




ORIGINAL PAPER
INFECTIOUS DISEASES

The deep impact of the COVID-19 pandemic on medical students: An online cross-sectional study evaluating Turkish students' anxiety

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Abstract

Aim: Coronavirus Disease 2019 (COVID-19) changed the delivery of medical education in Turkey by moving to an emergency remote teaching system and led to many challenges for future doctors. In this study, we aimed to explore the impact of the COVID-19 pandemic on medical students, to assess their anxiety level and their main anxiety sources related to this pandemic.

Methods: A Google Form was distributed to medical students using the virtual snowball sampling method. The form included the Beck Anxiety Inventory and additional 19 questions on sociodemographic characteristics, perceived level of knowledge about the epidemic, self-risk perceptions of COVID-19 and their anxiety levels about some other topics related to COVID-19.

Results: Overall, 3105 medical students with a mean age of 22.37 ± 2.46 , took the survey. Amongst the participants, only 32% of the students defined their knowledge about the precautions that should be taken during an epidemic disease as acceptable. Students reported highest anxiety level for the continuing spread of COVID-19 in Turkey and transmitting coronavirus to another person. Clinically significant anxiety prevalence was 23.2%. Regression analysis revealed that factors that increased the risk of being anxious included being female, being other than a 5th-year student, thinking that being a medical student would increase the risk of coronavirus transmission or being uncertain about it, being exposed to a patient with COVID-19 or being uncertain about it, being anxious about the continuing spread of COVID-19 in Turkey, being anxious about acquiring COVID-19, being anxious for graduating and being on active duty, being anxious about a medical training interruption.

Conclusion: Our results suggest that anxiety is prevalent amongst Turkish medical students during the COVID-19 pandemic and they have a weak preparedness for a pandemic such as COVID-19. Based on our results, new strategies should be implemented for medical education and for alleviating students' anxiety levels.

What's known

The COVID-19 pandemic affected almost every aspect of life including education. COVID-19-related policies changed the delivery of medical education in Turkey by moving to an emergency remote teaching system. During this period medical students were faced with many uncertainties and challenges, the major one being the loss of the opportunity for clinical training at the bedside because of the limitations of the virtual education system.

What's new

For Turkish medical students, the most disturbing issues related to COVID-19 were the continuing spread of the virus throughout the country and the fear of transmitting the virus because of having asymptomatic and undiagnosed COVID-19. Being female, being other than a 5th-year student, having higher risk perception about COVID-19, concern about graduating and going on active duty, and concern about medical training interruption were risk factors for experiencing anxiety.

1 | INTRODUCTION

The first Coronavirus Disease 2019 (COVID-19) was detected in Turkey on 10 March 2020. On the following day, the World Health Organization declared COVID-19 a pandemic.¹⁻³ Following this, the Turkish government implemented several measures to control the infection, including closing all schools and universities starting from March 16th. While the initial plan was to suspend education for only three weeks, the remote teaching system was initiated as an emergency action when the number of cases and deaths increased.^{1,2}

During the pandemic, medical students were faced with many uncertainties and challenges and they lost the opportunity for clinical training at the bedside because of the transition to virtual learning.⁴ Personal experience gained in the clinic is a major factor for the selection of a specialty in medicine. Given the fact that many residents regret their initial selection, making a decision may now be even more challenging.^{5,6} The paradox between the lack of bedside training and the anticipation of serving in the pandemic might have increased the anxiety level of last year students and weakened their preparedness for fighting against the COVID-19 pandemic with this new education system—a problem that has been discussed by educators in Turkey⁷⁻⁹ and globally.¹⁰

This study aimed to investigate the impact of the COVID-19 pandemic on medical students, to assess their anxiety level and their main concerns related to this pandemic.

2 | MATERIALS AND METHODS

This study was performed in collaboration with the Departments of Infectious Diseases and Clinical Microbiology, and Psychiatry, Ege University Faculty of Medicine.

2.1 | Participants

The sample consisted of 3105 medical students who volunteered to take part in the survey. A virtual snowball sampling method was

used. Initially, the link of the questionnaire was sent to the representatives of each class in the Ege University by a telephone message and they were asked to share the link with their classmates. The students at other medical universities in the same geographic region were accessed through their academic staff members who shared the link with their students. In addition, the second author who is a medical student, shared a link to the questionnaire in medical students' social networks. All participants were asked to send the questionnaire to other medical students in their networks. All responses meeting inclusion criteria were analysed. Inclusion criteria were as follows: (1) being a medical student, (2) above 18 years of age, (3) agreeing to volunteer to take part in the survey.

