3
Very difficult than before	90	10.6
Respondent's opinion on the importance of exercise while pursuing study		
Very important	155	18.2
Important	305	35.8
Average important	255	29.9
Slightly important	122	14.3
Not important at all	16	1.9
Increment in frequency or intensity of exercise since pursuing study		
Increased a lot	64	7.5
Increased than before	164	19.2
Average	350	41
Reduced	190	22.3
Not at all	85	10

CONTINUE

Table I: Demographic, medical, and social characteristics of the participants (n:853) (CONT.)

Social Factors	n	(%)
How far does your physical activity affected since you pursued your study?		
Increased a lot	37	4.3
Slightly increased	183	21.5
No change	496	58.1
Slightly reduced	106	12.4
A lot has reduced	31	3.6
Did you notice any increase in the amount of food or meal frequency?		
I ate a lot than usual	71	8.3
I ate slightly more than usual	192	22.5
No change	384	45
I ate less than usual	206	24.2
Respondent's perception on their eating habit pattern		
I ate more healthily	186	21.8
No change in my food selection and eating habits	536	62.8
I had bad eating habits	131	15.4
Respondent's body weight changes after pursuing study		
My body weight has reduced significantly (> 2-3kg)	49	5.7
My body weight has slightly reduced (<2kg)	169	19.8
My body weight did not change.	469	55
My body weight has slightly increased. (<2kg)	122	14.3
My body weight has increased significantly (>2-3kg)	30	3.5

Looking into the social factors, only about 5% reported having family conflict; 4.7% reported more than usual and 1.2% a lot of change, respectively. Regarding the ability to maintain daily routine, the majority reported being able to follow (47.2%), but 38.5% reported only being able to follow sometimes, but not always. Half of the sample (50.2%) reported having financial difficulty during the study period. Although 54% scored important (35.8%) and very important (18.2%) on exercise during

the study period, only 26.7% reported an increase in frequency or intensity of exercise (increased: 19.2% and increased a lot: 7.5%), whereas 15% reported that their physical activity was either slightly reduced (12.4%) or reduced (3.6%) during the study period. The majority noticed there was a change in frequency or the amount of food intake (55%), of which 21.8% eat healthily, and 15.4% have a bad eating habit. Lastly, 25.5% showed a reduction in weight, while 17.8% showed an increment in body weight during the study period.

Prevalence of probable depression

The prevalence of probable depression is 19% while majority of the participants has no depression as shown in Table II.

Table II: Prevalence of probable depression among the participants

CESD Score	n	(%)
Probable depression	162	19.0
No depression	691	81.0
Total	853	100.0

Association between demographic, medical and social factors with probable depression

Table III shows the distribution of all the factors based on presence of probable depression and the significance of their association. Place of stay prior enrolling to current course showed significant association with probable depression (p-value = 0.011), in which mostly are from suburban to rural area (25.3%). Meanwhile, number of close friends/confidantes also showed a significant p-value of 0.010, with a higher percentage in those with 0 to 2 confidantes (66.7%). However, age, gender, course, number of siblings, number of people living together previously and number of people living together currently showed no significant association with depression.

Table III: Chi-squared test between each variable with probable depression

Factor	No depression		Probable depression		p-value
	n	(%)	n	(%)	
Age					0.131 ^a
18-20	247	36.5	47	30.1	
21 -29	429	63.5	109	69.9	
Gender					0.481 ^a
Male	25	3.6	4	2.5	
Female	665	96.4	156	97.5	
Place of stay prior to enrolling in current course					0.011 ^a
Capital City	73	10.6	24	14.8	
City > 1 million residents	64	9.3	27	16.7	
City (100000 - 1 million residents)	71	10.3	13	8.0	
City (20000 - 100000 residents)	142	20.5	34	21.0	
City (<20000 residents)	86	12.4	23	14.2	
Suburban - Rural	255	36.9	41	25.3	

CONTINUE

Table III: Chi-squared test between each variable with probable depression (CONT.)

