ORIGINAL ARTICLE

Physiological Response and Impact of COVID-19 Pandemic among Malaysian Citizens: A Cross-sectional Study

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ABSTRACT

Introduction: Studies have shown that staying at home for prolonged periods of crisis can pose a significant challenge to individuals and affect their mental health. Hence, this study was conducted to identify the susceptible subgroups among Malaysian citizens that are prone to mental health problems during the lockdown period of the COVID-19 pandemic and its association with sociodemographic factors. **Methods:** The mental health status was assessed using the Depression, Anxiety, and Stress Scale -21 (DASS-21) questionnaire. The survey link was distributed online between October and December 2020. **Results:** Of 637 respondents, one-third experienced mild to extremely severe depression and anxiety (31.1% and 35.1%, respectively). Female respondents (odds ratio = 1.516, 95% confidence interval (CI) 1.057-2.172) were 1.5 times more likely to experience mild to severe depression than male respondents. Unmarried and divorced respondents were 2.1 times more prone to experience mild to severe depression than married respondents. A significant association was also found between employment status and age with depression symptoms among the respondents. For anxiety, a significant association was observed between the age group with mild to severe anxiety symptoms. Marital status, age, and employment status were socio-demographic factors significantly impacting stress levels. **Conclusion:** According to our findings, females, individuals aged 18-30 years old, students, unmarried and divorced respondents were more susceptible to mental health problems, suggesting that mental health support shall also be provided for these vulnerable groups during the COVID-19 crisis.
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INTRODUCTION

Coronavirus 2019 disease (COVID-19) has recently resulted in 129 million and 2.83 million cases and deaths worldwide, respectively [1], with a 15-fold increased risk of death found in patients over 50 years of age [2]. In line with the global COVID-19 cases, Malaysia accounts for 345,500 cases and 1272 deaths, as reported by the Ministry of Health Malaysia [1]. To flatten the epidemiological curve of the COVID-19 outbreak, the Malaysian government implemented quarantine regulations issued as 'Movement Control Order (MCO)' on 18th March 2020. During this period, Malaysian citizens are requested to stay home, keep physical distance, and commute within 10 km of their living area. Only several services, such as food, energy, communication, and healthcare, can operate. Interstate travel was banned, and borders were closed effectively [3]. The public is forced to keep their social distance and conduct home isolation. In addition, all normal operations activities in schools and businesses were halted to reduce disease transmission. Consequently, near zero incidence of local transmissions of COVID-19 cases was achieved during the first MCO implementation due to the strict measures taken by the Malaysian government [4].

However, staying at home for prolonged periods during the crisis can pose a significant challenge for individuals, affecting their mental health [5]. The

situation involving employee retrenchment and the closure of businesses, schools, and restaurants has also resulted in significant mental health problems worldwide [6]. The majority of them suffer from anxiety, stress, and confusion, with longer durations of seclusion worsening these effects [5]. A study found that the incidence of mental health problems was 8.4% higher after the implementation of the lockdown, with a higher incidence of psychological problems observed among adolescents, women, and those living with young children during the pandemic in the United Kingdom [7].

Several studies conducted during the lockdown suggest that mental health issues have arisen since the beginning of the pandemic [8,9]. It has been found that 45% to 62% of participants from the Middle East/ North Africa (MENA) region felt helpless and nervous due to COVID-19. The study was conducted among the general population in the MENA region, with higher psychological distress found among female participants [8]. Studies found that women are prone to get stressed and feel anxiety compared to men, especially in the aftermath of stressful conditions [10,11]. Lai et al. [12] reported that 50% of healthcare workers in China experienced depression, while three-quarters and one-third of them suffered from stress and sleeping disorders like insomnia, respectively, during the COVID-19 pandemic.

It is reported that 36% of people felt lonely during the pandemic due to home quarantine and separation from loved ones [13], which is highly associated with mental health [14]. Besides, it is important to note that pandemics also have a profound impact on underprivileged and vulnerable communities, especially those with severe mental illnesses. People having severe mental health conditions are susceptible to relapse due to worry and anxiety caused by loss of employment and interventions [15]. The younger populations, such as adolescents and teenagers, also face many challenges, including concern about the current quarantine, future careers, and the impact of deferred graduation [16]. Due to the sudden national lockdown, students living on campus in Malaysian universities were stranded in their colleges for months.

In reviewing the literature, evidence revealed that prolonged stay at home has significantly increased mental health problems, particularly during the COVID-19 outbreak [5,7]. This unforeseen event has affected the Malaysian population, whereby approximately 4.2 million (29%) of them had mental illness [17] just before COVID-19. Hence, our present study was conducted to identify the susceptible subgroups among Malaysian citizens that are prone to mental health problems during the lockdown period of the COVID-19 pandemic. The association of mental health outcomes with sociodemographic factors was also evaluated in this study.

