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Original Article

Depression and Anxiety among Iranian Medical Students during COVID-19 Pandemic

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Abstract

Objective: COVID-19 has spread throughout the world and has become a global pandemic. This situation can cause psychological distress among people, especially health care workers.
This study aimed to determine depression and anxiety levels among Iranian medical students during the COVID-19 pandemic.
Method: In this cross sectional study, we designed an online survey of Beck Anxiety Inventory (BAI) and Beck Depression Inventory (BDI) questionnaires. The survey link was sent to 500 medical clerks and interns studying at Tehran University of Medical Sciences (TUMS).
Results: A total of 64.6% of the students completed the survey. The prevalence of mild to severe anxiety and depression among them was 38.1% and 27.6%, respectively. Anxiety and changes in sleep patterns were the most common symptoms. Higher levels of anxiety were related to female gender, lower grade point average (GPA), and experience of COVID-19 symptoms. Students with lower GPA and prior experience of COVID-19 symptoms were more likely to feel depressed.
Conclusion: Depression and anxiety did not significantly differ among Iranian medical students before and after the COVID-19 outbreak. Somatic symptoms of depression are more common during this pandemic and need particular attention in future similar situations. A higher GPA is related to lower anxiety and depression among medical students.

Key words: *Anxiety; Coronavirus; Depression; Medical; Pandemics; Students*

In December 2019, a cluster of patients was reported with fever, cough, and symptoms of pneumonia in Wuhan, China, which led to recognition of a novel Coronavirus, named as SARS-COV-2 (1, 2). Since then, this virus has spread throughout the world and to date, more than 2 million people have been affected (1). On March 11, 2020, World Health Organization (WHO) declared the situation as a global pandemic (3).

There are many concerns about the rapid transmission and fatality of this virus, which impose much psychological burden on the health care workers (4). Psychological effects of the Severe Acute Respiratory Syndrome (SARS) epidemic, which was similar to the current situation, are well studied. For instance, in a study conducted by Lung et al, 17.3% of health care workers reported psychological symptoms after the outbreak was controlled (4). Similarly, long-term psychological consequences, such as posttraumatic stress disorder (PTSD), have been reported among the health care workers who had close contacts with patients affected by SARS disease (5).

During this pandemic, the prevalence of anxiety, fear, depression, insomnia, somatization, and obsessive-compulsive symptoms have been higher among health care workers (6-9), especially among those who work in high-risk units, such as emergency department (ED) and intensive care unit (ICU) (6).

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Extended work shifts, lack of adequate personal protective equipment (PPE), and higher exposure risk to the SARS-COV-2 virus are some of the causes of higher psychological symptoms among health care workers (10, 11).

In a study conducted by Cao et al, 25% of medical students in China showed different levels of anxiety (12).

The medical students' clinical experience starts from clerkship. Clerks are considered as a part of the clinical team (13). This new role may impose psychological pressure on them, which increases during a crisis. For example, psychological distress such as anxiety has been reported among medical students during the SARS epidemic, particularly among junior students (14). On the other hand, medical interns who are the final year medical students are at the front line in visiting patients, which can lead to a high level of stress resulting in anxiety and depression. A crisis like the current COVID-19 pandemic can intensify tensions due to the risk of exposure to the virus, limitations of educational programs, higher workloads, and concerns about lack of protective equipment.

Since no data are available on psychological status of Iranian medical students during the present pandemic, this study aimed to determine the presence and level of depression and anxiety among TUMS students (clerks and interns) during the COVID-19 pandemic. The present study results can help educational stakeholders understand students' mental status and plan interventions to face such issues during the present and future pandemics.

Materials and Methods

We designed a cross sectional study conducted from April 8 to April 10, 2020, about 2 months after the confirmation of the first COVID cases in Iran. This was an online survey.

Questionnaire

We used Beck Anxiety Inventory (BAI) and Beck Depression Inventory-Ⅱ (BDI-Ⅱ) questionnaires to evaluate anxiety and depression, respectively. BAI has been shown to be a reliable and valid tool for measuring anxiety and has a high internal consistency (15, 16). BAI consists of 21 items, each evaluating the presence of a symptom during the past week. Items can be answered on a 4-point scale from 0 to 3, with 0 indicating the respondent had no symptom, and 1, 2, and 3 indicating that the respondent has experienced mild, moderate, and severe symptoms. Total score is the sum of all and is calculated out of 63. Total scores of 0 to 9 are considered as normal, 10 to 18 mild to moderate, 19 to 29 moderate to severe, and 30 to 63 as severe anxiety (17). BAI is translated to Persian by Kaviani et l. The Persian version of the BAI has good test-retest reliability ($r = 0.83$, $P<0.001$) and adequate validity ($r = 0.72$. $P < 0.001$). The Persian version of BAI has excellent internal consistency with Cronbach's alpha of 0.92. (18). We used the Persian version of BAI in this study .