Factor	No depression		Probable depression		p-value
	n	(%)	n	(%)	
Total number of siblings regardless of place of living					0.276 ^a
0 (I don't have sibling)	38	5.5	4	2.5	
1-3 sibling	206	29.8	50	20.9	
4 siblings or more	447	64.7	108	66.7	
Number of people living together including respondent at previous place of living					0.163 ^a
1-2 person	10	1.4	6	3.7	
3-4 person	184	26.6	42	25.9	
5 person or more	497	71.9	114	70.4	
Number of people living together with respondent during current study period					0.497 ^a
1-2 person	146	21.2	41	25.3	
3-4 person	15	2.2	4	2.5	
5 person or more	528	76.6	117	72.2	
Number of close friend(s) who are also a confidante to the respondent					<0.001 ^a
0-2 person	363	52.6	112	69.6	
3-4 person	211	30.6	34	21.1	
5 person or more	116	16.8	15	9.3	
Course					0.261 ^a
Basic Science	57	8.2	18	11.1	
Medicine and Allied Health Science	226	32.7	42	25.9	
Business and Commerce	277	40.1	70	43.2	
Teaching, Education and Language	97	14.0	24	14.8	
Arts and Architecture	20	2.9	2	1.2	
Others	14	2.0	6	3.7	
Respondent's general health condition during the past one month					<0.001 ^a
Bad and Worse	359	52.0	76	46.9	
Average	95	13.7	74	45.7	
Very Good and Excellent	237	34.3	12	7.4	
Presence of chronic illness					0.802 ^b
No	669	96.8	158	97.5	
Yes	22	3.2	4	2.5	
Diagnosis of chronic illness					0.914 ^b
No	669	96.8	159	98.1	
Asthma	15	2.2	2	1.2	
Others	7	1.0	1	0.6	
Previous Psychiatric History					
No	634	91.8	110	7.9	<0.001 ^a
Anxiety	53	7.7	34	21.0	<0.001 ^a
Depression	20	2.9	33	20.4	<0.001 ^a
Psychosis	2	0.3	3	1.9	0.050 ^b
Bipolar Disorder	1	0.1	8	4.9	<0.001 ^b
Others	3	0.4	11	6.8	<0.001 ^b
Ongoing Psychiatric Treatment					
No	683	98.8	148	91.4	<0.001 ^b
Psychotherapy	5	0.7	10	6.2	<0.001 ^b
Antidepressant	3	0.4	9	5.6	<0.001 ^b
Antiepileptic agent	1	0.1	3	1.9	0.023 ^b
Lithium	0	0.0	1	0.6	0.190 ^b

CONTINUE

Table III: Chi-squared test between each variable with probable depression (CONT.)

