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The Prevalence of Depression and Anxiety Among Medical Students in Taibah University During the COVID-19 Pandemic: A Cross-Sectional Study

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The COVID-19 pandemic has affected the health care system, economic sector, and social life. Studies have examined the prevalence of mental disorders related to COVID-19 in the general population, but few studies have examined this among medical students. The aim of this study was to assess the level of depression and anxiety during the COVID-19 pandemic among medical students at Taibah University. A cross-sectional study was carried out among medical students at Taibah University. A web-based survey was distributed among medical students between January to July 2021. The survey includes Patient Health Questionnaire-9 (PHQ-9) and Generalized Anxiety Disorder-7 (GAD-7) in addition to sociodemographic characteristics. Logistic regression analysis was used to assess the factors associated with anxiety and depression by calculating the odds ratios (ORs) with 95% confidence intervals (CIs). A total of 218 students participated in the study with mean age of 22±1.7 years, and 59% male students. The mean depression score was 9±6 for all participants, while it was 7±5 for anxiety. Younger age groups have a higher mean of depression score than students above 23 years, and it was higher among female students than male students. For anxiety, female students also had a higher mean anxiety score (11±6) than male students (7±5). Senior year in medical school and those with previous history of COVID had a lower risk of depression, while for anxiety, the younger age group had a high level of anxiety compared to younger students. During the COVID-19 pandemic, high depression symptoms and anxiety levels were found among junior female medical students. The university's well-being center needs to support medical students to overcome challenges and difficulties during their junior years.

Keywords: Anxiety; COVID-19; Depression; Medical; Taibah university.

` A novel viral outbreak caused by Coronavirus Disease 2019 (COVID-19) appeared in China in December 2019, and since then it has become an international public health emergency[1,2]. Many countries still face this epidemic disease, and substantial research has been published to provide a deep understanding of its epidemiology and health-related consequences. One critical aspect related to the health consequence of the COVID-19 pandemic is mental health[3]. Thus, many national preventive and precautionary measures have been implemented to reduce the spread of COVID_19

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infection, such as isolation, restriction on traveling, and avoiding handshaking. Those preventative measures have been suggested in many reports to negatively impact the population's feelings, emotions, and mental health[4].

In the literature, many studies tried to address the implication of the COVID-19 pandemic on physical and mental health among the general population and healthcare workers, especially those who work on the front line[3,5-7]. Few of those studies have examined the effect of COVID-19 on medical students or students in health-related specialties[5]. Earlier studies from China have reported a psychological impact of COVID-19 among university students. Those studies found that between 2-21% of college students experienced anxiety as a consequence of the COVID-19 pandemic[5,7].

At the national level, studies have addressed the mental health status among the general population. Zakout et al., in their research, reported a 37.67% prevalence of stress and 36.74% of anxiety among the study population during the COVID-19 pandemic[7]. However, there is a lack of studies that assess mental health during the current pandemic among medical students. Studies have generally reported that depression and anxiety disorders are five times to eight times higher in medical students than their peers[8]. In the current situation, education at different levels has been directed toward utilizing online sessions and resources. Medical students are still facing real challenges in their education process. Thus, the COVID-19 pandemic in 2020 was disrupting medical students' education with the conversing to virtual learning and the canceling of clinical rotation in hospitals, which poses extra challenges to their learning process and affecting their physical and mental health. Therefore, this study aimed to examine the prevalence of anxiety and depression among medical students at Taibah University.

METHODS

Study design and setting

An observational cross-sectional study have been conducted among medical students at Taibah University, Madinah, Saudi Arabia, between January 2021 and July 2021. The medical school at Taibah University consists of 6 years and a final year of internship. During the early month of the COVID-19 pandemic in Saudi Arabia, all universities across Saudi Arabia have been closed in which all the lectures turned to the online session. Then gradually, in 2021, universities have started to resume in-campus classes with adherence to precautionary measurement. During the study period and survey distribution, the lectures and sessions were delivered through a mixed method. The practical session was carried in campus, while the theoretical courses were delivered through the online session.

