



Original Research Article

The impact of COVID-19 pandemic and psychological resilience among undergraduate medical students

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ABSTRACT

Background: Pandemic always has negative impact on students in higher education. Especially when learning emphasises on hands-on experience. Due to movement The social distancing and online teaching during COVID-19 pandemic had impact on student learning. We aimed to assess the prevalence of anxiety, depression and resilience of medical students to COVID-19 related worries during pandemic.

Materials and Methods: We conducted a cross-sectional study among 1200 undergraduate medical students. The survey questionnaires has six parts; demography information, modified version of COVID-19 related worries, the impact of COVID-19 in teaching and learning, resilience using the Connor-Davidson Resilience Scale, generalized anxiety disorder 7-item (GAD-7) scale & lastly patient health questionnaire-2 (PHQ-2). The Cronbach's alpha coefficient of GAD-7 was 0.930 and PHQ-2 was 0.811. We used multiple linear regression to determine the association between resilience and anxiety, depression, and COVID-19 related worries. All the statistical tests were two-sided, and the level of significance was set at 0.05.

Result: Most of the students showed a moderate amount of COVID-19 related worries about contracting, dying or unintentionally infecting others, having financial burden following pandemic, affecting their study. Around 32.8% of the medical students had minimal anxiety while 35.7% had mild, 14.1% had moderate and 17.4% had severe anxiety disorder. The mean resilience score was 23.1 (SD 7.3). There was statistically significant negative association between resilience and anxiety with regression coefficient of -0.36 (95% confidence interval -0.43 to -0.29), $P < 0.001$. Female students had significantly higher anxiety (regression coefficient 2.03; 95% confidence interval 0.92 to 3.15; $P < 0.001$) and COVID-19 related worries (regression coefficient 2.91; 95% confidence interval 1.48 to 4.35; $P < 0.001$) than male students.

Conclusion: A significant proportion of medical students experienced anxiety and depressive symptoms, with varying degrees of severity. We emphasize the need for targeted support and interventions to address anxiety, depression, and promote resilience.

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1. Introduction

The spread of diseases like epidemics and pandemics has had a significant impact on students, especially those in higher education. Previous studies have shown that during outbreaks such as swine flu (H1N1), SARS-CoV-1, and MERS-CoV, students faced mental health challenges.¹⁻³

The current COVID-19 pandemic has similarly affected Malaysian students, with research indicating that almost 30% of university students in Malaysia have experienced anxiety due to the pandemic.⁴ Malaysian university students have reported difficulties in learning during the pandemic, including issues like poor internet connection, limited interactions with lecturers, and trouble understanding course materials, all of which have contributed to psychological

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issues.⁵ Even before COVID-19, stress levels among medical students in Malaysia varied from 14.3% to 56%, with the highest levels seen during the transition from pre-clinical to clinical years.^{6,7} Studies during the COVID-19 pandemic have found higher rates of anxiety among medical students compared to the general population.⁸ Resilience, which is seen as a positive factor in dealing with life's challenges, has been linked to better well-being and the prevention of stress, anxiety, and depression.^{9–12} While research has explored stress, anxiety, and depression among health professional students during the pandemic,^{13–17} there has been limited focus on examining psychological resilience, which is crucial in such times. This study aims to evaluate the prevalence of anxiety, depression, and COVID-19 related concerns, determine the level of psychological resilience and its relationship to worries about COVID-19, anxiety, and depression, and investigate the pandemic's impact on the teaching and learning experiences of medical students.

2. Materials and Methods

We conducted a cross-sectional study among undergraduate medical students in private medical university in Malaysia from January to December 2021. There are approximately 1200 students attending MBBS program. The sample size was calculated using the formula for estimating finite population proportion with the margin of error 5%, the assumption of 95% confidence level and the prevalence 33.2% of depression during pandemic among medical students.¹⁸ The minimum sample size required was 278. We expected 30% non-response; therefore the final sample size was 398 students. The students who were in MBBS program of our university, willing to participate and those provided the informed consent were included in this study.