Factor	No depression		Probable depression		p-value
	n	(%)	n	(%)	
Ongoing Psychiatric Treatment					
Anxiolytics	1	0.1	5	3.1	<0.001^b
Presence of conflict within respondent's family during current study period					<0.001^b
Slightly less	172	24.9	48	29.6	
Less	412	59.6	59	30.2	
No change	87	12.6	35	21.6	
More than usual	18	2.6	22	13.6	
A lot of change	2	0.3	8	4.9	
The ability to maintain basic daily routine after pursuing study					<0.001^a
Followed routine	68	9.8	8	4.9	
In general, yes	354	51.2	49	30.2	
Sometimes, but not always	246	35.6	82	50.6	
Not at all	23	3.3	23	14.2	
Financial condition during the period of study					<0.001^a
Way easier than before	10	1.4	2	1.2	
Easier	33	4.8	12	7.4	
About the same	297	43.0	48	29.6	
More difficult than before	293	42.4	68	42.0	
Very difficult than before	58	8.4	32	19.8	
Respondent's opinion on the importance of exercise while pursuing study					0.002^a
Very important	129	18.7	26	16.9	
Important	265	38.4	40	29.1	
Average important	198	28.7	57	35.2	
Slightly important	88	12.7	94	21.0	
Not important at all	11	1.6	13	3.1	
Increment in frequency or intensity of exercise since pursuing study					0.002^a
Increased a lot	52	7.5	12	7.4	
Increased than before	149	21.6	15	9.3	
Average	283	41.0	67	41.4	
Reduced	146	21.1	44	27.2	
Not at all	61	8.8	24	14.	
How far does your physical activity affected since you pursued your study?					<0.001^a
Increased a lot	28	4.1	9	5.6	
Slightly increased	151	21.9	32	19.8	
No change	413	59.8	83	51.2	
Slightly reduced	85	12.3	21	13.0	
A lot has reduced	14	2.0	17	10.5	
Did you notice any increase in the amount of food or meal frequency?					<0.001^a
I ate a lot than usual	44	6.4	27	16.7	
I ate slightly more than usual	138	20.0	54	33.3	
No change	342	49.5	42	25.9	
I ate less than usual	167	24.2	39	24.1	
Respondent's perception on their eating habit pattern					<0.001^a
I ate more healthily	170	24.6	16	9.9	
No change in my food selection and eating habits	439	63.5	97	59.9	
I had bad eating habits	82	11.9	49	30.2	

CONTINUE

Table III: Chi-squared test between each variable with probable depression (CONT.)

Factor	No depression		Probable depression		p-value
	n	(%)	n	(%)	
Respondent's body weight changes after pursuing study					
My body weight has reduced significantly (> 2-3kg)	31	4.5	18	11.1	0.001^a
My body weight has slightly reduced (<2kg)	127	18.4	42	25.9	0.030^a
My body weight did not change.	406	58.8	63	38.9	<0.001^a
My body weight has slightly increased. (<2kg)	99	14.3	23	14.2	0.966 ^a
My body weight has increased significantly (>2-3kg)	18	2.6	12	7.4	0.003^a

Note: a Pearson Chi-squared test

b Fisher's Exact test

* Significant p-value, set at <0.05

On top of that, the respondent's general health condition, previous psychiatry history and ongoing psychiatry treatment also showed a significant association with probable depression with a p-value of <0.001 each. However, factors of on ongoing treatment with lithium and anti-epileptic agent has inadequate sample in which they could not be further analysed for its significance.

In terms of social factors, all the variables studied showed a significant association with probable depression evidenced by p-value of <0.001 for the presence of family conflict, ability to maintain a daily routine, financial condition during study, perception on their eating habits, changes on eating habits; p-value of 0.002 for respondent's opinion on the importance of exercise and changes in physical activity while pursuing study and p-value of <0.001 to 0.030 for body weight changes after pursuing study.

In Table IV, all the significant factors were included in multiple logistic regression to further explore the

form of association with probable depression. The respondent who reported bad and worse in their general health condition had higher odds of developing probable depression in comparison to those reported as having good and excellent health (AOR 2.63 95% CI 1.61-4.30). Similarly, those diagnosed with chronic illnesses that have been categorised under others (thyroid disorders, hypertension, and dyslipidaemia) also showed higher odds of having probable depression (AOR 209.63 95% CI 6.35-6920.31) than those who have no chronic illness. Looking at previous psychiatry history, bipolar disorder showed the highest odds (AOR 32.61 95% CI 3.04-349.57) of developing probable depression, followed by psychosis (AOR 13.75 95% CI 1.18-159.70) and depression (AOR 4.79 95% CI 1.61-14.25) in comparing to the students who does not have any previous history. Surprisingly, anxiety was found to reduce the odds for probable depression by 0.34 (AOR 0.34 95% CI 0.09-0.93) if compared to those without any psychiatric illness.

