# ORIGINAL ARTICLE

# Psychological Impact of Covid-19 Pandemic on Mental Health Among Medical Students in Malaysia

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## ABSTRACT

Introduction: The Coronavirus disease-2019 impacted the governments and public health systems worldwide, with the psychological impact including an increase in the level of stress, anxiety and depression. We determine the prevalence of depression, anxiety and stress using the Depression Anxiety Stress Scales (DASS-21), and to determine the psychological impact of COVID-19 pandemic amongst medical students in Sarawak, Malaysia using the revised Impact of Event Scale (IES-R). Methods: We analysed 355 medical student's data obtained from an online survey. All the undergraduate medical students were the sample population. IBM SPSS version 22.0 was used for data analysis. A p-value of <.05 was considered statistically significant. **Results:** Analysis indicated that three-fourths of the students had no mental health issues. More than one-tenth of the students were moderately depressed (12.4%) and 4.3% severely depressed. A similar pattern of prevalence of anxiety was noted with 10% reported moderate anxiety, and 6.8% had severe anxiety. 15.8% of the students had mild stress, 4.2% moderately stressed, and 2% severely stressed. A hierarchical multiple linear regression analysis showed that hyperarousal appeared to be a predictor of depression ( $\beta$ =.466, p<.001), anxiety ( $\beta$ =.481, p<.001) and stress  $\beta$ =.508, p<.001). Along with hyperarousal, intrusion ( $\beta$ =.148, p<.05) predicts stress among the students. **Conclusion:** Our analysis revealed that hyperarousal symptoms related to the global pandemic of COVID-19 led to significant mental health issues among students. Therefore, urgent strategies to support the students' psychosocial wellbeing and self-care and to strengthen their coping skills and resilience need to be implemented.

Keywords: Anxiety, COVID-19, Depression, Posttraumatic Stress Disorder, Psychological impact, Stress

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#### INTRODUCTION

Fear of the unknown and uncertainty about a possible future threat can induce anxiety (1) and increase the level of anxiety in people with or without underlying mental health conditions (2). The emergence of the novel Coronavirus (2019-nCoV), first isolated in a group of patients with pneumonia of unknown origin in late December 2019 in Wuhan, China (3), had subsequently spread to several nations as the newly termed Coronavirus disease 2019 (COVID-19), some of which have reported further transmission in the community (4). On 30th January 2020, the outbreak of coronavirus has been announced by the World Health Organization as a Global Public Health Emergency (5,6). Besides the potential risk of mortality related to the infection, the impact of this pandemic includes a significant psychological burden (7). The consequences of this evolving pandemic were predicted to include emotional responses like extreme fear and anxiety, social isolation and mental health problems including posttraumatic stress disorder, anxiety disorders and depression, and health risk behaviours such as tobacco and alcohol use. Public fear has been reported to manifest in alienation and discrimination (2).

In Malaysia, the Restricted Movement Order (RMO), also known as the Movement Control Order (MCO), has been mandated by the government since March 18, 2020, and has been extended twice. The RMO impose prohibition of mass gatherings, closure of business premises except for essential stores, closure of educational sectors, and a travel ban (7).

In addition to the psychological impact of COVID-19 that affects society as a whole, the student population faces greater challenges. The closure of universities and the potential extension of studies would likely cause disruption to the students' daily activities and future plans. The imposed restrictions would likely add to the psychological pressure of the university students whose academic sessions were postponed until further notice.

Among them, medical students are one of the most affected groups as clinical attachments at hospitals and other health care centres where they learn the essential clinical skills has been suspended until further notice. They also have to adapt quickly to online learning which requires much adjustment from the face-to-face and patient-based learning in the health care setting. These unfavourable circumstances would likely increase the stress level among medical students, especially those who experience coping and adjustment difficulties. Another factor that might affect the mental health of the students is living away from home. All these factors might contribute to anxiety, stress and depression among the students.