MATERIALS AND METHODS

Ethics approval and study design

Our study has obtained ethics approval from Universiti Putra (JKEUPM-2020-184). A cross-sectional study using a convenient sampling technique was conducted between October and December 2020. An anonymous and confidential internet-based Google form survey was distributed to volunteer respondents after they signed a consent form and declarations of anonymity and confidentiality prior to participation on the first page of the questionnaire. The survey link was distributed online to numerous social media platforms such as Facebook, WhatsApp, and Twitter. Malaysian citizens above 18 years old and at their current residence during the MCO were eligible to participate in this study. Adult male and female respondents were recruited from all 13 states and three federal territories in Malaysia. We excluded participation from this group: frontliners such as healthcare workers, police, army, dispatchers of goods/food, COVID-19-positive patients, individuals who have been or are being quarantined, and a person under investigation (PUI) (Fig. 1). To represent the Malaysian population, we used the purposive sampling technique and obtained the respondents from each state and federal territory. The obtained respondents were then grouped based on the regional area in Malaysia, namely the Northern (Perlis, Kedah, Perak, Penang), Central (Wilayah Persekutuan Kuala Lumpur, Selangor, Negeri Sembilan,

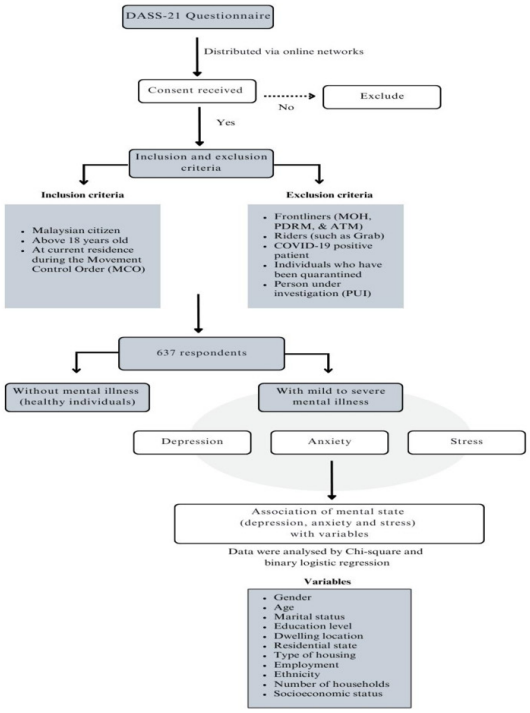

Fig. 1 : Flowchart on the study design, inclusion, and exclusion criteria used in this study.

Putrajaya), East Coast (Terengganu, Kelantan, Pahang), Southern (Melaka, Johor) and Borneo region (Sabah, Sarawak, Wilayah Persekutuan Labuan).

Sample size

The required sample size for this cross-sectional study was calculated as previously described [18]. Considering the recent study reported that 29% of the adult Malaysian population was diagnosed with mental disorders [19], the sample size was calculated based on the following formula with 10% of the non-responding rate:

$$\text{Sample size} = \frac{1.96^2 \times p(1-p)}{d^2}$$

P = Expected proportion of mental health disorders based on a previous study (29%).
d = 5% of margin error (0.05).
The total required sample size for our study is 348 respondents (with a 10% non-responding rate).

Study instrument and data collection

The questions in the survey questionnaire were presented in Bahasa Malaysia in the survey link. The survey questionnaire comprised three sections: Sections A, B, and C. Section A collected the demographic and socioeconomic data. In section B, questions related to the respondent's current physical health and mental health with a history of chronic illness were asked. In section C, close-ended questions using DASS-21 were used to collect information on the impacts of COVID-19 on their mental health. DASS-21 has 21 items and three scales with seven items related to depression, anxiety, and stress. This instrument is a version translated from English into Bahasa Malaysia and was adopted from Ramli et al. [20]. The DASS questions were classified into three categories: 3, 5, 10, 13, 16, 17, and 21 assessed depressions; 2, 4, 7, 9, 15, 19, and 20 assessed anxieties; and 1, 6, 8, 11, 12, 14, and 18 assessed stress [21]. The following scoring scale was used to analyse the obtained finding: (a) depression: normal (0-4), mild (5-6), moderate (7-10), severe (11-13), and extremely severe (14 and above); (b) anxiety: normal (0-3), mild (4-5), moderate (6-7), severe (8-9) and extremely severe (10 and above); and c) stress: normal (0-7), mild (8-9), moderate (10-12), severe (13-16) and extremely severe (17 and above).

Data analysis

All data were analysed by descriptive analysis and presented as mean, percentage, and frequency using Statistical Package for Social Sciences (SPSS) v29. Prior to data analysis, the obtained data were categorised into (1) respondents with mild to severe depression/anxiety/stress and (2) respondents without depression/anxiety/stress. Then, the association between demographic factors and psychological responses during the COVID-19 outbreak among the Malaysian population was analysed using chi-square tests and binary logistic regression models. The strength of the association between mental health disorders with the sociodemographic variables was quantified using the non-adjusted odds ratio (OR). A p-value of less than 0.05 is considered significant.