BDI-Ⅱ is the second version of the BDI, which was designed by Beck et al in 1996 (19). The original version of BDI-Ⅱ is a reliable and valid tool for evaluating depression (20). This questionnaire consists of 21 items, and each assesses a symptom related to depression during the past 2 weeks. Each item is scored on a 4-point scale from 0 to 3, with higher scores indicating severe symptoms. The total score is the sum of scores of all items and is calculated from 63 (21). A total score of 0 to 13 indicates minimum, 14 to 19 mild, 20 to 28 moderate, and 29 to 63 severe depression (19). BDI-Ⅱ was translated to Persian by Ghassemzadeh et al. The Persian version of BDI-Ⅱ has good internal consistency (Cronbach's Alpha = 0.87), adequate test-retest reliability ($r = 0.74$), and adequate concurrent validity ($r = 0.77$) (21). The Persian version of BDI Ⅱ was used in our study .

Demographic characteristics of participants, including age, gender, marital status, place of living, curricular phase (clerkship or internship), and grade point average (GPA), were asked via the questionnaire. We also asked whether the participants were involved in the management of COVID patients in special wards or the emergency department, and whether they experienced COVID-19 symptoms like fever, cough, dyspnea, or gastrointestinal symptoms .

Participants

Medical doctor (MD) program in TUMS consists of 4 different phases: basic sciences, physiopathology courses (organ-based), clerkship, and internship. Basic sciences and physiopathology courses are preclinical (13). About 500 medical clerks and 500 medical interns have been studying in different hospitals of TUMS at the time of this study. A sample of 250 clerks and 250 interns were selected randomly to attend our study. In the first step, we sent messages explaining the study rationale, goals, and design to selected medical students via social platforms. It was mentioned that participation in the online survey was voluntary and that anonymity was preserved. The survey's link was sent to all students who were willing to participate in the study.

Data Analysis

We calculated the percentage of students who suffered from different levels of anxiety and depression, and we also calculated the percentage of all related symptoms in all participants and each subgroup (clerks, interns) separately. We compared the results of the interns between those who worked in COVID-19 hospital units and those who did not. Spearman correlation test was used to determine whether depression and anxiety are related to age and GPA. We used Pearson correlation test to determine whether BAI and BDI-Ⅱ have relations with age and GPA. Ordinal regression analyses were used to determine factors associated with a higher level of anxiety and depression. We considered a

qualitative scoring system of GPA for regression, in which GPAs higher than 17 are considered as A and less than 17 as B. We set the level of significance at 0.05.

Results

A total of 323 medical students have completed the questionnaire (response rate = 64.6%); 37.2% of them were clerks and 62.8% interns. The mean age of participants was 23.73 (SD = 1.62), and 47.7% of them were male and 52.3% female. Also, 15.8% of participants were married and 84.2% single. The mean GPA was 16.9 (SD = 1.07). At the time of the study, 28.5% of the participants were living at the dormitory, 16.4% were living alone at home, and 55.1% were living with their families at their parents' home .

Also, 200 participants (61.9%) did not have anxiety, 77 (23.8%) had mild to moderate anxiety, 31 (9.6%) moderate to severe, and 15 (4.6%) severe anxiety. The prevalence of anxiety among medical clerks and medical interns were 35.8% and 37.2%, respectively. Inability to relax (65.9%), being terrified or afraid (63.5%), and being scared (60.7%) were the most common reported symptoms.

Also, 234 participants (72.4%) did not have depression, 54 had mild (16.7%), 26 moderate (8%), and 9 severe (2.8%) depression. The prevalence of depression among medical clerks and medical interns was 27.5% and 27.6%, respectively. Changes in sleep pattern (74.3%), loss of energy (53.6%), and difficulty in concentration (51.1%) were the most common reported symptoms .