Cao et al. (8) reported that constant worrying about academic delays and the effect of epidemic correlated positively with anxiety level attributable to COVID-19 outbreak. Anxiety, as well as depression, are more prone to arise and worsen, in the lack of direct personto-person communication (9). The implementation of social distancing is very crucial as this virus spreads through contact of contaminated surface together with the transmission in air droplets particles. Thus, the social distancing of one meter or more could sufficiently prevent the transmission chain of this disease (10). Therefore, when offices and business premises are open to the public, social distancing has to be practised by the general population. The rapid spread of COVID-19, anxiety regarding the consequences of the infection and the risk of death, worries about passing on the infection to others and the quarantine policies have contributed to mental health concerns among the patients with COVID-19, close contacts, the public and health professionals. (11). There was a gender difference in anxiety, depression and psychological distress reported in a study where the boys scored significantly lower than the girls (12). In Serbia, Kyrgic et al. (13) reported a study where the female population was more susceptible to mental health difficulties than the male population. The female population was more likely to be subjected to stressful circumstances and emotional difficulties and encounter adverse conditions and emotions more frequently. Although there are variations between the categories of psychological illnesses involving male and female, the general incidence of emotional and behavioural conditions does not appear to vary between men and women.

During their academic and clinical studies, medical students are continuously subjected to various factors which have been shown to lead to high rates of depression, anxiety and stress. The purpose of this research was to analyse the mental health issues in terms of depression, anxiety, stress and post-traumatic stress among medical students in a Malaysian medical school, along with suggestions for early detection, intervention and support. This study also served as a screening initiative to identify the at-risk and affected students so that timely intervention and support can be provided to improve the mental health and wellbeing of our future frontliners.

## MATERIALS AND METHODS

#### Sample and data collection

The present study is a cross-sectional study conducted in a Malaysian public university. There are currently 696 medical students enrolled from year 1 to year 5. All the medical students were considered the study sample. Students from non-medical courses and medical students who were unwilling to participate were not included in this research. Data were gathered via an online survey questionnaire, which consisted of both English and Malay language versions. The questions were derived from several constructs that might be interpreted as the prevalence of mental health issues related to depression, anxiety and stress in regard to COVID-19 events. A pilot test was performed before data collection to ensure the appropriateness and the feasibility of the questionnaire for the research. Feedback from 30 students was taken into consideration to edit and improve the questionnaire. The finalised questionnaire, together with the complete instructions and consent form, were emailed to the target sample. An email link to the set of questionnaires was created and attached to the email and sent to all the medical students.

### Measures

Perceived knowledge of COVID-19 questionnaire was adapted from previous studies (14–16). There were 14 items of questions with the score of '1' for the correct answer, and '0' for the wrong answer or 'do not know' response. The knowledge score was further divided into three subsections viz. knowledge of signs and symptoms of COVID-19 (item 1, 2, and 4), knowledge of transmission or spread (Item 5, 6, and 7) and knowledge of prevention (3, 8, 9, 10, 11, 12, 13 and 14). A summative score with a higher score indicating better knowledge and a lower score indicating poorer knowledge. This variable was entered into the analytic model as a continuous variable.

The psychological impact of COVID-19 was assessed by employing the 22- item revised Impact of Events Scale (IES-R) adapted from McCabe (17). It is a selfreport measure which determines the subjective distress in the last seven days caused by traumatic events. Each response has five options viz. 'not at all,' 'a little bit,' 'moderately,' 'quite a bit,' and 'extremely' and were scored from '0' ('not at all') to '4' ('extremely'). It has three subsections which are: (a) intrusion and the items are 1, 2, 3, 6, 9, 14, 16, 20 (b) avoidance and the items are 5, 7, 8, 11, 12, 13, 17, 22 and (c) hyper-arousal and the items are 4, 10, 15, 18, 19, 21. The total IES-R score was classified into 0–23 (normal), 24–32 (mild), 33–36 (moderate), and  $\geq$ 37 (severe) psychological impact (18). The IES-R appears to be a reliable indicator of posttraumatic stress symptoms that can complement relevant assessment approaches in clinical and social research environments (19). In the present study, the domainwise Cronbach alpha varies from 0.750 (hyperarousal), 0.836 (avoidance) and 0.848 (intrusion), respectively. The overall Cronbach alpha was 0.923.

