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Impact of COVID-19 Pandemic on Mental Health among Health Sciences Students: A single centre study

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Abstract
COVID-19 pandemic has caused psychological impact on human being. This study is aimed to determine the prevalence and predictors of depression, anxiety and stress among undergraduate students during COVID-19 pandemic. A cross-sectional survey using Depression Anxiety Stress Scale 21 was conducted on 319 students. The results demonstrated that 21.6% - 33% of the students had moderate to extremely severe depression, anxiety, and stress. The number of close friends and number of persons living at home were identified as their most significant predictors. These findings provide preliminary awareness towards understanding the mental health issue among college students during the COVID-19 pandemic.

Keywords: COVID-19; mental health; students

1.0 Introduction

Mental health is a severe problem in our society that must be addressed, particularly among college students. Mental illness can affect students' motivation, concentration, and social interaction, affecting their succes in higher education (Unger, 2007). The mental health of college students has been affected and the number of students with negative emotions and psychological problems has increased during the COVID-19 pandemic (Khan et al., 2020).

COVID-19 has trigged a global health crisis and affects the mental health of human beings (World Health Organization, 2020; Zhong et al., 2021). The COVID-19 pandemic in Malaysia was discovered early in January 2020, and the number of cases continued to rise until the end of February 2020 (Pung et al., 2020). Due to the sudden increase in cases, the Malaysian government implemented the Movement Control Order (MCO) to prevent viral outbreaks from spreading throughout the country. Most of the routine activities were restricted during the MCO period. Consequently, higher learning institutions were prompted to adopt online distance learning mode as the alternative for teaching and learning activities.

According to a study in China, the COVID-19 pandemic significantly impacted students' mental health and anxiety levels (Cao et al., 2020). This pandemic caused a sudden change in the mode learning mode and forced students to undergo isolation and lockdown, which

increased anxiety and created extreme stress (Tian et al., 2020). Several studies on the impact of the COVID-19 pandemic on mental health among college students representing various demographic backgrounds have been reported in the literature (Irfan et al., 2020; Odriozola-González et al., 2020; Saraswathi et al., 2020; Son et al., 2020). However, limited study on Malaysian students has been addressed in the current literature. Therefore, this study aims to investigate mental health among college students, particularly health sciences students. The objectives of the study are to determine the prevalence of depression, anxiety and stress among undergraduate health sciences students during the COVID-19 pandemic and identify the predictors of depression, anxiety and stress.

2.0 Literature Review

The COVID-19 pandemic caused a psychological impact and affected people's mental health, including college students. The COVID-19 disease's potential for death had significant psychological and emotional effects on college students, including extreme fear and anxiety, social isolation, stress disorder and health risk behaviours like sleep disorder and binge eating (Sundarasen et al., 2020). A study on the psychological well-being of Spanish college students reported that 34.19%, 21.34% and 28.14% of the students had moderate to severe depression, extremely severe anxiety and moderate to severe stress symptoms, respectively (Odriozola-González et al., 2020). Another study conducted on 195 college students in the United States revealed that 70.8% of the students increased stress and anxiety during the COVID-19 pandemic (Son et al., 2020). Khan et al. (2020) claimed that college students are particularly vulnerable to the psychological effects of the pandemic, increasing their susceptibility to minor and severe mental illnesses. A mental health survey involving 505 Bangladeshi college students during COVID-19 showed that 28.5% of the respondents experienced stress, 33.3% experienced anxiety and 46.92% experienced depression (Khan et al., 2020). Even though most students understood the preventive measures, the inability to physically meet their colleagues contributed to the psychological symptoms during the pandemic.

Numerous research instruments have been employed to study the psychological impacts of COVID-19 involving various study populations. Sundarasen et al. (2020) used Zung's self-rating anxiety scale (SAS) to evaluate the level of anxiety among Malaysian university students during the MCO period. Likewise, Cao et al. (2020) and Fruehwirth et al. (2021) utilised a 7-item Generalized Anxiety Disorder Scale (GAD-7) to determine the psychological impact of the COVID-19 pandemic on college students in Changzhi Medical College, China and North Carolina, United States, respectively. Similarly, Irfan et al. (2021) used the same instrument in their study involving college students from 16 different universities in Malaysia. Furthermore, the Depression, Anxiety and Stress Scale 21 (DASS-21) have been used by Khan et al. (2020), Odriozola-González et al. (2020), Rahman et al. (2021), Shah et al. (2021) and Wang et al. (2020) in their surveys to determine the prevalence of depression, anxiety and stress among their respective demographic populations during the COVID-19 pandemic. Meanwhile, Son et al. (2020) utilised Perceived Stress Scale-10 (PSS) to identify significant stressors associated with the COVID-19 pandemic among college students in several universities in Texas, United States. The works of literature show that the variance research instruments employed in the studies are based on the purpose of the study.