2.2 | Procedure

Participation in this study was anonymous and informed consent was obtained. This study was approved by the Ege University Research Ethics Committee (Date: 6/4/2020, Number: 99166796). Data were collected between 6th of April and 7th of May 2020, before the return to normalisation in Turkey.

A Google Form was designed for data collection including 19 questions on sociodemographic characteristics, students' perceived level of knowledge about the epidemic, preventive measures they were practicing, their anxiety levels and sources of worries. Participants were requested to rate their anxiety level on a scale between 1 and 10, about the continuing spread of COVID-19 in Turkey, acquiring COVID-19, transmitting coronavirus to another person and experiencing a medical training interruption. Also, students were asked to complete the Beck Anxiety Inventory (BAI), which is a 21-item self-report test measuring the severity of anxiety.¹¹ BAI scores can range from 0 to 63, with higher numbers suggesting greater degrees of anxiety. The recommended clinical classification of scoring results are as follows: 0-7 suggests minimal anxiety, 8-15 suggests mild anxiety, 16-25 suggests moderate anxiety and 26-63 suggests severe anxiety.¹² The suggested cut-off for clinically significant anxiety on the BAI is 16 and the students who had a BAI score higher

than 16 were defined as “anxious” in our study.¹³ The Turkish version of BAI was found to be valid and reliable.¹⁴

2.3 | Statistics

Data analyses were performed by the IBM Statistical Package for Social Sciences (SPSS), version 21 for Windows. The Kolmogorov-Smirnov test was used to test normality. Quantitative variables with normal distribution were expressed by mean and standard deviations (SD) and the variables with skewed distribution were expressed by the median and minimum-maximum values. Categorical variables were presented by frequencies and percentages. Mann-Whitney U or Kruskal Wallis tests were used to compare quantitative data. For comparison of qualitative data, the χ^2 test or Fisher's-exact test was used. Spearman's rank test was used to assess correlations between continuous variables. We calculated the optimal cut-off values of the student-reported anxiety levels for four stated conditions at the receiver operating characteristics curve (ROC) and Youden index J analysis. A *P* value of $<.05$ was considered statistically significant. For multivariate analysis, a backward stepwise logistic regression procedure was performed, including the variables which were found to be associated with experiencing anxiety in the univariate analysis. To measure the internal consistency reliability of the BAI in the studied sample Chronbach's alpha test was used.

3 | RESULTS

Overall, 3105 medical students from 70 different universities took the survey. Sociodemographic characteristics and the responses of the students are shown in Table 1.

3.1 | Anxiety levels of the students

Students were requested to rate their anxiety levels, for the stated conditions related to the COVID-19 pandemic. The lowest anxiety level recorded was for acquiring COVID-19 (Table 2). All reported anxiety levels were inter-correlated (Table 3).

Cut-off scores of reported concern levels for being anxious (BAI score higher than 16) were determined for the logistic regression analysis. Calculated cut-off scores at the ROC curve were 6 for anxiety about acquiring COVID-19 (area under ROC curve [AUC] = 0.642, *P* < .0001), 8 for anxiety related to an education interruption (AUC = 0.581, *P* < .0001), 8 for anxiety related to transmitting COVID-19 to another person (AUC = 0.58, *P* < .0001) and 8 for anxiety related to the continuing spread of the virus in Turkey (AUC = 0.591, *P* < .0001).

According to the clinical classification of BAI scores, 1542 (49.7%) students had minimal anxiety, 844 (27.2%) had mild anxiety, 466 (15%) had moderate anxiety and 253 (8.1%) had severe anxiety. Overall, 719 (23.2%) students were defined as being “anxious.”