In terms of mental health status, depression, anxiety and stress were evaluated using the Depression Anxiety Stress Scales (DASS-21), a 21-item questionnaire with statements reflecting the three subscales of (a) depression, (b) anxiety, and (c) stress (20). Each item has 4 options that show how much the statement correlates to the respondent over the past week ('0' for 'Never', '1' for 'Sometimes', '2' for 'Often' and '3' for 'Almost always'). Each summed subscale score is multiplied by 2 to give the total subscale score that corresponds to the original 42- item DASS. Items 3, 5, 10, 13, 16, 17 and 21 represented a subscale for the depression. The overall subscale score for depression was graded as normal (0-9), mild depression (10-12), moderate depression (13-20), severe depression (21-27), and extremely severe depression (28-42). Items 2, 4, 7, 9, 15, 19, and 20 represent the anxiety subscale. The overall anxiety subscale score was classified into normal (0-6), mild anxiety (7-9), moderate anxiety (10-14), severe anxiety (15–19), and extremely severe anxiety (20–42). Finally, items 1, 6, 8, 11, 12, 14, and 18 represented the stress subscale. The overall stress subscale score was classified into normal (0–10), mild stress (11–18), moderate stress (19-26), severe stress (27-34), and extremely severe stress (35-42). This instrument is widely used in Malaysia and validated in local contexts (21-23).

Socio-demographic characteristics include age, gender, year of study, living arrangement (residence) and family size. The personal and behavioural characteristics include movement during the RMO period, physical contact with persons with COVID-19, physical exercise, and the use of social networking.

#### Data entry and analysis

Online survey responses were automatically saved in Microsoft Excel through the Google Form application. After three reminders to the students, data collection was stopped. All the questions were closed-ended and mandatory, except the age of the students. This ensured completion of the questionnaire without missing values. For analysis, the Microsoft Excel data was then moved to IBM SPSS version 22.0 (24). As some data might be distorted during importation, we carefully crosschecked the data for completeness and consistency. The duplicate response was removed from the final analysis. Exploratory data analysis (EDA) was performed to look for normality and outliers (25). Descriptive analysis was performed for continuous data and reported as mean, median, and standard deviation, while frequency and percentage were reported for categorical data. For every domain of mental health status (depression, anxiety and stress) as dependent variables with the selected independent variables, hierarchical linear regression was performed (26). The objective was to determine the domain-wise potential predictors and also to compare the strength of predictors across the models (27). A statistically significant p-value is set at  $\leq 0.05$ .

#### Ethical issues

Ethical approval to conduct the study was obtained from the Ethics Committee of the Faculty of Medicine and Health Sciences (FMHS), Universiti Malaysia Sarawak. Participation in this research was voluntary. Since we were using an online survey instead of a face-to-face interview, all the instructions and information regarding this research were explained clearly in the online form on the first page. We ensured privacy, anonymity and confidentiality, and data quality. Consent was given by ticking a box that indicated their understanding and agreement to participate in this research voluntarily before they can proceed to answer the questionnaire. Two screening questions were included to confirm that the respondent was over the age of consent of 18 years and that the student was a medical student.

#### RESULTS

#### **Characteristics of the students**

We invited all the medical students to participate in the study via an invitation email. Out of 696, 357 students responded to the survey form. However, two data were removed due to duplication. So, we analysed 355 student's data with a response rate of 51.0%. Table 1 shows the sociodemographic features of students. The mean age (SD) of the students was 21.96(1.57) years with a minimum age of 18 and a maximum of 25 years. Three-fourths (75.8%) of the students were female, and the rest were male (24.2%) with the male to female ratio of 1:3.13. Half of the students were living with their family (51.5%) and another half were staying in the university college or outside the campus. The mean (SD) family size was 5.57(1.72). The median duration of social media uses in the last week was 8.0 hours. The mean (SD) frequency of movement was 1.37(1.80) with a minimum 0 and the maximum five times. Half of the students (49.9%) did not move during the MCO period. One-fifth (22.5%) did not practise physical exercise, 59.2 % had a history of infrequent physical exercise and 18.3% had a history of regular physical exercise during MCO. Very few students had a history of social gathering or contact with persons infected with COVID-19.

#### **Knowledge of COVID-19**

The overall mean percentage of knowledge was 82.33, with a standard deviation of 9.62. The minimum score was 14.29, and the maximum score was 100.0 (Figure 1). Comparing the domains of knowledge, the knowledge of transmission or spread of COVID-19 recorded the lowest mean percentage (Mean = 73.33, SD = 21.46), followed by signs and symptoms (Mean = 79.15, SD