RESULTS

We obtained 637 respondents, two-thirds of whom were female (63.6%), with a mean age of 38.19 ±0.42 years between 31 and 60 years (73.6%) (Table I). The majority of respondents belong to Malay ethnicity (92.3%), with two-thirds being married couples (69.2%), belonged to the B40 income group (< MYR4, 360) (59.3%), and were from the Central region (62.5%) such as Wilayah Persekutuan Kuala Lumpur, Negeri Sembilan, and Putrajaya. It is notable that about three-quarters of the respondents live in low-rise dwellings (78.3%) (such as terraced houses, townhouses, semi-detached houses, traditional village houses, etc.), in urban areas (71.6%) with three to five households per house (52.6%). Almost all of them (91.8%) did not have any chronic illnesses and perceived their overall mental health as good (97.6%) and were not taking medication for mental illness (98.7%).

Our findings revealed that one-third of the respondents experienced mild to extremely severe depression and anxiety (31.1% and 35.1%, respectively) (Fig. 2). We also found that 18% of the respondents experienced mild to extremely severe stress symptoms. The summary of respondents with mental health symptoms, including depression, anxiety, and stress, together with the associated sociodemographic factors, is shown in Tables II, III, and IV. Our findings revealed that female respondents (OR = 1.516, 95% CI 1.057-2.172) were 1.5 times more likely to experience mild to severe depressive disorder than male respondents (Table II). Respondents in the 18-30 age group were significantly more likely to experience mild to severe depression than those in the other age groups (31-60 and 61 years and older). Notably, unmarried and divorced respondents (OR = 2.107 CI 1.478-3.004) were 2.1 times more likely to have mild to severe depressive symptoms compared to married respondents. We also found a significant association between employment status and respondents' depression symptoms during the COVID-19 outbreak within the study period. Students (OR= 2.014, 95% CI 1.183-3.430) were two times more likely to experience mild to severe depressive symptoms compared to employed ones, with unemployed respondents less likely to experience depressive symptoms.

For anxiety, we observed a significant association between the age group with mild to severe anxiety symptoms (X2:10.835p=0.004) (Table III). Similarly,

Table I : Characteristics of the study population

Characteristics	Total, n (%)
Total study population	637
Gender	
Female	405 (63.6)
Male	232 (36.4)
Age (years old)	Mean = 38.19 ±0.42
18-30	137 (21.5)
31-60	469 (73.6)
61 and above	31 (4.9)
Marital status	
Single/Divorced	196 (30.8)
Married	441 (69.2)
Education level	
Secondary school	94 (14.8)
Diploma or equivalent	149 (23.4)
Bachelor's degree and higher	394 (61.9)
Dwelling location	
Urban	456 (71.6)
Rural	181 (28.4)
Residential state (during MCO)	
Northern region	80 (12.6)
East Coast region	87 (13.7)
Southern region	36 (5.7)
Borneo	36 (5.7)
Central	398 (62.5)
Type of housing	
High rise	138 (21.7)
Low rise	499 (78.3)
Employment	
Employed	484 (76.0)
Unemployed	90 (14.1)
Student	63 (9.9)
Ethnicity	
Malay	588 (92.3)
Non-Malay	49 (7.7)
Number of households	Mean= 4.96±0.094
1 – 2	80 (12.6)
3 – 5	335 (52.6)
6 and above	222 (34.9)
Socioeconomic status	
RM 4, 360 and below per month (B40)	378 (59.3)
Between RM4, 361 - RM 9, 619 (M40)	230 (36.1)
RM 9, 620 and above (T20)[3]	29 (4.6)
Any chronic illness?	
Yes	52 (8.2)
No	585 (91.8)
Diagnosed with mental health-related illness?	
Yes	15 (2.4)
No	622 (97.6)
Received treatment for mental health-related illness?	
Yes	8 (1.3)
No	629 (98.7)

The state of respondents was divided into the Northern region (Perlis, Kedah, Perak, Penang), Central (Wilayah Persekutuan Kuala Lumpur, Selangor, Negeri Sembilan, Putrajaya), East coast (Terengganu, Kelantan, Pahang), Southern (Melaka, Johor) and Borneo (Sabah, Sarawak, Wilayah Persekutuan Labuan). Three categories of income groups: [1]Top 20% (T20), [2]Middle 40% (M40), [3]Bottom 40% (B40) in Malaysia. Abbreviation: MCO, Movement control order.