Table IV: Simple and multiple logistic regression between each variable with probable depression.docx

Factor	Simple Logistic Regression			Multiple Logistic Regression ^a		
	Crude OR	(95% CI)	p-value	AOR	(95% CI)	p-value
Age			0.132			
18-20	1.00	(ref)				
21 -29	1.20	(0.82, 1.77)				
Gender			0.463			
Male	1.00	(ref)				
Female	1.50	(0.51, 4.41)				
Place of stay prior to enrolling in current course			0.013			
Capital City	1.66	(0.94, 2.93)	0.078			
City > 1 million residents	1.49	(0.90, 2.45)	0.118			
City (100000 - 1 million residents)	1.14	(0.58, 2.24)	0.707			
City (20000 - 100000 residents)	2.62	(1.50, 4.58)	<0.001			
City (<20000 residents)	2.05	(1.16, 3.61)	0.013			
Suburban - Rural	1.00	(ref)				
Total number of siblings regardless of place of living			0.295			
0 (I don't have sibling)	1.00	(ref)				
1-3 sibling	2.31	(0.79, 6.76)	0.128			
4 siblings or more	2.30	(0.80, 6.57)	0.121			

CONTINUE

Table IV: Simple and multiple logistic regression between each variable with probable depression.docx (CONT.)

Factor	Simple Logistic Regression			Multiple Logistic Regression ^a		
	Crude OR	(95% CI)	p-value	AOR	(95% CI)	p-value
Number of people living together including respondent at previous place of living			0.654			
1-2 person	1.00	(0.67, 1.47)	0.981			
3-4 person	2.62	(0.93, 7.34)	0.068			
5 person or more	1.00	(ref)				
Number of people living together with respondent during current study period			0.498			
1-2 person	1.20	(0.39, 3.69)	0.746			
3-4 person	1.27	(0.85, 1.89)	0.246			
5 person or more	1.00	(ref)				
Number of close friend(s) who are also a confidante to the respondent			<0.001*			
0-2 person	2.39	(1.34, 4.25)	0.003			
3-4 person	1.25	(0.65, 2.38)	0.506			
5 person or more	1.00	(ref)				
Course			0.277			
Basic Science	1.00	(ref)				
Medicine and Allied Health Science	0.59	(0.32, 1.10)	0.096			
Business and Commerce	0.80	(0.44, 1.45)	0.460			
Teaching, Education and Language	0.78	(0.39, 1.57)	0.490			
Arts and Architecture	0.32	(0.07, 1.49)	0.145			
Others	1.36	(0.46, 4.05)	0.584			
Respondent's general health condition during the past one month			<0.001*			<0.001*
Bad and Worse	15.38	(7.99, 29.61)	<0.001*	2.63	(1.61, 4.30)	<0.001*
Average	4.18	(2.23, 7.86)	<0.001*	0.25	(0.12, 0.53)	<0.001*
Very Good and Excellent	1.00	(ref)		1.00	(ref)	
Presence of chronic illness			0.635			
No	1.30	(0.44, 3.82)				
Yes	1.00	(ref)				
Diagnosis of chronic illness			0.670			0.010*
No	1.00	(ref)		1.00	(ref)	
Asthma	1.07	(0.08, 13.90)	0.958	1.75	(0.02, 191.088)	0.815
Others	1.78	(0.40, 7.87)	0.446	209.63	(6.35, 6920.31)	0.003*
Previous Psychiatric History			<0.001*			
No	1.00	(ref)		1.00	(ref)	
Anxiety	3.20	(2.00, 5.12)	<0.001*	0.29	(0.09, 0.93)	0.038*
Depression	8.58	(4.77, 15.43)	<0.001*	4.79	(1.61, 14.25)	0.005*
Psychosis	6.50	(1.08, 39.22)	0.041*			
Bipolar Disorder	35.84	(4.45, 288.69)	<0.001*	13.75	(1.18, 159.70)	0.036*
Others	16.71	(4.61, 60.61)	<0.001*			
Ongoing Psychiatric Treatment			<0.001*			
No	1.00	(ref)				
Psychotherapy	9.03	(3.04, 26.79)	<0.001*			
Antidepressant	13.49	(3.61, 50.42)	<0.001*			
Antiepileptic agent	13.02	(1.35, 125.98)	0.027*			
Anxiolytics	21.98	(2.55, 189.42)	0.005			

CONTINUE

Table IV: Simple and multiple logistic regression between each variable with probable depression.docx (CONT.)