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Characteristics	Fre- quency	%	Mean(SD)
Age in year			
≤20	76	21.4	Mean (SD)=21.96(1.57)
21-23	196	55.2	Median=22.0
≥24	83	23.4	Min=18, Max=25
Year of study			
Year 1	80	22.5	
Year 2	86	24.2	
Year 3	59	16.6	
Year 4	61	17.2	
Year 5	69	19.4	
Gender			
Male	86	24.2	
Female	269	75.8	
Residence			
Living with family	183	51.5	
Outside campus	52	14.6	
University college	120	33.8	
Family size			
1-4	92	25.9	Mean (SD)=5.57(1.72)
5-6	176	49.6	Median=5.5
≥7	87	24.5	
Social media use (hours)			
1-5	96	27.0	Mean (SD)=9.97(6.2)
6-10	128	36.1	Median= 8.00
≥11	131	36.9	
Exercise			
Not at all	80	22.5	
Irregular	210	59.2	
Regular	65	18.3	
Frequency of movement			
0	177	49.9	Mean (SD)=1.37(1.8)
1-3	128	36.1	Median=1.0
≥4	50	14.1	Min=0, Max=5
Contact with persons with	COVID-19		
No	346	97.5	
Yes	9	2.5	

= 23.84 and the knowledge of prevention was highest with a mean (SD) of 86.90 (10.71).

**The pattern of psychological impact and mental health** The analysis found that 71.3% of the students did not experience the impact of COVID-19 from a psychological aspect. However, one-tenth (11.3%) had mild, 8.5% had moderate, and 9.0% had a severe psychological impact of COVID-19 event (Figure 2). Our study found that 74.4% to 78% of the students had no mental health issues. More than one-tenth of the students were moderately depressed (12.4%) and 4.3% severely depressed. A similar pattern of anxiety



Figure 1: Mean percentage of knowledge of COVID-19 with 95% confidence interval



Figure 2: Prevalence of psychological impact of COVID-19

was observed among the students, with 10.1% had moderate anxiety, and 6.8% had severe anxiety. 15.8% of the students had mild stress, 4.2% were moderately stressed, and 2% severely stressed (Figure 3).

# Relationship between psychological impact (IES-R) and DASS-21

Table II illustrates the domain-wise correlation matrix of IES-R and DASS-21 scale. The analysis revealed that each of the domains is significantly highly correlated



**Figure 3: Prevalence of mental health status.** The bar-diagram showing the prevalence of mental status in terms of depression (blue), anxiety (orange) and stress (grey)

#### Table II: Domain-wise correlation matrix of IES-R and DASS-21

Parameters	1	2	3	4	5	6	Mean	SD	Cronbach's alpha
IES-R							17.60	14.24	0.929
1. Intrusion	-						5.97	5.42	0.870
2. Avoidance	.713**	-					7.14	6.20	0.852
3. Hyperarousal	.794**	.650**	-				4.49	4.18	0.781
DASS-21							8.39	9.16	0.940
4. Depression	.558**	.506**	.613**	-			2.97	3.58	0.892
5. Anxiety	.583**	.529**	.634**	.678**	-		2.26	2.95	0.822
6. Stress	.620**	.518**	.681**	.781**	.786**	-	3.14	3.50	0.860

Correlation is significant at the 0.01 level (2-tailed)

with the other domain. The overall Cronbach's alpha for IES-R and DASS-21 scale was 0.929 and 0.940, respectively. Cronbach's alpha of every domain varies from 0.781 to 0.870 for IES-R and 0.822 to 0.892 for the DASS-21 scale, which indicates an excellent internal consistency.

# Predictors of mental health: Hierarchical various linear regression analysis

Finally, a hierarchical various linear regression analysis was done to determine the factors associated with depression, anxiety and stress during MCO. We hypothesised that the pandemic events had a contributing impact on the mental health status of the students. The other independent variables were the age of the students, living arrangement (residence), knowledge of COVID-19 in terms of signs and symptoms, transmission and prevention and domains of IES-R viz. intrusion, avoidance and hyperarousal. The categorical variable, gender, was dummy coded into female as '1' and male as '0', and the living arrangement of living with family dummy coded as '0' and not living with family coded '1'. The age of the students, knowledge of COVID-19 and domains of IES-R were the continuous variables. An exploratory data analysis was done to determine the potential outliers and skewed data. Mahalanobis distance with a significant p-value of less than 0.05 (28) and studentised residual with a 95% confidence interval of absolute value  $\pm$  2.0 (29) was used for the determination of multivariate outliers. A total of twentysix data that were identified as outliers were removed. The age of the respondents and the year of study were found to be highly collinear. So, the year of study was removed in the final model.