The prevalence of anxiety and depression based on demographic characteristics is presented in Table 1. Depression and anxiety were more prevalent among those who had experienced COVID-19 symptoms than those who did not ($P < 0.05$). Anxiety was more common in females than in males ($P < 0.001$). The prevalence of depression and anxiety among medical interns, based on working in COVID-19 wards, is presented in Table 2.

GPA was negatively correlated with anxiety and depression levels with Spearman's coefficient of -0.273 ($P < 0.001$) and -0.179 ($P = 0.001$), respectively, which means those with higher GPA experienced less anxiety and depression. Age had no significant correlation with depression and anxiety ($P > 0.05$).

Factors affecting anxiety and depression in medical interns and medical clerks, according to the results of the regression analysis, are presented in Tables 3 and 4, respectively.

Discussion

We evaluated the prevalence and severity of anxiety and depression among TUMS medical students .

The prevalence of anxiety among medical students was 38% in our study, which is not much different from the previous studies conducted in Iran before the COVID-19 outbreak (22-24). We conducted our study about 2 months after the COVID-19 outbreak in Iran. During the outbreak, the medical clerkship program consisted of online courses, and the presence of clerks in the clinical fields will be after the outbreak. There was a reduction in the number of interns' shifts and their presence in hospitals was minimized. It seems minimizing students' presence in the clinical settings and their exposure to COVID-19 patients helped control anxiety symptoms, and this can explain why there was no difference between the anxiety level of medical students before and after the outbreak. In other words, the prevalence of anxiety in our study can be attributed to previous psychological issues among medical students .

The prevalence of anxiety was higher among Iranian medical students (38%) compared to Chinese medical students (24.9%) (12). Similar findings noted before the COVID-19 outbreak as anxiety was less prevalent among Chinese medical students (21%) (25) compared to Iranian students (39%) (22). Higher anxiety among Iranian medical students during the COVID-19 outbreak can also be attributable to previous psychological issues.

Fear of the worst outcome, being nervous and scared were the most common anxiety-related symptoms in a non-pandemic situation (26). There is a shift in symptoms, as inability to relax and being terrified were the most common symptoms in our study, indicating different manifestations of anxiety in a pandemic situation. Lack of adequate PPE (27) and more exposure to COVID-19 patients may be the reason for this shift, which led medical students to feel frightened.

In our study, anxiety was more prevalent among females than in males ($P < 0.001$), in contrast with the study by Cao et al, where no significant difference was reported between genders in this regard (12). A study of anxiety in Iran did not show any significant difference between females and males' anxiety levels (22). In previous studies, with the same perceived stressors among medical students, anxiety levels were higher among females (28). Such findings may indicate males and females respond differently to stressors. As there was no difference between males and females before the COVID-19 outbreak in Iran, the difference between males and females' anxiety levels may be attributed to their different responses to new situations.

Lower GPA was related to higher anxiety among medical students, which is in line with what Nahar et al reported before the COVID-19 outbreak (29). This difference may be due to preexisting psychological issues, especially among medical clerks with lower GPA, which was the best predictor for the development of anxiety compared to other variables in our study (OR = 5.8). In addition, according to Iran medical education curriculum, theoretical exams and global rating forms are used to evaluate medical students before internship in which only global rating forms in limited courses are being used. As a result, grades and GPA's effect on students can be more prominent before their internship. Another explanation for lower anxiety among those with higher GPAs can be due to the fact that they are more

committed to self-education, which can lead to higher knowledge about COVID-19. Higher knowledge of COVID-19 in this group may be the reason for their lower anxiety as information can decrease anxiety (27).

Experiencing COVID-19 symptoms was a determining factor for the development of anxiety among medical clerks. Adaptation to the situation can reduce anxiety (30). After practicing in COVID-19 units for a while, medical interns seemed to adapt to the new situation, which may be the reason why COVID-19 symptoms were not related to anxiety in medical interns in contrast to medical clerks .

In our study, the prevalence of depression among medical students was 27.6%. The mean BDI scores among medical students ranged from 8.45 to 10.76 in studies before the COVID-19 outbreak in Iran (23, 31). This may indicate a preexisting depressed mood among some students as there is no change before and after the COVID-19 outbreak. As long-term psychological issues were similar to the SARS outbreak (5) and this study was conducted during the acute phase of the pandemic, further studies are needed to assess the long-term incidence of depression among medical students. The prevalence of depression among medical staff during the COVID-19 pandemic ranged from 12.1% to 59.1% in different studies (6, 8, 32). Different evaluation tools, groups of medical staff, and study locations may be responsible for these diverse outcomes and make it hard to compare studies .