The prevalence of depression, anxiety, and stress among college students during the COVID-19 pandemic has been associated with socio-demographic factors such as gender, family income, and living arrangements (Irfan et al., 2020). Female students have higher levels of psychological impact than male students, as evidenced by female student respondents displaying more anxiety symptoms than male students (Browning et al.,2021). Moreover, the prevalence of depression, anxiety, and stress during the COVID-19 pandemic has been strongly associated with family income, particularly among college students from lower-income families (Fruehwirth et al., 2021). Mohammed et al. (2015) found that family income was significantly associated with stress, with respondents reporting that stress symptoms were more prevalent in families with lower income and financial burdens. Likewise, the prevalence of depression, anxiety, and stress during the COVID-19 pandemic has been associated with college students staying alone, with family, or with friends (Sundarasen et al., 2020). Those who stayed alone had higher anxiety levels than those who stayed with family and friends. Students who stay alone are more likely to feel lonely because they are separated from their families and have no protection against safety and security during the pandemic (Elmer et al., 2020). This argument was in line with the findings of Irfan et al. (2020) reported that the likelihood of having anxiety decreases as students live with their parents.

Furthermore, the female gender was the significant predictor of psychological symptoms (Browning et al., 2021; Karing, 2021; Alyami et al., 2022). Likewise, knowing someone infected with COVID-19 predicted psychological problems during the COVID-19 pandemic (Browning et al., 2021). Previous works of literature reported that too many siblings in a home (Adewuya et al., 2006), insufficient social support especially family support (Li et al., 2021), lack of financial resources and support (Celik et al., 2019) and lack of physical exercise (Li et al., 2021) were the predictors of depression among college students. Therefore, those studies proved that depression, anxiety and stress were significantly associated with the socio-demographic factors of college students. Hence, this study is conducted to determine the prevalence and predictors of depression, anxiety and stress among health sciences students of UiTM during the COVID-19 pandemic.

3.0 Methodology

3.1 Research design and sample size

This cross-sectional survey study was performed on undergraduate students from the Faculty of Health Sciences, Universiti Teknologi MARA (UiTM) Selangor Puncak Alam Campus during the MCO period implemented by the government from March until July 2021. The students represented a diploma program in Medical Imaging and eight bachelor's degree programs, including Medical Imaging, Medical Laboratory Technology, Environmental Health and Safety, Optometry, Dietetics, Nursing, Physiotherapy and Occupational Therapy. The participants were invited to participate in this study by distributing questionnaires using social media networks such as WhatsApp and

Telegram**.** The sample size was estimated using a Raosoft sample size calculator with a 5% margin of error, 95% confidence level and 50% response distribution. A total of 319 respondents was estimated from the sample size calculation. Full-time undergraduate students without being clinically diagnosed with depression were included in this study. Yet, distance learning and post-graduate students were excluded from this study.

3.2 Research tool
A survey was performed using a questionnaire that was constructed into two sections, including Section A (demographic characteristics of the respondents) adopted from Irfan et al. (2021) and Section B (Depression, Anxiety and Stress Scale 21, DASS-21). DASS**-**21 is used as a cross-culturally validated tool to assess the psychological impacts of pandemic disease, which consists of 21 items and three subscales: anxiety subscale (DASS-A), depression subscale (DASS-D), and stress subscale (DASS-S) (Lovibond & Lovibond, 1995).

The participants were required to rate their experiences on a four-point severity. Each question was rated as follows: 0 for "did not apply to me at all", 1 for "applied to me to some degree, or some of the time", 2 for "applied to me to a considerable degree, or a good part of the time", and 3 for "applied to me very much, or most of the time". The DASS-21 result was derived by adding the scores of each subscale of depression, anxiety, and stress and multiplying by 2. "Normal", "mild", "moderate", "severe", and "extremely severe" were the results corresponding the level of participants' depression, anxiety, and stress.

3.3 Statistical analysis
The data were analysed using the Statistical Package for the Social Sciences (IBM SPSS) version 25. Descriptive analysis was performed to present the descriptive data of demographic and frequencies of the DASS-21 to determine the level of depression, anxiety and stress. Subsequently, multivariate logistic regression analysis using the Enter method was conducted to determine the predictors of anxiety, depression and stress. The significance level was established at $p < 0.05$.