Age, gender and living arrangement were entered in the first stage, while the knowledge of COVID-19 and domains of IES-R score in the second stage. In the first and second models, the adjusted R-square was examined for model improvement (30) and the percentage of variability explained by the explanatory variables. Before interpreting the output, the ANOVA table (F-statistics) was examined for contributing significant predictors, and for testing the null hypothesis of the beta coefficient, which equal to zero. Variation of this indicated that at least one independent variable reliably predicts the dependent variable. The part (called semipartial) correlation of each output was also examined for unique contribution (variance) of the explanatory variable in the fitted model that explains the dependent variable.

Table III shows the analysis of hierarchical multiple linear regression. In terms of depression, in the first stage, age ( $\beta$ =-.145, p<0.01) and gender ( $\beta$ =.119, p<.05) were significantly associated with adjusted  $R^2 = .029$ (p<.001). However, after the inclusion of knowledge of COVID-19 and IES-R score in the second stage, age and gender did not significantly influence depression, but the model was significant with adjusted  $R^2 = .351$  (p<.001). The analysis revealed that hyperarousal appeared to be a significant predictor of depression ( $\beta$ =.466, p<.001) with 28.3% unique contribution. Similarly, the age of the students was negatively associated with anxiety  $(\beta=-.239, p<.001)$  in the first stage, but hyperarousal appeared to be a potential predictor of anxiety ( $\beta$ =.481, p<.001) with 29.2% unique contribution, in the second stage. In terms of stress, age ( $\beta$ =-.151, p<.01) and gender  $(\beta = .133, p < .05)$  appeared to be the predictors of stress in the first stage. However, in the second stage, intrusion  $(\beta = .148, p < .05)$  and hyperarousal  $(\beta = .508, p < .001)$ appeared to be the potential predictors with 8.1% and 30.9% unique contribution in the model, respectively. Age and gender of the students had no significant impact on any of the final models.

## DISCUSSION

Our analysis found that more than 70% of the students had no mental health issues such as depression, anxiety or stress during the challenging time of COVID-19 pandemic. This finding is in contrast to a study by Cao et al. (8) which reported that constant worries about academic delays and the influence of epidemic positively associated with the anxiety symptoms and that 24.9% of students had experienced anxiety because of the COVID-19 outbreak, with 0.9% experienced severe anxiety, 2.7% moderate anxiety, and 21.3% experienced mild anxiety. With the enforcement of Restricted Movement Order (RMO) which began on March 18, 2020, in Malaysia (7), there was an expectation of an increase in people whose mental health are adversely affected by the lack of communication and socialisation. With the lack of interpersonal connections, anxiety and

			Depres	sion					Anxi	ety					SI	tress		
arameters	8	SE	β	п	n	Part	в	SE	β	п	n	Part	в	SE	β	п	n	Part
1 (Constant)	14.564	4.400		5.908	23.221		17.742	3.349		11.152	24.331		15.739	4.379		7.123	24.355	
Age in year	523	.200	145**	917	128	144	663	.153	239***	963	362	237	540	.199	151**	932	147	150
Gender (fe- male)	1.589	.746	.119*	.121	3.056	.118	.555	.568	.054	562	1.672	.053	1.494	.742	.113*	.033	2.954	.111
Residence (non-family)	1.138	.635	.100	112	2.388	660.	134	.484	015	-1.085	.818	015	.565	.632	.050	679	1.809	.049
2 (Constant)	3.148	4.690		-6.080	12.376		6.262	3.399		426	12.950		1.910	4.180		-6.315	10.135	
Age in year	048	.176	013	395	.298	013	237	.128	085	488	.014	080	.051	.157	.014	258	.361	.013
Gender (fe- male)	.988	.637	.074	266	2.242	.071	016	.462	002	925	.893	001	.783	.568	.059	335	1.901	.057
Residence (non-family)	.931	.533	.082	117	1.979	.080	384	.386	044	-1.143	.376	043	.266	.475	.024	668	1.200	.023
COVID-19 symptom	.015	.012	.058	-000	.038	.057	.004	600.	.022	013	.021	.021	.012	.010	.047	-000	.032	.046
COVID-19 transmission	012	.013	043	036	.013	043	.001	600.	.005	017	.019	.005	007	.011	024	028	.015	024
COVID-19 prevention	028	.027	049	082	.025	048	010	.020	023	049	.029	023	039	.024	068	087	.008	067
Intrusion	.106	660.	060.	089	.301	.049	260.	.072	.107	044	.238	.059	.174	.088	.148*	.001	.348	.081
Avoidance	.050	.073	.050	094	.193	.031	.061	.053	.080	043	.166	.050	.077	.065	.077	052	.205	.048
Hyperarousal	.704	.114	.466***	.479	.928	.283	.559	.083	.481***	.396	.722	.292	.763	.102	.508***	.563	.963	.309
Model 1 (Adj, R² & F(df) ratio		.029***		F(df)	=4.121(3,31	8) **		0.050***		F(df)=6	.548(3,318	*** (		0.024		F(df	=3.569(3,3	18) **
Model 2 (Adj, R² & F(df) ratio		.351***		F(df)=	18.576(9,31	8) ***		0.408***		F(df)=2.	5.330(9,31	3) ***		0.462		F(df)=	=31.320(9,3	18) ***