3.2 | Factors associated with anxiety

We analysed the differences between the students who were and were not anxious (Table 4). There was no linear association between the prevalence of anxious students and the year of the medical school and there was no significant difference between the groups when the first three-year (preclinical phase) students were compared with the last three-year (clinical phase) students (*P* = .398, $\chi^2 = 0.715$). The prevalence of anxious students was lower amongst the fifth-year students compared with the remaining years (*P* = .001, $\chi^2 = 11.257$). There were fewer anxious students in the groups with acceptable knowledge about the preventive measures that should be taken during an epidemic (*P* = .016, $\chi^2 = 5.795$) or about COVID-19 (*P* = .008, $\chi^2 = 7.106$) compared with those with lower than acceptable knowledge. Students who thought a SARS-CoV-2 infection would not lead to a serious health problem for themselves because they were young (*P* = .001, $\chi^2 = 12.036$), or thought they did not have a higher risk for the transmission of coronavirus because they were medical students (*P* < .0001, $\chi^2 = 23.519$), were less likely to be anxious, compared with the rest of the students. Also the prevalence of anxiety amongst those who reported that they were not exposed to a COVID-19-diagnosed patient (*P* < .0001, $\chi^2 = 12.623$) or they had adequate personal protective equipment (PPE) (*P* = .001, $\chi^2 = 11.632$) was lower than the rest of the participants.

Backward stepwise logistic regression was performed to measure the combined impact of the variables which were found to be associated with experiencing anxiety. The results of this logistic regression analysis are presented in Table 5. In the multivariate model, the association between being anxious and the level of knowledge about COVID-19, or the measures that should be taken during an epidemic disease, thinking young age would be protective against severe disease in case of being infected, the quality of PPE, or being worried about transmitting COVID-19 to another person because of having undiagnosed COVID-19, lost its significance.

4 | DISCUSSION

This study suggests that medical students in Turkey face several challenges during the COVID-19 pandemic and that nearly one-fourth of the sample is anxious. Several factors increased the risk of being anxious such as being female, being other than a 5th-year student, thinking that being a medical student would increase the risk of coronavirus transmission or being uncertain about it, being exposed to a patient with COVID-19 or being uncertain about it, anxiety for the continuing spread of COVID-19 in Turkey, anxiety for acquiring COVID-19, anxiety for graduating and going on active duty, and anxiety for experiencing a medical training interruption.

The majority of the students thought that global preventive measures were not sufficient to stop the epidemic. Considering the conflict between countries regarding the origin of the virus, the lack of cooperation and collaboration, this is not surprising. Approximately 60% of the participants defined their PPE as “good

TABLE 1 Responder profile and participants' answers to the questionnaire

Variables	
Gender, n (%)	
Female	1762 (56.7%)
Male	1343 (43.3%)
Age, mean \pm SD (minimum-maximum)	
	22.37 \pm 2.46 (18-58)
Medical school year, n (%)	
First-year	441 (14.2%)
Second-year	527 (17%)
Third-year	492 (15.8%)
Fourth-year	582 (18.7%)
Fifth-year	443 (14.3%)
Sixth-year (Intern)	620 (20%)
How would you define your level of knowledge about the precautions that should be taken during an epidemic disease? n (%)	
Acceptable	995 (32%)
Poor	2078 (66.9%)
None	32 (1%)
How would you define your level of knowledge on COVID-19? n (%)	
Acceptable	1260 (40.6%)
Poor	1830 (58.9%)
None	15 (0.5%)
Which of the following isolation precaution(s) do you know? n (%)	
Standard precautions	2741 (88.3%)
Contact precautions	2799 (90.1%)
Airborne precautions	2225 (71.7%)
Droplet precautions	2173 (70%)
Do you think that enough measures have been taken in the world to be protected against COVID-19? n (%)	
Yes	135 (4.3%)
No	2769 (89.2%)
Do not know	201 (6.5%)
Do you think that it would not be a serious problem for you if you acquire SARS-CoV-2, as you are young? n (%)	
Yes	930 (30%)
No	1649 (53.1%)
Do not know	526 (16.9%)
Do you think that you have a higher risk for the transmission of coronavirus, as you are a medical student? n (%)	
Yes	2067 (66.6%)
No	850 (27.4%)
Do not know	188 (6.1%)
Have you been exposed to a COVID-19 diagnosed patient? n (%)	
Yes	22 (0.7%)
No	2421 (78%)
Do not know	662 (21.3%)
Do you have personal protective equipment? n (%)	
Yes, good enough	1765 (56.8%)

(Continues)

TABLE 1 (Continued)