We employed purposive sampling and electronic survey form (googleform) were sent to the students. The questionnaire included six parts. First part included sociodemographic characteristics such as age, gender, ethnicity, nationality, religion, academic year, country residing currently, living status, knowing COVID-19 positive person and student's COVID-19 test results. In second part, we used modified version of COVID-19 related worries which includes 10 questions.¹⁹ The questions included two sub-scale such as worries related to contracting COVID-19 and infecting others, and worries related to academics. Five-point Likert scale which was ranged from 0 (not at all), 1 (a little), 2 (a moderate amount), 3 (a lot) to 4 (a great deal). The Cronbach's alpha coefficient of modified version of COVID-19 related worries was 0.819. The impact of COVID-19 in teaching and learning was also measured in part three. The students were asked how COVID-19 affected their clinical training, examination, and elective postings.^{13,18}

In part four, we measured resilience using the Connor-Davidson Resilience Scale (CD-RISC 10).²⁰ CD-RISC 10 is the self-rating scale and the students were asked to rate how he/she felt the previous month. The scale contained 10 items and the 5-points scale ranging from 0 (not true at all), 1 (rarely true), 2 (sometimes true), 3 (often true) and 4 (true nearly all of the time). We computed the total score (full range was 0 to 40) and higher score indicated greater resilience. The Cronbach's alpha coefficient of 0.903 showed strong internal consistency of the scale.

In part five, we used generalized anxiety disorder 7-item (GAD-7) scale to assess the student's anxiety.²¹ Four-point Likert scale ranging from 0 (not at all), 1 (several days), 2 (over half the days) to 3 (nearly every day) was used. Total score was computed and it was ranged from 0-21. It was categorized to minimal anxiety (0-4), mild anxiety (5-9), moderate anxiety (10-14) and severe anxiety (15-21). Lastly, patient health questionnaire-2 (PHQ-2) was also used to assess the frequency of depressed mood.²² This scale consisted of 2 items using four-point scale ranging from 0 (not at all sure), 1 (several days), 2 (over half the days) to 3 (nearly every day). The total score was ranged from 0 to 6, and score ≥ 3 was categorized as likely major depressive disorder. The Cronbach's alpha coefficient of GAD-7 was 0.930 and PHQ-2 was 0.811.

As the English was the language of instruction in our university, we did not translate the original English questionnaire to local language. We conducted a pilot study with convenience sample to check for reliability, clarity and understanding of the questionnaire. We calculated the Cronbach's alpha coefficient for internal consistency of the COVID-19 related worries, Connor-Davidson Resilience Scale (CD-RISC 10), GAD-7 and PHQ-2.

After checking and coding the questionnaire, we used SPSS version 26 for data analysis. We calculated frequency and percentage for sociodemographic variables. Mean and standard deviation were calculated for quantitative variables such as resilience, COVID-19 related worries, anxiety and depression. We used multiple linear regression to determine the association between resilience and anxiety, depression, and COVID-19 related worries. All the statistical tests were two-sided and the level of significance was set at 0.05.

Before data collection, the purpose of the study was explained to the respondents. Participation was strictly voluntary and autonomy of the respondents was be respected. Written informed consent was taken from each participant. Confidentiality was maintained and anonymity of respondents was ensured. In addition, data were kept secured and available only to the statistician. This research was approved by Research Ethics Committee, Faculty of Medicine, Manipal University College Malaysia (MMMC/FOM/Research Ethics Committee – 1/2021).

3. Result

A total of 403 undergraduate students participated in the study, with 70.2% from clinical years and 29.8% from pre-clinical years. The mean age was 22.6 years, and the majority (93.1%) were Malaysian students. A small percentage (6.9%) were international students.

Concerning COVID-19 testing, 36.7% of students had been tested, with only one student testing positive. Table 2 displayed COVID-19 related worries, showing that most students expressed moderate to significant concerns about various aspects related to the pandemic.

Table 3 presented the prevalence of anxiety, depression, and resilience among medical students during the COVID-19 pandemic. A considerable percentage experienced mild to severe anxiety (32.8% minimal, 35.7% mild, 14.1% moderate, and 17.4% severe), while 31.8% had a likely major depressive disorder. The mean resilience score was 23.1 (SD 7.3).

In Table 4, the association between gender, academic year, resilience, and psychological factors (anxiety, depression, COVID-19 related worries) was examined using multiple linear regression. The results indicated a statistically significant negative association between resilience and anxiety (regression coefficient -0.36, $P < 0.001$) and depression (regression coefficient -0.12, $P < 0.001$). However, resilience did not significantly associate with COVID-19 related worries. Female students exhibited higher anxiety and COVID-19 related worries than males, but there was no significant gender difference in depression. Clinical year students had significantly lower anxiety and depression compared to pre-clinical year students, with no significant difference in COVID-19 related worries.

Table 5 detailed the impact of the pandemic on students' clinical training, electives, and examinations. A significant percentage reported the postponement (68.7%) or cancellation (29%) of clinical training. Changes were observed in OSCEs and theory examinations, with alterations to venues and postponements or cancellations of electives.

Figure 1 depicted that a majority of students agreed that they were less prepared in clinical skills and knowledge due to changes in teaching and learning. However, Figure 2 showed that most students felt these changes were necessary.