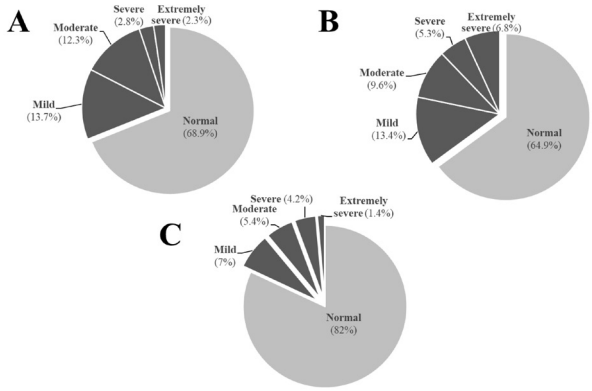

Fig. 2 : The prevalence of (A) depression, (B) anxiety, and (C) stress among Malaysian citizens during the COVID-19 pandemic based on DASS-21.

respondents from the 18-30-year-old group were more likely to experience mild to severe anxiety symptoms. As for stress, sociodemographic factors such as marital status, age, and employment status were among the variables that showed significant factors ($p< 0.05$) that contribute to mild to severe stress among the respondents in this study (Table IV). Our findings revealed that younger individuals between 18-30 years old, and single and divorced (OR=1.928 CI 1.271-2.926) were likely to experience mild to severe stress symptoms. Similar to depression, our findings also revealed that students are 2.3 times more likely to experience mild to severe stress during the COVID-19 outbreak than employed ones. Interestingly, our results show that number of occupancies in home residents is not associated with depression, anxiety, and stress symptoms during the period of stay-at-home (MCO).

DISCUSSION

Mental illness is a major global health problem affecting 4.2 million Malaysian population [17] and the lockdown during COVID-19 has resulted in the rise of mental health issues [5,7,8,9,12]. Our findings revealed that 18.0% to 35.1% of the respondents were more likely to experience mild to severe mental illness. The proportion of respondents with mild-to-severe mental illness in our study was higher than the World Health Organization (WHO) prevalence of 10% to 20% [20]. Our respondents also showed a high prevalence of anxiety symptoms (Fig. 2). The present study suggests that Malaysian citizens demonstrated a greater tendency to anxiety disorders over the course of the ongoing pandemic. Our findings aligned with a study conducted in China, with 23.8% and 19.2% reported having anxiety and depression during the COVID-19 lockdown [23]. Anxiety represents the most prevalent psychological disorder and is closely linked to the

Table II : Coping responses and factors associated with depression among the study population during COVID-19

Characteristics	n (%)		Chi-square			Logistic regression	
	Without depression	With mild to severe depression	*Df*	X^2	*P* value	*Non-adjusted OR* (95% CI)	*P* value
Total study respondents	440	197					
Gender							
Female	267 (65.9)	138 (34.1)	1	5.158	0.023	1.516 (1.057-2.172)	0.024
Male	173 (74.6)	59 (25.4)				Ref	
Age (years old)							
18-30	82 (59.9)	55 (40.1)	2	12.368	0.002	Ref	0.004
31-60	330 (70.4)	139 (29.6)				0.628 (0.423-0.932)	0.021
61 and above	28 (90.3)	3 (9.7)				0.160 (0.046-0.551)	0.004
Marital status							
Single/Divorced	113 (57.7)	83 (42.3)	1	17.286	0.001	2.107 (1.478-3.004)	0.001
Married	327 (74.1)	114 (25.9)				Ref	
Education level							
Secondary school	69 (73.4)	25 (26.6)	2	5.470	0.065	0.695 (0.421-1.149)	0.156
Diploma or equivalent	112 (75.2)	37 (24.8)				0.634 (0.414-0.970)	0.036
Bachelor's degree and higher	259 (65.7)	135 (34.3)				Ref	0.066
Dwelling location							
Urban	318 (69.7)	138 (30.3)	1	0.330	0.565	Ref	0.566
Rural	122 (67.4)	59 (32.6)				1.114 (0.770-1.613)	
Residential state (during MCO)							
Northern region	59 (73.8)	21 (26.2)	4	1.793	0.774	0.751 (0.437-1.289)	0.299
East Coast region	60 (69.0)	27 (31.0)				0.949 (0.575-1.566)	0.838
Southern region	24 (66.7)	12 (33.3)				1.055 (0.511-2.176)	0.885
Borneo	27 (75.0)	9 (25.0)				0.703 (0.321-1.539)	0.378
Central	270 (67.8)	128 (32.2)				Ref	0.775
Type of housing							
High rise	90 (65.2)	48 (34.8)	1	1.226	0.268	1.253 (0.840-1.868)	0.269
Low rise	350 (70.1)	149 (29.9)				Ref	
Employment							
Employed	340 (70.2)	144 (29.8)	2	7.806	0.020	Ref	0.023
Unemployed	66 (73.3)	24 (26.7)				0.859 (0.518-1.424)	0.555
Student	34 (54.0)	29 (46.0)				2.014 (1.183-3.430)	0.010
Ethnicity							
Malay	410 (69.7)	178 (30.3)	1	1.531	0.216	Ref	
Non-Malay	30 (61.2)	19 (38.8)				1.459 (0.800-2.661)	0.218
Number of households							
1 – 2	48 (60.0)	32 (40.0)	2	3.794	0.150	1.683 (0.986-2.870)	0.056
3 – 5	233 (69.6)	102 (30.4)				1.105 (0.761-1.605)	0.601
6 and above	159 (71.6)	63 (28.3)				Ref	0.153
Socioeconomic status							
RM 4, 360 and below per month (B40)	263 (69.6)	115 (30.4)	2	0.975	0.614	Ref	0.616
Between RM4, 361 - RM 9, 619 (M40)	155 (67.4)	75 (32.6)				1.107 (0.778-1.574)	0.573
RM 9, 620 and above (T20)[3]	22 (75.9)	7 (24.1)				0.728 (0.302-1.751)	0.478
Any chronic illness?							
Yes	41 (78.8)	11 (21.2)	1	2.531	0.112	0.576 (0.289-1.145)	0.115
No	399 (68.2)	186 (31.8)				Ref	
Diagnosed with mental health-related illness?							
Yes	6 (40.0)	9 (60.0)	1	6.079	0.014	3.463 (1.215-9.866)	0.020
No	434 (69.8)	188 (30.2)				Ref	
Received treatment for mental health-related illness?							
Yes	3 (37.5)	5 (62.5)	1	3.781	0.052	3.793 (0.898-16.033)	0.070
No	437 (69.5)	192 (30.5)				Ref	