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depression are likely to occur and deteriorate (9). The students were stranded in their respective residential colleges or out-campus residence away from family due to the restrictions on travelling back home during RMO. It was not unexpected that a large number of them would likely experience mental health issues. The result of the study might reflect under-reporting due to fear of stigmatisation (31), especially considering the potential privacy and confidentiality issues with an online form. Another potential explanation might be that the majority of the students were accommodated and supported well in terms of their essential needs such as food, shelter and financial aid by the government and Ministry of Higher Education (32,33). Cao et al. (8) stated that aside from the risk of death associated with the infection, significant psychological pressure was brought about by the pandemic. A variable degree of psychological impact, from mild to severe, was reported in China (34). However, our analysis found that 71.3% of the students were not affected psychologically during COVID-19 pandemic.

Regardless of the on-going pandemic, university students face academic challenges as well as challenges related to independent living and social circumstances. Shamsuddin et al. (23) found that the depression, anxiety and stress prevalence are higher amongst students aged 20 years and above. Therefore, with the current situation where the students had to postpone their studies until further notice, the prevalence of depression, anxiety and stress were expected to rise. In addition, the ongoing pandemic might result in enduring and problematic impact due to fear of infection, frustration and boredom, reduced in-person contact with classmates, teachers and friends, financial burden, lack of personal space and the restrictions brought about by the RMO.

In our analysis, we found that female students were more vulnerable to mental health issues, especially stress and depression compared to male in the initial model. However, gender differences had no impact on the final model. This is in line with a report by Amr et al. (35), that reported no major gender gaps in perceived stress, despite females scoring higher than males on the scales of depression. More than half of the students live with their family (51.5%) throughout the Restricted Movement Order (RMO) period. We hypothesised that the students living with families or relatives might have lower mental health issues during the pandemic. However, the advanced analysis did not support our hypothesis. They experienced heightened anxiety about their health and safety, along with the negative emotional impact of physical distancing. One of the potential explanations might be related to the fear and worries of having an asymptomatic infection and inadvertently transmitting the virus to the family members during the incubation period with infective capability, especially considering that the medical students might have been potentially exposed to the virus in the high-risk hospital environment with no screening done before the students return home to their families. Doheny (36) stated that the fear of having the disease transmitted to family members is a matter of fact. In addition, it is likely that some of the students might live with elderly family members or family members with chronic medical conditions with increased risk of mortality and vulnerability to develop the severe infection if infected with COVID-19. Furthermore, family members living in close proximity at home with restricted freedom of going out during the RMO period and the added stress of potential psychological and financial burden brought about by the pandemic might experience increased family conflicts.

Hierarchical analysis using multiple linear regression was performed to identify the psychological impact of the COVID-19 pandemic event on depression, anxiety and stress. We entered the three domains of PTSD which are intrusion, avoidance and hyperarousal (37) in the second step of the model. In the first step, the inclusion of age and gender significantly influence depression, whereby younger age and female gender had a significant influence on depression. However, after the inclusion of the knowledge of COVID-19 and the domains of IES-Revised i.e. PTSD symptoms in the second stage, age and gender did not remain significant factors that influence depression. Stordal et al. (38) found that there is minimal difference between the genders in the prevalence rates of depression, with the female slightly higher than male. The study also reported that the depression prevalence increases continuously with age in both genders. Salk et al. (39) found that male may be less likely to develop depression compared to female. Our study found that hyperarousal appeared to be the most potent predictors of depression in the final model. Perez et. al. (40) posited that trauma exposure to be significantly and strongly associated with the three clusters of PTSD symptoms (re-experiencing, avoidance/ numbing, and hyperarousal) and depressive symptoms. All PTSD symptoms clusters were reported to have strong and significant association with depressive symptoms.