3.4 Ethical consideration
This study was approved by the Research Ethics Committee of the Faculty of Health Sciences (REC/05/2021 (UG/MR/447). Participation in the survey was voluntary and consent was acquired from the respondents.

4.0 Findings

4.1 Demographic characteristics
The age range of the students was 19 to 25 years old, with a mean age of 23.1 ± 1.4 years representing 16% male and 84% female. Most respondents (62.4%) were final-year students in bachelor's degree programs. Most respondents were from urban areas (59.3%) with moderate internet accessibility (46.7%). Additionally, the demographic data showed that 44.2% of the respondents' family income was affected by the COVID-19 pandemic and 54.2% of their close relatives or friends were infected by COVID-19. The demographic data are summarized in Table 1.

Table 1: Demographics of the participants

Demographic		N (%)
Age	19	9 (2.8)
	20	2 (0.6)
	21	27 (8.5)
	22	60 (18.8)
	23	103 (32.3)
	24	64 (20.1)
	More than 24	54 (16.9)
Gender	Male	51 (16.0)
	Female	268 (84.0)
Living area	Rural	130 (40.8)
	Urban	189 (59.2)
Internet accessibility	Poor	34 (10.7)
	Moderate	149 (46.7)
	Good	136 (42.6)
Number of close friends	1 – 4	172 (53.9)
	5 – 8	80 (25.1)
	9 -12	55 (17.2)
	More than 12	12 (3.8)
Playing sports	Yes	109 (34.2)
	No	210 (65.8)
Living with parents	Yes	288 (90.3)
	No	31 (9.7)
Number of persons living at home	1 – 2	30 (9.4)
	3 – 4	110 (34.5)

	5 – 6	89 (27.9)
	More than six persons	90 (28.2)
Personal expenses monthly	RM 1 - RM 500	235 (73.7)
	RM 501 - RM1000	65 (20.4)
	RM 1001 - RM1500	16 (5.0)
	RM 1501 - RM2000	3 (0.9)
Family income affected by COVID-19	Yes	141 (44.2)
	No	178 (55.8)
Diseases other than COVID-19	Yes	5 (1.6)
	No	314 (98.4)
COVID-19 infects close relatives or friends	Yes	173 (54.2)
	No	146 (45.8)

4.2 Prevalence of depression, anxiety and stress

The average score of DASS-21 is presented in Table 2. The results demonstrated that 28.1%, 21.6% and 33% of the students had moderate to extremely severe depression, anxiety, and stress symptoms, respectively.

Table 2: Prevalence of depression, anxiety and stress

Level	Depression		Anxiety		Stress	
	Number (n)	Percentage (%)	Number (n)	Percentage (%)	Number (n)	Percentage (%)
Normal	171	53.6	188	58.9	166	52.0
Mild	58	18.2	62	19.4	48	`15.0
Moderate	29	9.1	39	12.2	59	18.5
Severe	42	13.2	27	8.5	41	12.9
Extremely severe	19	6.0	3	0.9	5	1.6

4.3 Predictors of depression, anxiety and stress.

Eight demographic factors of the respondents were further analysed using multiple logistic regression analysis to determine the predictors of depression, anxiety and stress. Age, number of close friends, playing sport, number of persons living at home and COVID-19 infects close relatives or friends are the predictors of depression. Gender, living area, number of close friends, playing sport, living with parents and number of persons living at home are found as the predictors of anxiety. Meanwhile, the predictors of stress are the number of close friends, living with parents, the number of persons living at home and COVID-19 infects close relatives or friends.

Out of these factors, number of close friends and persons living at home is the most significant predictor of depression, anxiety and stress as shown in Table 3.

Table 3: Predictors of depression, anxiety and stress based on multivariate logistic regression analysis

	Depression			Anxiety			Stress		
	B	Wald	p-value	B	Wald	p-value	B	Wald	p-value
Age	-0.457	6.485	0.011	0.238	2.449	0.118	-0.117	0.556	0.456
Gender	-0.804	2.730	0.099	1.147	7.004	0.008	-0.178	0.125	0.837
Living area	0.046	0.018	0.893	0.908	8.061	0.005	0.278	0.680	0.410
Number of close friends	-1.053	30.138	< 0.001	-0.614	13.739	< 0.001	-0.838	22.295	< 0.001
Playing sport	-1.462	15.609	< 0.001	-1.052	10.491	< 0.001	0.507	1.755	0.185
Living with parents	-0.516	0.467	0.495	1.668	9.149	0.002	1.876	11.130	< 0.001
Number of persons living at home	0.643	10.166	< 0.001	0.846	20.636	< 0.001	1.541	41.596	< 0.001
COVID-19 infects close relatives or friends	0.727	4.727	0.030	0.543	2.813	0.093	0.998	7.183	0.007