Study population and data collection

Medical students (both male and female) from the second year to internship who were enrolled in the academic year during the study period were included in this study. We utilized a convenience sampling technique and an online questionnaire to collect the response from the study participants. We estimated that we required a minimum of 212 medical students in our study based on an estimated study population of 500, 40% expected frequency, 95% confidence level, and 5% margin of error(those calculations were based on the following formula n=N x/((N-1)E2 + x) using the EPI INFO tool). This study utilized an online questionnaire sent as a google form to the participants' email. The survey consisted of three sections—the first one related to academic information and COVID-19 history of infection. The second and third parts used the Patient Health Questionnaire (PHQ-9) and Generalized Anxiety Disorder-7 (GAD-7) [9]. This questionnaire has been validated in many research related to assessing depression and anxiety [9,10]. The PHQ-9 includes nine items that represent the main criteria for the diagnosis of major depressive disorder. Each response to each question has a score based on a Likert scale rated from 0(not experienced at all), 1(Several days),2(More than half the days), and 3(Nearly every day). The total final score is out of 27, in which the higher score represents severe depression categorized as follow: normal (score below 5), mild depression (score between 5–9), moderate depression (score between 10–14), moderately severe depression (score between 15–19), or severe depression (score between 20–27). The total calculated score of the question will be varied. The GAD-7 section has seven items with a score for each question range from 0-3 based on

Likert scale rated from 0 (not experienced at all), 1 (Several days), 2 (More than half the days), and 3 (Nearly every day) in which a total score from 0 - 21. The highest score will be indicating severe anxiety, and it is categorized as minimal anxiety (score below 5), mild anxiety (score between 5–9), moderate anxiety (score between 10–14), or severe anxiety (score between 15–21). In previous studies, the internal consistency of both PHQ-9 and GAD-7 was evaluated using Cronbach's alpha (á = 0.95 for GAD-7, and á = 0.89 for PHQ-9). Both survey tools have been validated for use in community settings to measure the severity of depression and anxiety, respectively [9,10].

Ethical approval was obtained from the Research Ethics Committee at Taibah University, Saudi Arabia (STU-20-008). The students agreed on informed consent before completing the questionnaire. The online survey cover page included an explanation of the questionnaire and the consent agreement. All participants need to agree on the informed consent before they can proceed with the questionnaire.

Analysis plan

The continuous variables were described using mean and standard deviation, and for categorical variables, count and percentage were used to describe the variable. We presented the total score of depression and anxiety as mean and SD; then, we provided the categories described above in relation to gender. The percentages of responses for each item in the questionnaire were presented for the study population. Logistic regression was used to estimate the odds ratios (ORs) with 95% confidence intervals (CIs) for anxiety or depression in which the cut-off points (e"15) were used. P-value d" 0.05 will be used as a significant cut-off point. All analyses was performed using STATA 12.

RESULTS

Participant characteristics

In total, 218 students participated by completing the questionnaire. Table 1 shows the academic characteristics of the study population. The average age of the participants was 22±1.7 years, and 59% were male students. The majority of the students were from second and third years, and the mean GPA was 4.4±0.5. 83 % of the participants performed a COVID-19 PCR test in which only 25% had confirmed COVID-19 infection.

Table 1. Study population characteristics and the means of demographic characteristics, by depressive and anxiety symptom score (N = 218)

Characteristics	Total (%)	Depressive symptoms Score ±SD	Anxiety symptom Score ±SD
Age groups			
19-20	56(25.6)	11.4(5)	7.9(4)
21-22	66(30.2)	9.1(6)	7.1(6)
23-24	65(34.4)	7(.35)	6.2(4)
>25	21(9.6)	8.8(5)	7.4(4)
Gender			
Male	130(59.6)	7.7(5)	6.3(5)
Female	88(40.3)	11.0(6)	8.1(4)
Academic Year			
Second year	47(21.5)	12.1(5)	8.3(5)
Third Year	45(20)	10.8(6)	8.1(5)
Fourth Year	23(10)	7.9(6)	7.1(5)
Fifth Year	49(22)	6.3(5)	5.2(5)
Sixth Year	36(16)	6.9(5.4)	6.5(4)
Internship	18(8.2)	10(5)	7.2(4)
GPA	4.4(0.5)		
History of COVID-19	182(83)	8.8(6)	6(5)
Test of COVID-19	49(25)	7(5)	6(5)

Depression and anxiety score

The mean depression score was 9±6 for all participants, while it was 7±5 for anxiety. Younger age groups have a high mean of depression score than students above 23 years, and it was higher among female students than male students (mean score in males 7.7 while in the female it was 11) (table 1). For anxiety, female students also had a higher mean anxiety score (11±6) compared to male students(7±5).