One of the possible explanations might be that the psychological effects of COVID-19 outbreak, including irritability, negative emotional state, feeling of isolation and sleeping and concentration difficulties might occur in both PTSD and depression. Mental disorders including mood disorders, anxiety disorders and posttraumatic disorders can be triggered or exacerbated by pandemicrelated stressors (41). As for anxiety, in the first stage, the age of the students is negatively correlated with anxiety, meaning that the younger the students are, the higher is their anxiety level. This finding is supported by a review article by Lenze and Wetherell (42), which reported that anxiety has the highest prevalence in childhood, lowering in prevalence in adulthood, before peaking again in old age. Rudolph and Hammen (43) reported that girls demonstrated a particular vulnerability to depressive response to stress. The present study found

hyperarousal to be an independent potent predictor of anxiety. This might be due to the fact that hyperarousal symptoms may be interpreted as more endangering or risky in individuals higher in anxiety sensitivity compared to individuals lower in anxiety sensitivity (44). Sensitivity to anxiety (fear of sensations linked to arousal) plays an important role, particularly in anxiety disorders (44).

Our analysis found that intrusion appeared to be a potential predictor of stress, apart from hyperarousal. This means that the students had re-experiencing of the traumatic event through flashbacks or intrusive thoughts. PTSD describes a specific cluster of symptoms that follows exposure to an overwhelming and often frightening event or experience (45) and COVID-19 pandemic and its consequences are arguably overwhelming and traumatic to many, especially people who have been directly affected. Three domains of PTSD symptoms were studied in our research. Avoidance is characterized by avoiding anything that serves as trauma reminders (37). Our analysis did not find an association between avoidance and any of the mental health issues. Our study found that hyperarousal is a significant predictor of depression, anxiety and stress. Blunt (46) in their study on military personnel found that hyperarousal to be an important indicator of depression, but not other anxiety disorders (panic disorder, obsessive-compulsive disorder, and generalized anxiety disorder) in univariate analysis. However, hyperarousal was not a significant depression predictor in multivariate logistic regression in the study. This might be due to the overlap of symptoms such as sleep difficulties which is a feature of hyperarousal as well as a common symptom of depression.

Our study has a number of limitations. Firstly, our research was conducted in one university with a specific target group, although the students originate from all over the country. Therefore, the results might not be generalisable. Secondly, the questionnaire mostly relies on self-report, has no established validity evidence, i.e. we did not confirm the findings, for example, by performing the diagnostic assessment. We used the questionnaire to capture the student's perception of their attitudes instead of directly observing their behaviour. Thirdly, our findings also are from a single site, introducing the potential for sampling bias. Fourthly, some of the students living off-campus might not have internet access necessary to respond to the online questionnaires. As a result, the response rate was not up to the expected level. Obtaining samples by email invitation might have resulted in a lower response rate compared to distributing the printed copy of the questionnaire in person, but it was the most feasible option amid a pandemic. Finally, we did not specifically request for socioeconomic status information in the sociodemographic data collection, which is likely to be an important factor that affects the students' psychological wellbeing during the COVID-19 pandemic.

Despite these limitations, our findings provide important information about the knowledge, attitude and preventive practice against COVID-19 during a peak period of the pandemic. As this study was conducted at one university, more studies are recommended to investigate the knowledge, attitude and practice towards COVID-19 among different ethnic and socioeconomic groups.

# CONCLUSION

The current study found that medical students experience fear, anxiety and depression due to the threats and psychological impact of COVID-19. Hierarchical multiple linear regression analysis identified hyperarousal to be the single most potent independent predictor of depression and anxiety. Intrusion and hyperarousal were correlated significantly positively with stress. Although this study might not be generalisable due to the non- random sampling method, the hyperarousal symptoms due to COVID-19 pandemic were found to cause a significant negative effect on the students' mental health. Therefore, urgent strategies to support the students' psychosocial wellbeing and selfcare and to strengthen their coping skills and resilience need to be implemented.

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