5.0 Discussion

This study was conducted to determine the prevalence of depression, anxiety and stress among health sciences students of UiTM during the COVID-19 pandemic. This study investigates the psychological impacts of depression, anxiety and stress simultaneously as these mental health disorders are biologically related to each other. Anxiety and major depressive disorder often present as co-morbid disorders and the expression and severity of these disorders are commonly associated with stressful experiences (Anisman et al., 2008). Biologically, stress and anxiety disorders are the risk factors for depression, and these behaviours are modulated by corticotropin- releasing factor and serotonin receptors (Magalhaes et al., 2010). Corticotropin-releasing factor is a hypothalamic hormone that has a wide variety of actions in the central nervous system and in the periphery, such as regulating the stress response, anxiety and mood (Dautzenberg & Hauger, 2002). Similarly, serotonin signalling has a fundamental role in the pathophysiology of depression and antidepressant response (Yon et al., 2017).

The results show approximately 21.6% - 33% of the students had moderate to extremely severe levels of symptoms of depression, anxiety, and stress. As the male students only comprise 17% of the faculty's total students' population, this factor may contribute to low respondence rate among male students in this survey. Our finding on anxiety prevalence is comparable with Cao et al. (2020), which reported that 24.9% of Chinese students experienced anxiety during the COVID-19 pandemic. A variable degree of psychological impact from mild to severe was reported among general population in China (Wang et al., 2020). However, our findings contradict a study on

medical students of Universiti Malaysia Sarawak by Rahman et al. (2021), which reported a low prevalence of mental health issues with moderate anxiety (10%), severe anxiety (6.8%), mild stress (15.8%), moderately stressed (4.2%) and severely stressed (4.2%). They claimed their under-reporting findings might be due to fear of stigmatisation among the respondents (Corrigan & Watson, 2002) especially considering the potential privacy and confidentiality issues with an online form. Nevertheless, a more significant increment in the prevalence of depression from the current study and previous studies during this pandemic has been observed compared to the global prevalence of depression of 4.4%, as reported by the World Health Organization (WHO) in 2015 (World Health Organization, 2017).

The impact of the COVID-19 pandemic could cause long-term mental health issues, particularly in terms of academic delays and a disrupted environment (Cao et al., 2020). With the enforcement of MCO which began on March 18, 2020, in Malaysia, this regulatory lockdown has led to a significant psychological and emotional impact on college students, including extreme fear, anxiety and stress disorder (Huckins et al., 2020). Lack of communication and socialisation with peers may become the significant factors contributing to this psychological impact. Our findings align with previous studies, which demonstrated that younger individuals, such as college students are at greater risk for psychological distress in a health emergency such as COVID-19 pandemic (Wang et al., 2020). Furthermore, the financial status of the students could explain the prevalence of anxiety and depression in the present study. As almost 44% of the respondents' family income was affected by COVID-19 as shown in Table 1, financial difficulty is associated with anxiety and predisposition to depression after several months of quarantine, worsened by undue uncertainty (Jurblum et al., 2020). Likewise, this study observed a lack of sport activities among most students due to restrictions on outdoor sports during the MCO period, which may contribute to the high prevalence of psychological problems. Exercising and physical activity during quarantine is essential to promote mental and physical health particularly for younger people (Maugeri et al., 2020). Furthermore, this study also showed that close relatives or friends of the respondents infected by COVID-19 could contribute to mental health problems during the pandemic. This study revealed that this novel coronavirus infected 54.2% of their close relatives or friends. The possibility of being infected with COVID-19 was likely to be more stressful because of the fear of mortality or morbidity associated with a disease (Jurblum et al., 2020).

The prediction of depression, anxiety and stress were investigated among the health sciences students during the pandemic. We have only emphasised the predictors significantly associated with depression, anxiety and stress. Our logistic regression analysis reported that the level of depression has decreased as age increases. The key reason for this seems to be that the senior students had better adaption to the transition from physical to online leaning mode than junior students during the MCO period. Younger students tend to worry more about their future education (Aristovnik et al., 2021) and engage in social media more than older students during the pandemic (Stieger et al., 2021). Moreover, this study demonstrated that gender was associated with anxiety as well. Male students were less likely observed to develop a higher level of anxiety than female students, which is comparable with the previous studies (Liu et al., 2020; Irfan et al., 2021). Gender-related attitudes and behaviours may explain the variance of this result. Fundamentally, females react more in fear-related neural networks and have more significant differential conditioned skin conductance responses to stimulations than males (Liu et al., 2020).