Table 2 displays the study population's responses to the nine items of the PHQ-9. Students have responded occurrence of the following items several days affirmatively: little interest or pleasure in doing things (46%), feeling down, depressed, or hopeless(43%), and feeling tired or having little energy(44%). For the anxiety question, 41% of the participants responded that they felt nervous, anxious, or on edge for several days, 40% became easily annoyed or irritable for several days, and 35% had felt afraid of bad things that might happen several days (Table3).

Figure (1) demonstrates the proportions of normal (24%), mild (30%), moderate (25%), moderately severe (9%), and severe (5%) depression in all study population. Figure (2) demonstrates anxiety categories prevalence among the prticipants, in which the percentages of mild, moderate, and severe anxiety were 30%, 26%, and 7.3%, respectively.

The logistic regression analysis identified female students at a higher risk of depression: female (OR 2.1 95% CI 1.11-4.30) (table4) while senior year in medical school had a lower risk of depression (OR for depression of sixth-year students was 0.38 (95%CI 0.09-0.66, p-value <0.05) compared to second-year students. Students with a previous history of COVID-19 had a lower risk of depression compared to those who did not (OR 0.29, 95%CI 0.01-0.87). For anxiety, the younger age group had a high level of anxiety OR 10.51 (95%CI 0.50-5.12) for 21-22 years compared to 19-21 years. Female students have a higher risk of anxiety OR 1.03, but this was not significant (95%CI 0.40-5.12).

DISCUSSION

The current study's finding indicates that medical students experienced mild to moderate depression in relation to the COVID-19 pandemic, while they experienced mild anxiety. Junior

Table 2. Percentages of the responses to depression items

Depression symptoms	Not at all	Several days	More than half the days	Nearly every day
1- Little interest or pleasure in doing things.	51(23.3)	101(46.3)	54(24.7)	12(5)
2- Feeling down, depressed, or hopeless.	59(27.1)	94(43.1)	51(23.3)	14(6.4)
3- Trouble falling or staying asleep, or sleeping too much.	66(30.2)	78(35.7)	49(22.4)	25(11.4)
4- Feeling tired or having little energy.	46(21.1)	97(44)	48(22)	27(12.3)
5- Poor appetite or overeating.	74(33.9)	73(33.4)	47(21.5)	24(11.0)
6- Feeling bad about yourself, or that you are a failure or have let yourself or your family down.	78(35.7)	83(38.1)	37(16.9)	20(9.1)
7- Trouble concentrating on things, such as reading the newspaper or watching television.	84(38.5)	64(29.3)	50(22.9)	20(9.1)
8- Moving or speaking so slowly that other people could have noticed? Or the opposite-being so fidgety or restless that you have been moving around a lot more than usual?	110(50.4)	59(27.1)	44(20.1)	5(2.2)
9- Thoughts that you would be better off dead or of hurting yourself in some way	138(63.3)	38(17.4)	29(13.3)	13(5.9)

medical and female students were more likely to have depression compared to their counter partners. Similarly, younger, preclinical, and female students have a high level of anxiety than senior medical students and male students, respectively. This indicated that the COVID-19 pandemic and related educational policies affected the students psychologically. In comparison to previous studies, medical students face a considerable amount of psychological stress, which, if not managed well, can lead to mental discords, including anxiety, stress, burnout, and depression. Several reports evaluated those discords among medical students and compared them to non-medical students. A meta-analysis study reported that medical students exhibit an anxiety rate between 29%-38% [11,12]. Other reports indicated that with the COVID-19 pandemic, medical students have an additional source of stress [13]. This can explain the increased percentage of depression and anxiety among second-year students compared to senior students in the current study. Thus, studies reported that after transitioning from traditional learning to online learning due to the pandemic, depression and anxiety increased [7,13].

The finding of this study is comparable to other studies that reported a prevalence of depression between 30 to 24% [11,14]. In addition, many studies have reported that depression and anxiety level scores tend to be higher in preclinical years compared to clinical years [15-17]. This finding is consistent with the result of this study. However, it should be noted that the difference in depression tools utilized in previous studies can explain