Factor	Simple Logistic Regression			Multiple Logistic Regression ^a		
	Crude OR	(95% CI)	p-value	AOR	(95% CI)	p-value
Presence of conflict within respondent's family during current study period			<0.001*			<0.001*
Slightly less	1.00	(ref)		1.00	(ref)	
Less	0.43	(0.28, 0.66)	<0.001*	0.34	(0.20, 0.59)	<0.001*
No change	1.44	(0.87, 2.39)	0.157	1.01	(0.53, 1.93)	0.966
More than usual	4.38	(2.17, 8.82)	<0.001*	2.25	(0.90, 5.62)	0.082
A lot of change	14.33	(2.95, 69.74)	<0.001*	4.63	(0.79, 27.01)	0.088
The ability to maintain basic daily routine after pursuing study			<0.001*			
Followed routine	1.00	(ref)				
In general, yes	1.18	(0.53, 2.60)	0.687			
Sometimes, but not always	2.83	(1.31, 6.14)	0.008			
Not at all	8.50	(3.43, 21.61)	<0.001*			
Financial condition during the period of study			<0.001*			
Way easier than before	1.00	(ref)				
Easier	1.81	(0.35, 9.52)	0.479			
About the same	0.81	(0.17, 3.80)	0.787			
More difficult than before	1.16	(0.25, 5.42)	0.850			
Very difficult than before	2.76	(0.57, 13.37)	0.208			
Respondent's opinion on the importance of exercise while pursuing study			0.002*			0.006*
Very important	1.00	(ref)		1.00	(ref)	
Important	0.75	(0.44, 1.28)	0.291	0.46	(0.22, 0.97)	0.040
Average important	1.43	(0.85, 2.38)	0.174	1.28	(0.63, 2.57)	0.498
Slightly important	1.92	(1.08, 3.42)	0.027*	1.24	(0.58, 2.66)	0.581
Not important at all	2.26	(0.72, 7.04)	0.161	0.32	(0.05, 1.86)	0.203
Increment in frequency or intensity of exercise since pursuing study			0.003*			
Increased a lot	1.00	(ref)				
Increased than before	0.44	(0.19, 0.99)	0.048*			
Average	1.03	(0.52, 2.03)	0.941			
Reduced	1.31	(0.64, 2.66)	0.463			
Not at all	1.71	(0.78, 3.74)	0.183			
How far does your physical activity affected since you pursued your study?			<0.001*			<0.001*
Increased a lot	1.00	(ref)		1.00	(ref)	
Slightly increased	0.66	(0.28, 1.53)	0.332	0.63	(0.20, 1.96)	0.422
No change	0.63	(0.28, 1.37)	0.242	0.49	(0.17, 1.46)	0.203
Slightly reduced	0.77	(0.32, 1.87)	0.562	0.33	(0.10, 1.13)	0.077
A lot has reduced	3.78	(1.35, 10.6)	0.012*	5.54	(1.37, 22.37)	0.016*
Did you notice any increase in the amount of food or meal frequency?			<0.001*			0.013*
I ate a lot than usual	2.63	(1.45, 4.75)	0.001*	1.36	(0.74, 2.49)	0.320
I ate slightly more than usual	1.68	(1.05, 2.68)	0.031*	2.36	(1.33, 4.19)	0.003*
No change	0.53	(0.33, 0.84)	0.008*	2.51	(1.17, 5.38)	0.018*
I ate less than usual	1.00	(ref)		1.00	(ref)	

CONTINUE

Table IV: Simple and multiple logistic regression between each variable with probable depression.docx (CONT.)