Furthermore, our analysis also found that living area is significantly correlated with anxiety, which this factor is commonly associated with internet accessibility. The urban area could provide more frequent internet access than the rural area. Good internet access would be helpful for the students to have online learning and more entertainment options at home during the MCO period, which may lead to reduce anxiety. Additionally, this study shows that students those having infected close relatives or friends with COVID-19 may lead to increase the level of stress and depression. Their knowledge of the infected relative or friends would result their familiarity with the disease. The familiarity can increase the salience and perceived risk of becoming infected and dealing with subsequent health concerns, like COVID-19-related death (Tzur Bitan et al., 2020). In addition, our study also demonstrated that lack a of playing a sport could increase depression and anxiety among the students, which agrees with Li et al. (2021). Playing sport or having regular exercise led to a healthy lifestyle, thus reducing the negative psychological impact of the COVID-19 pandemic.

Interestingly, the number of close friends is a common predictor of depression, anxiety and stress. This finding is comparable with a study by Shah et al. (2021). The results show that having a more significant number of close friends could help to reduce depression, anxiety and stress. The presence of close friends would be a source of relief as the students could share their problems and interact socially with their close friends. Social isolation has a higher effect on loneliness (Leigh-Hunt et al., 2017). Lack of social interaction has increased their psychological pressure. This finding would support the evidence on the importance of social interaction which significantly impacts depression, anxiety and stress among students. Physical interaction with family and friends can help students to manage their anxiety and stress properly.

However, as shown in our study, the number of persons living at home would have an expected impact on the level of depression, anxiety and stress. Most of the respondents lived with three to four persons at home. We postulated that too many persons living at home would disturb the students from concentrating and focusing on their studies, contributing to depression, anxiety and stress. A larger family was connected to higher depression, anxiety and stress (Le et al., 2020). This factor is attributed to increased concerns about the risk of infection of their family members (Wang et al., 2020). Yet, an adequate number of persons living together at home would be helpful for social interaction and a source of relief to face the psychological impact of the pandemic.

Furthermore, this study demonstrated that living with parents could increase anxiety and stress among students. We postulate that parental distress is the main factor contributing to these psychological symptoms among the students. With the presence of their parents during the MCO period, parental distress would directly affect their psychology. A high prevalence of severe anxiety has been reported in parental distress during the COVID-19 pandemic (Lee et al., 2021). Deleterious psychological impacts of quarantine were reported to be wide-ranging and associated with a high prevalence of psychological symptoms and distress (Ebrahimi et al., 2021). Similarly, our data support this argument which shows approximately 44.2% of the income of the respondents' family was affected during the pandemic. Financial security is significantly associated with parental distress (Frankel et al., 2021). The parental distress is not conducive for the students to survive, mainly concentrating on their online learning activities during the MCO, which leads to anxiety and stress.

6.0 Conclusion & Recommendations

In conclusion, this study shows that almost 21.6% - 33% of the UiTM health sciences students had psychological problems revealed by depression, anxiety and stress during the COVID-19 pandemic. The number of close friends and persons living at home has been identified as the main predictor of those symptoms. The findings of this study would be beneficial for the university management to provide the necessary intervention programs such as counselling and psychotherapy to facilitate the effective management of mental health among the students. These findings would be valuable for future mental health plans for college students.

This study is limited with self-reported measures rather than clinical diagnoses of depression, anxiety and stress although the DASS-21 scales have been validated and are commonly used in mental health surveys. Further research on exploring the association between physical and mental health status is recommended in the future to determine the impact of the post-COVID-19 pandemic in a more holistic approach. As UiTM has an enormous population of students among higher learning institutions in Malaysia, larger samples from the other faculties and campuses are necessary to represent the UiTM study population. Socio-demographic variances such as the course of study and location of campus may affect the findings of this mental health issue.

Acknowledgements

Paper Contribution to Related Field of Study

The results of this study would be valuable to understanding the mental health issue among college students, particularly health sciences students during the COVID-19 pandemic. The outcomes of this study would be helpful for the related authorities to provide necessary intervention programs for college students to manage the psychological impacts following the health emergency such as COVID-19 pandemic.

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