Table 3. Percentages of the responses to anxiety items

Anxiety symptoms	Not at all	Several days	More than half the days	Nearly every day
1- Feeling nervous, anxious or on edge	68(31.1)	91(41.7)	47(21.5)	12(5)
2- Not being able to stop or control worrying	80(36.7)	69(31.5)	56(25.6)	13(5.9)
3- Worrying too much about different things	69(31.6)	76(34.8)	46(21.1)	27(12.3)
4- Trouble relaxing	80(36.7)	74(33.9)	48(22.2)	16(7.3)
5- Being so restless that it is hard to sit still	99(45.4)	68(31.1)	39(17.8)	12(5.5)
6- Becoming easily annoyed or irritable	65(29.8)	88(40.3)	44(20.1)	21(9.6)
7- Feeling afraid as if something awful might happen	82(37.6)	78(35.7)	36(16.5)	22(10.1)

Table 4. Logistic regression analysis of predictor of depression and anxiety

Characteristics	Odd Ratio (95%CI) for depression	Odd Ratio (95%CI) for anxiety
Gender		
Male	0	1
Female	2.19(1.11-4.30)	1.03(0.40-2.83)
Age groups		
19-21	1	1
21-22	0.86(0.38-1.93)	1.61(0.50-5.12)
23-24	0.25(0.19-0.67)	0.27(0.05-1.49)
>25	0.21(0.10-1.61)	0.51(0.05-4.63)
Year		
Second Year	1	1
Third Year	0.87(0.36-2.09)	0.66(0.17-2.53)
Fourth Year	0.40(0.11-1.4)	0.56(0.12-3.50)
Fifth Year	0.12(0.33-0.47)	0.44(0.10-1.89)
Sixth Year	0.17(0.04-0.66)	0.40(0.7.2.21)
Internship	0.38(0.09-1.53)	-
Have COVID-19	0.29(0.10-0.87)	0.72(0.19-2.62)

the variation in the prevalence in this study and others[14].

Previous epidemiological studies have indicated that female students were more likely to have depression compared to their counterpart male students. Studies indicated that females, in general, are more vulnerable to stress leading to an increase in their risk to develop depression and other mental illnesses compared to men[18]. Therefore, it is expected that this risk will increase with the additive stress of COVID-19. This finding is consistent with many international studies that

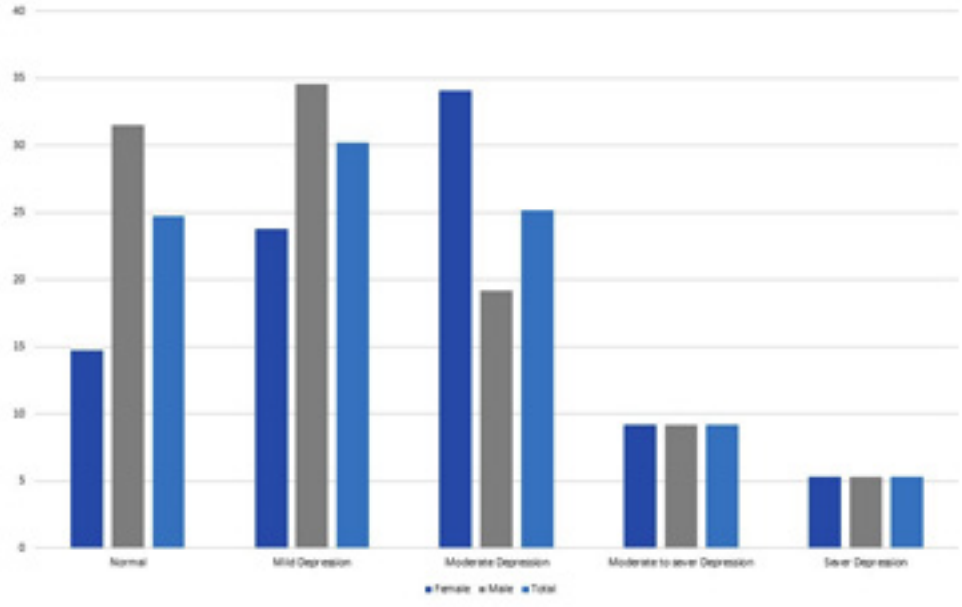

Fig. 1. The percentages of depression categories for all study population and stratified by gender