Factor	Simple Logistic Regression			Multiple Logistic Regression ^a		
	Crude OR	(95% CI)	p-value	AOR	(95% CI)	p-value
Respondent's perception on their eating habit pattern			<0.001*			<0.001*
I ate more healthily	1.00	(ref)		1.00	(ref)	
No change in my food selection and eating habits	2.35	(1.34, 4.10)	0.003*	2.47	(1.22, 5.00)	0.012*
I had bad eating habits	6.35	(3.41, 11.84)	<0.001*	5.03	(2.22, 11.39)	<0.001*
Respondent's body weight changes after pursuing study:						
My body weight has reduced significantly (> 2-3kg)			0.004*			
No	1.00	(ref)				
Yes	2.99	(1.41, 6.34)				
My body weight has slightly reduced (<2kg)			0.966			
No	1.00	(ref)				
Yes	0.99	(0.61, .62)				
My body weight did not change.			<0.001*			
No	1.00	(ref)				
Yes	0.48	(0.32, 0.63)				
My body weight has slightly increased. (<2kg)			0.031*			
No	1.00	(ref)				
Yes	1.55	(1.04, 2.32)				
My body weight has increased significantly (>2-3kg)			0.002*			
No	1.00	(ref)				
Yes	2.66	(1.45, 4.89)				

Note: ^a No multi-collinearity with Hosmer and Lemeshow Test, p-value = 0.572

* Significant p-value, set at <0.05

OR: Odds Ratio; CI: Confidence Interval; AOR: Adjusted Odds Ratio

Among the social factors which are observed to have significantly higher odds of developing probable depression after adjusting the confounding factors are students with increased eating frequency or amount (AOR 2.36 95% CI 1.33-4.19) and reduction in physical activity during the current study period (AOR 5.54 95% CI 1.37-22.37). The students who have a perception that their eating habit was bad have an odd of 5.03 more than those who reported to eat healthily (AOR 5.03 95% CI 2.22-11.39). Those reported exercise was important have lower odds of developing probable depression (AOR 0.46 95% CI 0.22 – 0.97, p-value 0.040). Similarly, students who reported less family conflict have lower odds of developing probable depression (AOR 0.34 95% CI 0.20 – 0.59) compared to those who reported no or more change than usual.

DISCUSSION

The prevalence of probable depression among the participants of this study was 19%. The proportion of probable depression was almost like previous research which looked at depression in those enrolled in medical course; 18.1% (4). If compared to the reference study done by Ngin et al. (32), the proportion of depression stated was higher; 50%. Despite also using the CESD as the assessment tool for depressive symptoms, this Cambodian study looked at more risk factors

for depression such as academic performance and adverse childhood experiences which could possibly contribute to the higher prevalence of depression in the study population. A similar result was reported in another local study by Ariffin et al. (34) which stated probable depression as 60.6%. These could be due to the different sample background and measurement tool used. In the latter study which was conducted in Universiti Putra Malaysia, Ariffin et al reported to have higher male respondent (38.6%) but there was no information on other sociodemographic factors and their association with depression. The study also used different measurement tools; Mental Health Inventory (MHI) which has more descriptive options and captured other mental health conditions such as anxiety and stress at the same time. Whereas, our study used CESD, to look specifically at probable depression.

General health condition, past psychiatry illness, and history of chronic illness were medical factors identified to have a significant association with probable depression. Like a study in Cyprus (12) self-assessed general health condition was a significant associated factor for probable depression. On top of that, previous psychiatry history of depression, psychosis and bipolar and chronic illness were deemed significant as supported by previous local study (35). These findings were expected because physical and mental health

mutually affect one another. Otherwise, ongoing psychiatry treatment was expected to be protective from further exposure to depressive episodes. Surprisingly, anxiety was found to be a protective factor from developing depression (AOD 0.34 95% CI 0.09-0.93) if compared to those without any psychiatric illness. This counterintuitive finding might be explained by preventive behaviours which were commonly reported among those with anxiety, for example adopting more adaptive coping skills, reaching out to social support and utilising mental health resources early (36).