Variables	
Yes, but insufficient	1189 (38.3%)
No	151 (4.9%)
Are you worried about this process, thinking "If I were graduated, I would be on active duty"? n (%)	
No	1036 (33.4%)
Yes	2069 (66.6%)
If yes, did you think that you were not suitable for this profession?	
Yes	849 (41%)
No	1220 (59%)
What kind of precautions do you take to prevent COVID-19 transmission? n (%)	
I wash my hands with soap often, at least for 20 seconds.	2999 (96.6%)
I do not go out unless it is necessary.	2956 (95.2%)
I avoid close contact such as hugging and shaking hands with people.	2891 (93.1%)
I always cover my mouth and nose with a disposable tissue when I cough or sneeze. If a tissue is not accessible, I cover my mouth and nose with the inside of my elbow.	2745 (88.4%)
I ventilate my indoor environment, often.	2605 (83.9%)
I avoid touching my eyes, nose and mouth with unwashed hands.	2160 (69.6%)
I keep a distance of 3-4 metres from others who have flu-like symptoms.	2146 (69.1%)
I drink lots of water, eat a balanced diet and pay attention to my sleep pattern.	2024 (65.2%)
I do not share my personal belongings such as a towel.	1900 (61.2%)
I eat various foods and use medicines to boost my immune system.	1387 (44.7%)
I wash my clothes at 60°C-90°C.	1165 (37.5%)
I clean frequently touched surfaces such as doorknobs, light switches, countertops and handles with water and detergent, every day.	1135 (36.6%)
I do not go out without wearing a mask.	890 (28.7%)

Abbreviation: COVID-19, Coronavirus Disease 2019.

TABLE 2 Students reported anxiety levels for some stated conditions and Beck Anxiety Inventory Score

Anxiety level about	Minimum	Median	Maximum
the continued spread of COVID-19 in Turkey	1	8	10
transmitting coronavirus to another person, as you have undiagnosed COVID-19	1	8	10
having a medical education interruption	1	7	10
acquiring COVID-19	1	4	10
Beck anxiety inventory score	0	8	63

Abbreviation: COVID-19, Coronavirus Disease 2019.

enough." While this seems controversial considering the worldwide shortage of PPE during the pandemic, it may be attributed to the relatively better access to PPE by medical staff in Turkey compared with those in other countries and the fact that the students were at home during the pandemic and their requirement for PPE was not as extensive as healthcare providers on duty. Besides, the definition of "sufficiency" is not the result of an objective evidence-based assessment but rather a self-reported opinion. We found that as the perceived sufficiency level of PPE increased the level of anxiety decreased. It is well understood in this pandemic that less safety brings more anxiety.¹⁵ In a study from Iran, medical students

working in emergency rooms with better PPE had lower risk perception than the students who were working in other wards with ordinary protective supply.¹⁶

Most of the students in our study thought that their level of knowledge was lower than acceptable on preventive measures that should be taken during an epidemic and on COVID-19. This may be a good reflection that the medical curriculum does not prepare the students for an emergency situation and that both knowledge and skills to manage an epidemic are lacking amongst medical students. We found that as the perceived level of knowledge increased, the anxiety level decreased. Hence preparedness of medical students

TABLE 3 Correlations between anxiety scores

Anxiety levels	Age	Spread of the virus in Turkey	Acquiring COVID-19	Transmitting COVID-19	Education interruption
Spread of virus in Turkey	$P = .046^*$ $r = -0.036$	$r = 1$			
Acquiring COVID-19	$P = .155$ $r = 0.026$	$P < .001^{**}$ $r = 0.701$	$r = 1$		
Transmitting COVID-19	$P = .186$ $r = -0.024$	$P < .001^{**}$ $r = 0.799$	$P < .001^{**}$ $r = 0.663$	$r = 1$	
Education interruption	$P = .938$ $r = -0.001$	$P < .001^{**}$ $r = 0.626$	$P < .001^{**}$ $r = 0.482$	$P < .001^{**}$ $r = 0.482$	$r = 1$
Beck anxiety inventory	$P = .587$ $r = -0.010$	$P < .001^{**}$ $r = 0.166$	$P < .001^{**}$ $r = 0.286$	$P < .001^{**}$ $r = 0.130$	$P < .001^{**}$ $r = 0.130$

Abbreviation: COVID-19, Coronavirus Disease 2019.

* $P < .05$, ** $P < .0001$.

for a pandemic may positively affect their decision-making capacity in the crisis while allowing optimum anxiety.