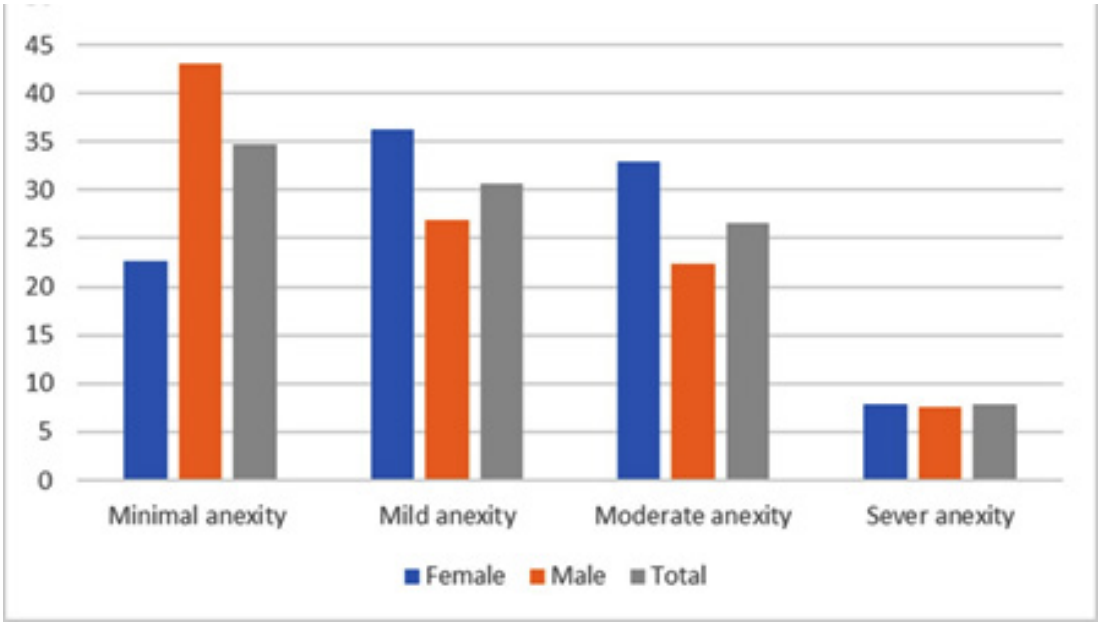

Fig. 2. The percentages of anxiety categories for all study populations and stratified by gender

showed that females and younger undergraduate students had higher scores of depression[18]. Many cross-sectional studies have suggested a number of factors that may have contributed to the high levels of depression and anxiety among younger medical students during COVID-19. Most of those factors is related to lockdown measurements, social restriction, economic status, mode swinging due to absence of friends and family relationship, and lack of exercise[19].

The results of previous studies showed that those who get infected with COVID-19 were at higher risk of psychiatric distress levels. A meta-analysis study reported that the prevalence of depression was 33.7% (95% CI: 27.5–40.6) in the general population compared to anxiety which was much higher (prevalence of 31.9% (95% CI: 27.5–36.7)[20]. Although studies indicated that undergraduate students were at higher risk of developing depression due to the transition to online platforms, the current study finding found a lower risk in those with a previous history of COVID-19. However, the magnitude of this is not high as the upper margin of the 95%CI is nearly to zero. Adding to this it is possible that those who had COVID-19 were less worried about getting infected compared to those who did not have a history of COVID-19.

There are many limitations of this study that need to be addressed. First, the current study did not collect information on other confounders or variables that may increase the level of depression or anxiety among the medical students due to the study's observational nature. For an instant, the socioeconomic stayed and financial status of the students. Additionally, the finding of this study mainly focused on medical students and cannot be generalized to another specialty at university. We anticipated that medical students have more pressure to perform well during the university years and maintain their academic performance, which may contribute to increase the anxiety level compared to other students from other colleges. Additionally, this study collected information from one educational institution, caustion regarding the generalization of the study should be considered. On the other hand, we utilized a validated survey in this study, reflecting a more precise measurement for the study outcome.

CONCLUSION

This is one of the few studies that aim to understand the psychological effects of COVID-19 on medical students. Female students have a higher mean score of depression and anxiety compared to male students. Also, junior students compare to senior students have a higher mean score of depression and anxiety. More studies of students of other majors are needed to establish whether these are specific to medical students or all students in general. The university's well-being center needs to support medical students to overcome challenges and difficulties during their junior years. This point is essential as those medical students will be future doctors involved in patient care and management.

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Ethical approval

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Authors contributions

HA supervise the project, initiate the research idea, validate the results and design the study. MO,IA,MB,MT, and MM contributes to the study design, data collection and analysis of the data. MO initiate the first draft of the manuscript, HA, MO,IA,MB,MT, and MM contribute to the manuscript writing. All authors reviewed and approved the final version of the manuscript.

Conflict of Interest

All authors have no conflict of interest.

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