Our study also revealed a significant association between some social factors with probable depression. Among them were student's opinion on the importance of exercise and perception of eating habits, followed by changes in lifestyle factors such as physical activity and eating patterns. Our findings were supported by previous study (37) whereby unhealthy sedentary lifestyles predisposed students to a higher risk of depression. Biologically, exercise enhanced the production of endorphins, which were natural analgesics and mood elevators. It aids to regulate circadian rhythms by influencing the timing of sleep and wakefulness, promoting better sleep quality (38). Whereas, healthy eating habits was important in ensuring our body receive good nutrition and prevent inflammation and oxidative stress from unhealthy food intake (39). Failure to keep up with physical activity and healthy eating habits will post the student at higher risk of developing depression. Thus, these factors should be considered in the development of lifestyle interventions.

Besides, our study reported the presence of family conflict also plays a role in probable depression as supported by oversea and local researches (8, 40). Important life event such as conflict in the family would possibly contribute to the precipitating factor for depression in those with or without other risk factors.

To address the objective of this study, unfortunately regression analysis did not show course as a significant associated factor to probable depression. This might be due to inadequate representation from each sub-category which can be addressed by adopting stratified random sampling across each course offered. Similarly, other demographic factors such as age, gender, residential origin, number of siblings, number of households in previous residence, and number of people living together currently were also insignificant unlike the findings from a previous study which found that female gender and older age to be significant factors for probable depression (4). Rather than age and gender, this may suggest that other factors for depression like the year of study (17), self-esteem and resiliency (41), behavioural disengagement and poor coping skills (42), and academic factors (fear of poor results, workload pressure, and wrong expectations from university and course) (43) are more influential in this population. Cultural factors may influence the presentation of depression and how it is reported. In some culture where stigma about mental

illness is still high, a depressed person would commonly present with somatic symptoms. This is viewed as a more valid reason to visit the doctor and depressive disorder might be misdiagnosed as a medical condition at the beginning (44). Hence, this could diminish the apparent role of demographics as well as the low prevalence of depression compared to studies done elsewhere.

Surprisingly, in contrast to research done by Mohd Ranizal et al. (35) the factor on number of close friends who were also confidante to the respondent did not show significant association after being adjusted for its odd ratio. These could be contributed by other factors such as different support system and cultural background. In our study, 63.1% of the respondents were from urban areas, where they were often raised to be independent from young due to their parents' demanding work schedules and the pressures of city life. This environment had culturally programmed them to internalize their emotions and expected to develop a high degree of resilience in the face of life's challenges. Though, we were expecting to report students originating from urban area to have significant association with depression (45), other factors not studied here such as duration of living in the area, coping mechanism and resilience may play a role in the final analysis which resulted in the factor not showing significant association with probable depression. Students might utilise their social networks differently or have varying definitions of confidantes. Support network in collectivist societies like Malaysia may be different compared to individualist ones. Family-based support system was found to be more important in collectivist societies based on previous study (46). This could be protective from depression even when peer support is lacking.