The state of respondents was divided into the Northern region (Perlis, Kedah, Perak, Penang), Central (Wilayah Persekutuan Kuala Lumpur, Selangor, Negeri Sembilan, Putrajaya), East coast (Terengganu, Kelantan, Pahang), Southern (Melaka, Johor) and Borneo (Sabah, Sarawak, Wilayah Persekutuan Labuan). Three categories of income groups: [1]Top 20% (T20), [2]Middle 40% (M40), [3]Bottom 40% (B40) in Malaysia.
Abbreviation: *Df*, Degree of freedom; Ref, Reference category; OR, Odds ratio, CI, Confidence interval, MCO, Movement control order.
Data in the bracket indicates frequency (% of frequency), whereby the % of frequency is calculated based on the total n for each subgroup in Table I.

Table III : Coping responses and factors associated with anxiety among the study population during COVID-19

Characteristics	n (%)		Chi-square			Logistic regression	
	Without anxiety	With mild to severe anxiety	*Df*	X^2	*P* value	*Non-adjusted OR* (95% CI)	*P* value
Total study respondents	415	222					
Gender							
Female	253 (62.5)	152 (37.5)	1	3.518	0.061	1.390 (0.985-1.963)	0.061
Male	162 (69.8)	70 (30.2)				Ref	
Age (years old)							
18-30	78 (56.9)	59 (43.1)	2	10.835	0.004	Ref	0.007
31-60	310 (66.1)	159 (33.9)				0.678 (0.460-1.000)	0.050
61 and above	27 (87.1)	4 (12.9)				0.196 (0.065-0.590)	0.004
Marital status							
Single/Divorced	118 (60.2)	78 (39.8)	1	3.049	0.081	1.363 (0.962-1.932)	0.081
Married	297 (67.3)	144 (32.7)				Ref	
Education level							
Secondary school	65 (69.1)	29 (30.9)	2	1.779	0.411	0.766 (0.473-1.242)	0.280
Diploma or equivalent	101 (67.8)	48 (32.2)				0.816 (0.547-1.217)	0.319
Bachelor's degree and higher	249 (63.2)	145 (36.8)				Ref	0.412
Dwelling location							
Urban	293 (64.3)	163 (35.7)	1	0.566	0.452	Ref	
Rural	122 (67.4)	59 (32.6)				0.869 (0.603-1.252)	0.452
Residential state (during MCO)							
Northern region	55 (68.8)	25 (31.2)	4	11.075	0.026	0.752 (0.449-1.257)	0.276
East Coast region	68 (78.2)	19 (21.8)				0.462 (0.267-0.799)	0.006
Southern region	19 (52.8)	17 (47.2)				1.479 (0.746-2.935)	0.263
Borneo	25 (69.4)	11 (30.6)				0.727 (0.348-1.521)	0.398
Central	248 (62.3)	150 (37.7)				Ref	0.029
Type of housing							
High rise	86 (62.3)	52 (37.7)	1	0.622	0.430	1.170 (0.792-1.730)	0.431
Low rise	329 (65.9)	170 (34.1)				Ref	
Employment							
Employed	315 (65.1)	169 (34.9)	2	3.189	0.203	Ref	0.206
Unemployed	64 (71.1)	26 (28.9)				0.757 (0.463-1.239)	0.269
Student	36 (57.1)	27 (42.9)				1.398 (0.821-2.382)	0.218
Ethnicity							
Malay	385 (65.5)	203 (34.5)	1	0.360	0.548	Ref	
Non-Malay	30 (61.2)	19 (38.8)				1.201 (0.660-2.187)	0.549
Number of households							
1 – 2	47 (58.8)	33 (41.2)	2	2.268	0.322	1.493 (0.882-2.529)	0.136
3 – 5	217 (64.8)	118 (35.2)				1.156 (0.807-1.658)	0.429
6 and above	151 (68.0)	71 (32.0)				Ref	0.323