4. Discussion

The aim of this research was to evaluate the resilience of medical students during the recent COVID-19 pandemic and study the connections between anxiety, depression, COVID-19-related concerns, and students' resilience during this difficult period. The results showed that during the pandemic, 67.2% of students experienced varying levels of

Table 1: Demographic characteristics among undergraduate medical students (n=403)

Variable	N (%)
Age (years)	
Mean (SD)	22.6 (1.8)
Minimum – Maximum	18.0 – 28.0
Academic year	
Pre-clinical	120 (29.8)
Clinical	283 (70.2)
Gender	
Male	111 (27.5)
Female	292 (72.5)
Ethnicity	
Malay	68 (16.9)
Chinese	136 (33.7)
Indian	138 (34.2)
Others	61 (15.1)
Nationality	
Malaysian	375 (93.1)
International students	28 (6.9)
Religion	
Islam	84 (20.8)
Hindu	124 (30.8)
Christian	56 (13.9)
Buddhist	112 (27.8)
Others	27 (6.7)
Currently, in which country are you residing?	
Malaysia	384 (95.3)
Outside Malaysia	19 (4.7)
Where and with whom do you live currently?	
At hostel	139 (34.5)
Friends outside campus	62 (15.4)
Alone outside campus	3 (0.7)
Parents/relatives	199 (49.4)
Have you ever been tested for COVID-19?	
Yes	148 (36.7)
No	255 (63.3)
COVID-19 test results (n=148)	
Positive	1 (0.6)
Negative	147 (99.4)
Do you know personally person with COVID-19?	
Yes	185 (45.9)
No	218 (54.1)
Do you know personally person who died from COVID-19?	
Yes	18 (4.5)
No	385 (95.5)

Table 2: COVID-19 related worries among undergraduate medical students

Question	N (%)				
	Not at all	A little	A moderate amount	A lot	A great deal
How much are you worried getting (contracting) COVID-19?	22 (5.5)	78 (19.4)	158 (39.2)	89 (22.1)	56 (13.9)
How much are you worried dying from COVID-19?	93 (23.1)	114 (28.3)	104 (25.8)	48 (11.9)	44 (10.9)
How much are you worried having COVID-19 now?	60 (14.9)	95 (23.6)	118 (29.3)	78 (19.4)	52 (12.9)
How much are you worried your family member getting COVID-19?	7 (1.7)	22 (5.5)	79 (19.6)	115 (28.5)	180 (44.7)
How much are you worried unknowingly (unintentionally) infecting others?	18 (4.5)	47 (11.7)	86 (21.3)	133 (33.0)	119 (29.5)
How much are you worried experiencing significant financial burden (in your family) following COVID-19 pandemic?	18 (4.5)	66 (16.4)	104 (25.8)	110 (27.3)	105 (26.1)
How much are you worried that the COVID-19 outbreak hinders with your acquisition of theoretical knowledge (Lecture sessions)?	12 (3.0)	29 (7.2)	83 (20.6)	129 (32.0)	150 (37.2)
How much are you worried that the COVID-19 outbreak affects your acquisition of practical/ clinical skills?	7 (1.7)	33 (8.2)	103 (25.6)	260 (64.5)	0 (0)
How much are you worried that the COVID-19 outbreak would affect your grades in the end of year examination?	4 (1.0)	26 (6.5)	77 (19.1)	102 (25.3)	194 (48.1)
How much are you worried that the COVID-19 outbreak would affect your future prospects in medical carrier?	5 (1.2)	12 (3.0)	75 (18.6)	112 (27.8)	199 (49.4)

Table 3: Anxiety, depression and resilience among medical students during COVID-19 pandemic

Variable	N (%)
Anxiety disorder	
Minimal	132 (32.8)
Mild	144 (35.7)
Moderate	57 (14.1)
Severe	70 (17.4)
Mean (SD)	7.8 (5.8)
Depression	
Likely major depressive disorder	128 (31.8)
No major depressive disorder	275 (68.2)
Mean (SD)	2.1 (1.9)
Resilience	
Mean (SD)	23.1 (7.3)

anxiety disorder, with 31.8% likely suffering from major depressive disorder. A study in China²³ reported anxiety disorder rates of 17.1% and depression rates of 25.3% among medical students in Beijing and Wuhan. In India, a study found that 9.8% of junior doctors and medical students had moderately severe anxiety,²⁴ with 7.3% experiencing severe depression. Our students also showed moderate to significant worries related to COVID-19, including fears of contracting the virus, financial difficulties, and the impact on their studies. Importantly, resilience was

found to have a significant negative association with anxiety and depression, consistent with studies on COVID-19 patients in China, citizens during the peak of the pandemic, and healthcare providers.^{9,25,26} Students in their clinical years had noticeably lower anxiety and depression scores compared to those in pre-clinical years, although there was no significant difference in COVID-19-related worries between the two groups. It is recommended for support groups or online communities to be established to assist students dealing with anxiety, depression, and COVID-19-