However, factor on the inability to perform daily routines was reported to be insignificant in our study contradicting to study done by Perveen et al. (23). Previous literature found that inability to follow routine can lead to a sense of helplessness and decreased self-efficacy. Chronic stress from the inability to manage daily routines can lead to hypothalamic-pituitary-adrenal axis dysregulation, contributing to elevated cortisol levels and a heightened stress response (47). Regardless, having to go through daily routine without understanding the purpose of life may lead to feeling of boredom or worse, causing existential crisis. If compared to depression, boredom was transient and caused by lack of engagement and excitement whereas existential crisis might be episodic or situational and involves deep self-reflection and questioning about purpose of life (48). Depression on the other hand, was more pervasive, accompanied by sense of worthlessness and biological symptoms such as sleep and appetite disturbances. Depression, boredom, and existential crisis if left unaddressed may lead to the person abandoning his or her daily routine especially when pursuing tertiary study is not the main interest. Further assessment is needed to determine the reason

to this factor before concluding it is due to depression. Hence, the factor of inability to perform daily routine in our study was considered as a confounding factor after being analysed in multiple logistic regression rather than a significant associated factor to depression.

Our study acknowledged several strengths and limitations. The respondents used in this study comprised of students from different faculties within a public Malaysian university. This large public university offers various courses and accepts students from all over Malaysia which makes it feasible to get a large homogenous sample size. The benefits of the large sample size used in this study reduces the occurrence of Type II error and subsequently minimising false positive result.

However, the scarcity of some of the factors studied, such as past psychiatry history and ongoing psychiatry treatment, made the regression analysis impossible due to the small observed data for each sub-category. For instance, the ongoing treatment with antipsychotics and lithium is less than 2. Hence it cannot be statistically analysed into the regression model. Besides that, this cross-sectional data may not indicate as strong causal relationship between the factors of interest and probable depression as in cohort study.

The limitation of our study lies in the uneven representation of gender. The selection bias because of consecutive sampling was evident when the respondents were mostly females. This was likely because the study was conducted in the year the COVID-19 Movement Control Order ended. The higher psychological awareness and health-seeking behaviour among female students caused over-presentation of this group in the study (49). Alternatively, the study could be improved using more systematic sampling methods such as multi-centre stratified random sampling to ensure more generalisability between the genders.

Although our study used an online self-report questionnaire, we recognize the importance of incorporating clinical assessments to confirm the presence of depression. For future development in this area, it is essential to conduct a longitudinal research design incorporating randomised sampling method, in-depth clinical assessment, and more diverse sample of participants to enhance our understanding of the risk factors associated with depression among Malaysian university students.

CONCLUSION

The high prevalence of probable depression indicates that universities should actively educate the students, academicians, and staff about it as a form of primary prevention. Regular mental health workshops, talks,

and screening programs could be conducted in collaboration with mental health professionals. While it is unfeasible to have a specific on-campus mental health clinic due to limited human and financial resources, continuous medical education sessions among the medical practitioners of the university health centres should include topics on common mental health conditions seen among students to ensure early detection, management and referrals for complex cases are made promptly. Integrating mental health modules throughout their course that cover basic knowledge about the common illnesses and empower them with self-help skills such as stress management, coping, mindfulness, problem-solving, time management, and organizational skills may be beneficial to maintain their mental well-being. Both the modules and awareness programs should strongly emphasize mental illness as a medical condition. Skill-training programs are more effective in alleviating symptoms of depression, anxiety, and psychological distress. Potential barriers such as lack of awareness and stigma related to mental health issues which could lead to resistance in seeking professional help and limited human and financial resources could be overcome by continuous on-campus mental health programs which are led by students in collaboration with mental health professionals from hospitals or relevant non-governmental organizations. Limited financial and human resources could be addressed by utilization of available technologies and online platforms. The university at present has developed a free mental health massive open online course (MOOC) for this purpose and it is a compulsory course for students to complete. Students should be encouraged and assisted to seek professional help through university health centres. Information regarding on-campus mental health services and supports should be disseminated and updated regularly to students via university's official website, social media platforms, and e-mail. Pathway and access to mental health services should be simplified by working closely with relevant nearby hospitals. Gate-keepers training programs involving those who are in regular contact with the students could provide knowledge and skills for early recognition and intervention for those experiencing mental health crisis. At-Risk for University Faculty, At-Risk for College Students, and Mental Health First Aid are examples of online training programs available for gate-keepers.

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