No significant difference was observed between genders in depression, which is line with previous studies on medical staff during COVID-19 outbreak (8). Overall, depression is more common among females compared to males (33). As there was no significant difference between the prevalence of depression between genders in the studies directing medical students, it seems gender is not the determining factor for the development of depression among Iranian medical students .

Crying, self-criticalness, and feeling of punishment were the most common depressive symptoms among medical students before the COVID-19 outbreak (26). Changes in the sleep pattern, loss of energy, and concentration difficulty were the most common depressive symptoms in our study, which indicate a shift to somatic symptoms (34) during the outbreak. More tension in the working environment and higher workload in shifts despite the reduction in the number of shifts may be the reason for the shift of symptoms. This may also suggest a need for more attention to somatic symptoms during such pandemics, as these symptoms may be signs of an underlying psychological problem and precede other symptoms. As medical interns' workload during pandemics may be more substantial than typical situations, distinguishing such symptoms from expected fatigue may be challenging .

Lower GPA was related to a higher prevalence of depression among medical clerks. In contrast, the experience of COVID-19 symptoms was the most influencing factor for the development of depression among medical interns. Such difference may indicate depression among medical clerks is attributable to preexisting depressed mood, but the environment influences depression more among medical interns .

According to the present study, the prevalence of depression and anxiety did not significantly change during the current pandemic among medical students. In addition to what discussed above, there may be several other reasons for these findings. First, according to official reports, the disease was well controlled in Iran compared to other countries in terms of mortality rate and patient admission (1). Second, the level of depression was higher among Iranian medical students than in other countries before the COVID-19 pandemic (12, 22-24); this was probably due to the long duration of the educational program, uncertainty of future career following graduation, and lower satisfaction during training, especially during internship. As a result, the change COVID-19 had caused in other countries may be more significant compared to Iran, which has led to an increase in the prevalence of anxiety and depression.

Table 1. Prevalence of Depression and Anxiety Based on Demographic Items

		Number (Percent)	Anxiety				Chi squared test	Depression				Chi squared test
			Normal	Mild to moderate	Moderate to severe	Severe		Minimal	Mild	Moderate	Severe	
Stage of education	Clerkship	120 (37.2%)	77 (64.2%)	23 (19.2%)	12 (10%)	8 (6.7%)	P=0.306	87 (72.5%)	20 (16.7%)	9 (7.5%)	4 (3.3%)	P=0.964
	Internship	203 (62.8%)	123 (60.6%)	54 (26.6%)	19 (9.4%)	7 (3.4%)		147 (72.4%)	34 (16.7%)	17 (8.4%)	5 (2.5%)	
Gender	Female	169 (52.3%)	85 (50.3%)	50 (29.6%)	20 (11.8%)	14 (8.3%)	P<0.001	116 (68.6%)	28 (16.6%)	20 (11.8%)	5 (3%)	P=0.07
	Male	154 (47.7%)	115 (74.7%)	27 (17.5%)	11 (7.1%)	1 (0.6%)		118 (76.6%)	26 (16.9%)	6 (3.9%)	4 (2.6%)	
Marital status	Single	272 (84.2%)	168 (61.8%)	65 (23.9%)	28 (10.3%)	11 (4%)	P=0.529	193 (71%)	48 (17.6%)	23 (8.5%)	8 (2.9%)	P=0.59
	Married	51 (15.8%)	32 (62.7%)	12 (23.5%)	3 (5.9%)	4 (7.8%)		41 (80.4%)	6 (11.8%)	3 (5.9%)	1 (2%)	
Place of living	Dormitory	92 (28.5%)	66 (71.7%)	15 (6.3%)	7 (7.6%)	4 (4.3%)	P=0.297	63(68.5%)	17 (18.5%)	7 (7.6%)	5 (5.4%)	P=0.621
	Alone at home	53 (16.4%)	33 (62.3%)	13 (24.5%)	6 (11.3%)	1 (1.9%)		40 (75.5%)	9 (17%)	3 (5.7%)	1 (1.9%)	
	Home with family	178 (55.1%)	101 (56.7%)	49 (27.5%)	18 (10.1%)	10 (5.6%)		131 (73.6%)	28 (15.7%)	16 (9%)	3 (1.7%)	
Experiencing COVID-19 symptoms	No	263 (81.4%)	174 (66.2%)	60 (22.8%)	22 (8.4%)	7 (2.7%)	P<0.001	200 (76%)	38 (14.4%)	17 (6.5%)	9 (3%)	**P=0.009**
	Yes	60 (18.6%)	26 (43.3%)	17 (28.3%)	9 (15%)	8 (13.3%)		34 (56.7%)	16 (26.7%)	9 (15%)	1 (1.7%)	