Table III : Coping responses and factors associated with anxiety among the study population during COVID-19 (Conitnued)

Characteristics	n (%)		Chi-square			Logistic regression	
	Without anxiety	With mild to severe anxiety	*Df*	X^2	*P* value	*Non-adjusted OR* (95% CI)	*P* value
Total study respondents	415	222					
Socioeconomic status							
RM 4, 360 and below per month (B40)	248 (65.6)	130 (34.4)	2	0.102	0.950	Ref	0.950
Between RM4, 361 - RM 9, 619 (M40)	148 (64.3)	82 (35.7)				1.057 (0.750-1.490)	0.752
RM 9, 620 and above (T20)[3]	19 (65.5)	10 (34.5)				1.004 (0.454-2.222)	0.992
Any chronic illness?							
Yes	34 (65.4)	18 (34.6)	1	0.001	0.970	0.989 (0.545-1.795)	0.970
No	381 (65.1)	204 (34.9)				Ref	
Diagnosed with mental health-related illness?							
Yes	1 (6.7)	14 (93.3)	1	23.140	0.001	27.865 (3.639-213.36)	0.001
No	414 (66.6)	208 (33.4)				Ref	
Received treatment for mental health-related illness?							
Yes	0 (0.0)	8 (100)	1	15.145	0.001	3132813363 (0.000)	0.999
No	415 (66.0)	214 (34.0)				Ref	

The state of respondents was divided into the Northern region (Perlis, Kedah, Perak, Penang), Central (Wilayah Persekutuan Kuala Lumpur, Selangor, Negeri Sembilan, Putrajaya), East coast (Terengganu, Kelantan, Pahang), Southern (Melaka, Johor) and Borneo (Sabah, Sarawak, Wilayah Persekutuan Labuan).
Three categories of income groups: [1]Top 20% (T20), [2]Middle 40% (M40), [3]Bottom 40% (B40) in Malaysia.
Abbreviation: *Df*, Degree of freedom; Ref, Reference category; OR, Odds ratio, CI, Confidence interval, MCO, Movement control order.

Table IV : Coping responses and factors associated with stress among the study population during COVID-19

Characteristics	n (%)		Chi-square			Logistic regression	
	Without stress	With mild to severe stress	*Df*	X^2	*P* value	*Non-adjusted OR* (95% CI)	*P* value
Total study respondents	523	114					
Gender							
Female	324 (80.0)	81 (20.0)	1	3.349	0.067	1.508 (0.969-2.345)	0.068
Male	199 (85.8)	33 (14.2)				Ref	
Age (years old)							
18-30	100 (73.0)	37 (27.0)	2	11.661	0.003	Ref	0.004
31-60	394 (84.0)	75 (16.0)				0.514 (0.328-0.807)	0.004
61 and above	29 (93.5)	2 (6.5)				0.186 (0.042-0.820)	0.026
Marital status							
Single/Divorced	147 (75.0)	49 (25.0)	1	9.723	0.002	1.928 (1.271-2.926)	0.002
Married	376 (85.3)	65 (14.7)				Ref	
Education level							
Secondary school	84 (89.4)	10 (10.6)	2	4.102	0.129	0.490 (0.243-0.988)	0.046
Diploma or equivalent	122 (81.9)	27 (18.1)				0.911 (0.561-1.481)	0.707
Bachelor's degree and higher	317 (80.5)	77 (19.5)				Ref	0.137
Dwelling location							
Urban	376 (82.5)	80 (17.5)	1	0.136	0.713	Ref	0.713
Rural	147 (81.2)	34 (18.8)				1.087 (0.697-1.695)	
Residential state (during MCO)							
Northern region	67 (83.8)	13 (16.2)	4	7.084	0.131	0.783 (0.412-1.490)	0.457
East Coast region	77 (88.5)	10 (11.5)				0.524 (0.260-1.060)	0.072
Southern region	27 (75.0)	9 (25.0)				1.346 (0.609-2.976)	0.463
Borneo	33 (91.7)	3 (8.3)				0.367 (0.110-1.228)	0.104
Central	319 (80.2)	79 (19.8)				Ref	0.147

Table IV : Coping responses and factors associated with stress among the study population during COVID-19 (Continued)