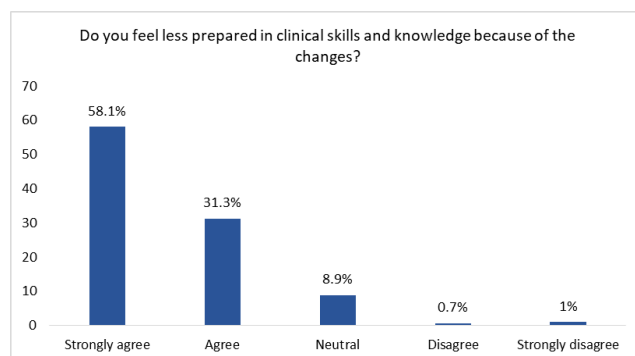
Table 4: Multiple Linear regression analysis of association between resilience, gender, academic year and anxiety, depression, COVID-19 related worries during pandemic

Variable	Anxiety		Depression		COVID-19 related worries	
	Adjusted b (95% CI)	P	Adjusted b (95% CI)	P	Adjusted b (95% CI)	P
Resilience	-0.36 (-0.43, -0.29)	<0.001	-0.12 (-0.15, -0.10)	<0.001	-0.08 (-0.17, 0.01)	0.072
Gender						
Male						
Female	2.03 (0.92 – 3.15)	<0.001	0.19 (-0.18, 0.55)	0.317	2.91 (1.48, 4.35)	<0.001
Academic year						
Pre-clinical						
Clinical	-1.17 (-2.25, -0.08)	0.035	-0.43 (-0.79, -0.08)	0.017	0.08 (-1.32, 1.47)	0.914

b= regression coefficient; 95%CI=95% confidence interval; P<0.05 is significant

Table 5: Impact of COVID-19 in teaching and learning among medical students

Variable	N (%)
How has COVID-19 affected clinical training at your medical school?	
Postponed	296 (68.7)
Cancelled	125 (29.0)
Format changed	309 (7.1)
No change	23 (5.3)
How has COVID-19 affected OSCEs (EOP exam, final examination) at your medical school?	
Postponed	187 (43.4)
Cancelled	44 (10.2)
Format changed	307 (71.2)
Venue changed	131 (30.4)
No change	55 (12.8)
How has COVID-19 affected theory examination (EOP exam, Final exam) at your medical school?	
Postponed	179 (41.5)
Cancelled	20 (4.6)
Format changed	211 (49.0)
Venue changed	132 (30.6)
No change	111 (25.8)
How has COVID-19 affected medical student electives at your medical school? (n=225)	
Postponed	118 (52.4)
Cancelled	107 (47.6)
Location changed	130 (57.8)
No change	34 (15.1)

**Figure 1:** Student's opinion on impact of COVID-19 in teaching and learning (Clinical skills and knowledge)

related concerns. Educational institutions should strive to create supportive learning environments that acknowledge students' difficulties and offer resources for adaptation. This could include mentorship programs, additional support, or online tools. To address knowledge and skill gaps resulting from changes in teaching and learning, institutions could incorporate remote learning methods and virtual simulations. While our study provided a comprehensive analysis of the impact of COVID-19 on undergraduate medical students, its limitation lies in focusing solely on one institution, making it challenging to generalize the findings.

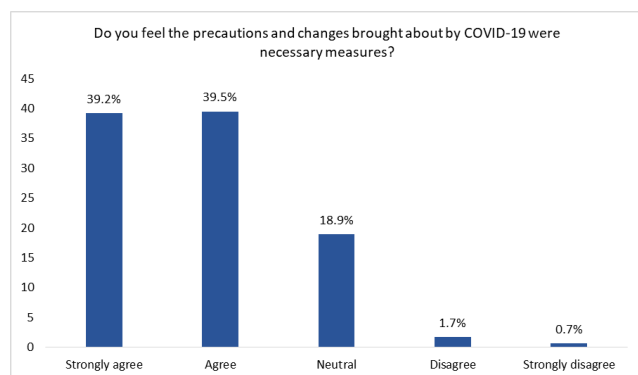


Figure 2: Student's opinion on impact of COVID-19 in teaching and learning (Precaution and changes)

5. Conclusion

The study emphasizes a significant prevalence of anxiety and depressive symptoms among medical students, varying in severity across individuals. Notably, the study underscored the pivotal role of resilience, as gauged by the resilience score, in alleviating anxiety and depression among the students.

6. Source of Funding

None.

7. Conflict of Interest

None.

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