Table 2. Prevalence of Depression and Anxiety Based on Working in COVID-19 Wards or Emergency Department

		Number (Percent)	Anxiety				Chi squared test	Depression				Chi squared test
			Normal	Mild to moderate	Moderate to severe	Severe		Minimal	Mild	Moderate	Severe	
Work in COVID-19 ward	No	113 (55.7%)	67 (59.3%)	34 (30.1%)	10 (8.8%)	2 (1.8%)	P=0.335	78 (69%)	20 (17.7%)	11 (9.7%)	4 (3.5%)	P=0.512
	Yes	90 (44.3%)	56 (62.2%)	20 (22.2%)	9 (10%)	5 (5.6%)		69 (76.7%)	14 (15.6%)	6 (6.7%)	1 (1.1%)	
Work in respiratory emergencies department	No	161 (79.3)	93 (58.8%)	47 (29.2%)	15 (9.3%)	6 (3.7%)	P=0.366	114 (70.8%)	27 (16.8%)	16 (9.9%)	4 (2.5%)	P=0.466
	Yes	42 (20.7%)	30 (71.4%)	7 (16.7%)	4 (9.5%)	1 (2.4%)		33 (78.6%)	7 (16.7%)	1 (2.4%)	1 (2.4%)	

Table 3. Results of Multiple Ordinal Regressions of the Factors Affecting Anxiety and Depression among Medical Interns

Variable			OR	SE	P value	95%-CI
Anxiety	Gender	Female	2.26	0.294	0.006	1.27-4.02
		Male+				
	GPA	Less than 17	2.01	0.287	0.014	1.15-3.53
		17 or higher+				
Depression	Experiencing COVID-19 symptoms	Yes	2.28	0.351	0.019	1.14- 4.54
		No				

+Reference group. OR = Odds ratio, SE = Standard Error, 95%-CI = 95%- Confidence Interval.

Table 4. Results of Multiple Ordinal Regressions of the Factors Affecting Anxiety and Depression among Medical Clerks

Variable			OR	SE	P value	95%-CI
Anxiety	Gender	Female	3.63	0.437	0.003	1.54-8.55
		Male+				
	GPA	Less than 17	5.8	0.444	<0.001	2.43- 13.85
		17 or higher+				
	Experiencing COVID-19 symptoms	Yes	5.11	0.532	0.002	1.8-14.49
		No*				
Depression	GPA	Less than 17	4.7	0.446	0.001	1.96-11.25
		17 or higher+				

+Reference group. OR = Odds ratio, SE = Standard Error, 95%-CI = 95%- Confidence Interval.

Limitation

We assessed anxiety and depression among TUMS medical students 2 months after the outbreak. As psychological disorders can become chronic, we suggest future follow-up studies to assess the long-term psychological consequences of COVID-19 on medical students. We only assessed medical students studying at TUMS. As there are differences in the prevalence of anxiety and depression in other universities and hospitals, we suggest future works to assess the psychological consequences of COVID-19 in different regions of Iran. Different universities in Iran also had different strategies during the pandemic, and the presence of medical interns and clerks differed in different universities of Iran. As a result, medical students, especially medical interns, had different levels of exposure to COVID-19 patients and management rules. Hospitals throughout Iran provided different extents of PPE. Because of such differences between hospitals and universities in Iran, the results of the current study may not be generalizable to other students studying in other universities. Future studies need to assess depression and anxiety among medical students studying in other universities.

Conclusion

Depression and anxiety did not significantly differ among Iranian medical students before and after the COVID-19 outbreak. Somatic symptoms of depression are more common in the pandemic situation and need specific consideration in future similar situations. Higher GPA was related to lower anxiety among clerks, which may be due to more knowledge of COVID-19, and interventions can address this issue. This study also emphasizes the importance of medical students' mental health, and there is a need for education to help medical students cope better in crises such as the current pandemic situation.

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Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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