Characteristics	n (%)		Chi-square			Logistic regression	
	Without stress	With mild to severe stress	*Df*	X^2	*P* value	*Non-adjusted OR* (95% CI)	*P* value
Total study respondents	523	114					
Type of housing							
High rise	107 (77.5)	31 (22.5)	1	2.501	0.114	1.452 (0.913-2.310)	0.115
Low rise	416 (83.4)	83 (16.6)				Ref	
Employment							
Employed	403 (83.3)	81 (16.7)	2	9.398	0.009	Ref	0.011
Unemployed	77 (85.6)	13 (14.4)				0.840 (0.445-1.584)	0.590
Student	43 (68.3)	20 (31.7)				2.314 (1.293-4.140)	0.005
Ethnicity							
Malay	485 (82.5)	103 (17.5)	1	0.749	0.387	Ref	0.388
Non-Malay	38 (77.6)	11 (22.4)				0.734 (0.363-1.483)	
Number of households							
1 – 2	64 (80.0)	16 (20.0)	2	0.753	0.686	1.292 (0.672-2.484)	0.443
3 – 5	273 (81.5)	62 (18.5)				1.173 (0.747-1.842)	0.487
6 and above	186 (83.8)	36 (16.2)				Ref	0.687
Socioeconomic status							
RM 4, 360 and below per month (B40)	309 (81.7)	69 (18.3)	2	0.081	0.960	Ref	0.960
Between RM4, 361 - RM 9, 619 (M40)	190 (82.6)	40 (17.4)				0.943 (0.614-1.448)	0.788
RM 9, 620 and above (T20)3	24 (82.8)	5 (17.2)				0.933 (0.344-2.532)	0.892
Any chronic illness?							
Yes	42 (80.8)	10 (19.2)	1	0.069	0.793	1.101 (0.535-2.266)	0.793
No	481 (82.2)	104 (17.8)				Ref	
Diagnosed with mental health-related illness?							
Yes	6 (40.0)	9 (60.0)	1	18.533	0.001	7.386 (2.574-21.192)	0.001
No	517 (83.1)	105 (16.9)				Ref	
Received treatment for mental health-related illness?							
Yes	2 (25.0)	6 (75.0)	1	17.980	0.001	14.472 (2.882-72.668)	0.001
No	521 (82.8)	108 (17.2)				Ref	

The state of respondents was divided into the Northern region (Perlis, Kedah, Perak, Penang), Central (Wilayah Persekutuan Kuala Lumpur, Selangor, Negeri Sembilan, Putrajaya), East coast (Terengganu, Kelantan, Pahang), Southern (Melaka, Johor) and Borneo (Sabah, Sarawak, Wilayah Persekutuan Labuan).
Three categories of income groups: [1]Top 20% (T20), [2]Middle 40% (M40), [3]Bottom 40% (B40) in Malaysia.
Abbreviation: *Df*, Degree of freedom; Ref, Reference category; OR, Odds ratio, CI, Confidence interval, MCO, Movement control order.
Data in the bracket indicates frequency (% of frequency), whereby the % of frequency is calculated based on the total n for each subgroup in Table I.

worldwide burden of disease [24].

Our findings revealed that 31.1% of the respondents experienced a depressive state during the MCO implementation (Fig. 2), which aligns with Yee et al. [25]. They reported that 28.2% of the respondents experienced mild-to-severe depression. This also agreed with findings reported by Wang et al. [26], with 30% of the total respondents from 19 countries worldwide (288,830 respondents) experiencing depression during the COVID-19 pandemic. From the present study, stress is the least prevalent mental health observed among the respondents, with 18% of the individuals observed to experience mild to severe stress. A similar finding was reported by Wong et al. [27], whereby the study respondents perceived the lowest prevalence of stress (12.5%) compared with depression (21.3%) and anxiety (28.6%). Even though individuals are less likely to be stressed, stress is still considered one of the most crucial risk factors contributing to mental illness [28].

The DASS-21 is a well-established questionnaire to evaluate mental health in non-clinical [29] and clinical [30] conditions of adult populations. It has been developed in Australia, applied in different socio-cultural contexts, and translated into different languages such as Korean [31] and Spanish [32]. In order to get the closest and most accurate picture of Malaysian mental health status during the pandemic, the DASS inventory was selected. This inventory has also been used by the Mental Health Psychosocial Support Services (MHPSS) unit, Ministry of Health (MOH) Malaysia, as a guideline

for early assessment of mental health and psychosocial well-being during the pandemic [33]. Alternatively, instruments such as Generalized Anxiety Disorder-7 (GAD-7) and Patient Health Questionnaire-8 (PHQ-8) can also be used with different objectives and tested variables. PHQ-8 is an assessment used to investigate the presence and severity of depressive disorder. In contrast, the GAD-7 is a seven-item scale that assesses generalised anxiety symptoms [34].

Our present study also assessed the association of sociodemographic factors with mental health among Malaysian citizens. The findings indicate that female respondents are at a significantly higher risk of experiencing mild to severe depression symptoms than their male counterparts. The present study found no significant correlation between the respondents' gender and their anxiety and stress levels. The observed gender disparity in mental distress is a well-documented phenomenon, as evidenced by numerous studies [35,36], indicating a higher prevalence of such conditions among females than males. A prior investigation has indicated that females are more likely to encounter mental distress than males due to their inadequate ability to manage stressful situations during the pandemic [37]. Research has shown that varying levels of oestrogen can have an adverse effect on stress and anxiety in women [38]. Therefore, it is imperative to investigate gender-specific strategies for addressing mental health concerns in the context of health crises.

In this study, individuals aged 18 – 30 years old reported having more likelihood of experiencing mental health symptoms such as depression, anxiety, and stress than those respondents in other age groups. This result was in line with the previous study conducted by Yee et al. [25]. They reported that young adults were more vulnerable to mental health problems during the COVID-19 pandemic. Increased risk of developing mental symptoms among younger age might reflect the difficulties they have experienced in the transition from youth into adolescence, in addition to the hormonal and biological changes that occur simultaneously [36,38]. In addition, the COVID-19 pandemic has disrupted many people's daily routines, including younger adults, leading to increased stress and anxiety. Young people are afraid of missing their milestones and having no economic prospects due to constant social, educational, and professional restrictions, which leads to a deterioration of their mental state [39]. In contrast, an increase in age and maturity also increases the abilities of individuals to adapt to the changes and uncertainty based on the past events that they experienced [36,37,38], suggesting that older individuals are less likely to experience mental health problems than younger individuals.

Likewise, our study found that single/divorced individuals showed a likelihood of experiencing mild to severe depression and stress symptoms than married individuals, which is similar to previous studies [40, 41]. They reported that the majority of psychological problems among depressed participants were seen among divorcees, separated, widowed, and single adults as compared to married couples. Meaningful social ties are essential to living a good life. The presence of good supporting relationships can improve long-term health outcomes. According to research conducted by Cacioppo et al. [42] and Umberson et al. [43], meaningful interactions give emotional support and improve psychological well-being. In contrast, loneliness is one of the risk factors for depression. Social isolation due to MCO during the pandemic may amplify these consequences.

It is also important to note that this study found no significant association between the number of occupants in a household and mental health responses during the stay-at-home (MCO) period. The data from this study do not agree with the findings reported by previous studies [44,45], in which they have found that household size positively exacerbates the association between the COVID-19 pandemic and anxiety. It is important to note that the results of any single study should not be taken as definitive. Further investigation is warranted to validate the current findings of this investigation and to ascertain their generalisability to a broader demographic.

Stressors of the COVID-19 pandemic could also result in behavioural impairment of young adults, which could potentially impact their mental well-being in early adulthood. This was evidenced by our current findings that showed students have a higher tendency to experience depression and stress (Tables II and IV) as compared to the employed respondents. Several previous studies showed significant pandemic COVID-19 effects on the mental health of students, who are known to be a vulnerable population [41,46]. Several stressors, including financial difficulties, online classes, and inaccurate news on social media, have been identified as important factors affecting students' mental well-being. Other stressors include poor internet connection, extended class hours, high expectations from their lecturer, a decline in social interactions, and the uncertainty of their future career and life plans, which have further contributed to mental stress and other health issues [46,47].

The findings of this study indicate that individuals who suffer from mental health disorders exhibit an increased tendency towards experiencing psychological distress, as shown by the findings presented in Tables II-IV. Similarly, the currently available research has documented that pre-existing mental illness is correlated with an escalated likelihood of experiencing psychological distress during the COVID-19 pandemic in Australia [48]. This phenomenon may be attributed to the persistent anxiety that individuals have experienced. Continuous anxiety can exacerbate mental health conditions and

cause serious mental disorders [49]. Fears of COVID-19 and uncertainty are the major factors contributing to anxiety [46,48]. The other reasons for exacerbating mental distress among people with a pre-existing mental condition are lockdown, social distancing, quarantine, separation from friends and family, and the fear of not having control over the situation [50].

CONCLUSION

The present study indicates that 31.1%, 35.1%, and 18.0% of the respondents experience mild to severe depressive, anxiety, and stress symptoms, respectively. It indicates that anxiety was the most prevalent mental health factor among the respondents during the COVID-19 pandemic. According to sociodemographic variables, females, individuals aged 18-30 years old, students, unmarried and divorced respondents were more susceptible to mental health problems such as depression, anxiety, and stress. It is suggested that the following up treatment shall be provided for those who are affected by mental health factors amidst post COVID-19 world and offering targeted therapies for the variables that showed the most significantly associated with mental health problems.

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