As COVID-19-related mortality is concentrated in elderly groups we wanted to define self-risk perceptions of young people for COVID-19. About a third of our sample stated that COVID-19 would not cause them much harm as they were young and concordantly those perceiving less risk were found to be less anxious. In contrast, in a study from Turkey younger people, who were not medical students, reported higher perceived risk, vulnerability and fear,¹⁷ which suggests that medical training influences risk perceptions.

Students were asked to report their practice on 13 selected measures to prevent COVID-19 transmission, which are recommended by the Turkish Ministry of Health. The most prevalent one followed by the participants was hand washing similar to the findings of the study by Aker et al, where almost 90% of the students agreed that "hand washing was the major means of protection against COVID-19".⁷ The least prevalent measure adopted was wearing a mask. This may be attributed to the changing recommendations of the Turkish Ministry of Health during the epidemic where initially only patients who had symptoms of COVID-19 were advised to wear masks much later followed by a recommendation for everyone. The timing of our research which was early in the epidemic might have influenced this result.

Students' greatest areas of anxiety were about the continuing spread of COVID-19 in Turkey and transmitting coronavirus to another person in case they had undiagnosed COVID-19, while the lowest rating was for acquiring COVID-19. Considering the content of the Hippocratic Oath "primum non nocere," it is clear that the doctors have internalised their identity as medical professionals.¹⁸ Students' reported anxiety levels and the BAI results were inter-related and revealed that COVID-19 was one of the main concerns of the participants. Consistent with our results, the level of anxiety about academic delays was reported to be positively correlated with the anxiety level of medical students in China.¹⁹

A quarter of our participants reported experiencing anxiety—a finding similar to the results of several Chinese studies reporting 26%-27% prevalence.^{19,20} Another study from Turkey reported a

25% prevalence for clinically significant anxiety amongst medical students in 2002.²¹ This suggests that the COVID-19 pandemic does not increase the number of anxious medical students. However, since the pre-pandemic level of anxiety of the participants is unknown, it is difficult to draw a definitive conclusion. In another study from Turkey, including the general population at the beginning of the pandemic, 21.3% of the participants scored higher than 16 in BAI.²² Hence, we may suggest that medical students had quite a similar anxiety prevalence to that of the general population, during the COVID-19 pandemic.

We analysed the risk factors for being anxious to define vulnerable groups and found that female medical students had a nearly 3-fold increased risk of experiencing anxiety than male students. Given the fact that anxiety disorders are more prevalent amongst women, our results are consistent with those of the general population.²³ Similarly, a study from China found that students who showed psychological distress during the COVID-19 pandemic were more likely to be female,²⁰ and in a study from Vietnam female students reported a higher level of fear for COVID-19.²⁴ Interestingly in our study, the anxiety prevalence was lowest amongst fifth-year students; the remaining students had a 1.5-fold increased risk for being anxious. Nguyen et al found that senior students had lower scores for fear of COVID-19 and they explained this finding by better knowledge of the students at higher academic year.²⁴ However, the level of knowledge lost its association with experiencing anxiety in the multivariate analysis, in our study. Therefore, this finding should be further studied.

Two-thirds of our participants were worried about being on active duty and nearly half of the worried students considered themselves unsuitable for being a working physician. Although Turkey's health care system responded well to the pandemic and there has been no under-staffing problem in our country, several other countries held discussions for recruiting retired doctors and medical students were invited to volunteer or graduated early to provide support.^{18,25-28} As Rastegar Kazerooni et al mentioned, both the unprecedented pause in education and premature graduations seemed to develop anxiety

TABLE 4 Comparison of the students who are anxious and who are not anxious

Variable		Anxious (n = 719)	Not Anxious (n = 2386)	Statistics
Age, Median (minimum-maximum)		22 (18-58)	22 (18-51)	$P = .847, Z = -0.193$
Gender, n (%)	Female	549 (31.2%)	1213 (68.8%)	$P < .001^{**}, \chi^2 = 146.577$
	Male	170 (12.7%)	1173 (87.3%)	
Year of the medical school, n (%)	1st-year	92 (20.9%)	349 (79.1%)	$P = .002^*, \chi^2 = 19.195$
	2nd-year	124 (23.5%)	403 (76.5%)	
	3rd-year	132 (26.8%)	360 (73.2%)	
	4th-year	156 (26.8%)	426 (73.2%)	
	5th-year	75 (16.9%)	368 (83.1%)	
	Intern	140 (22.6%)	480 (77.4%)	
How would you define your level of knowledge about the precautions that should be taken during an epidemic disease? n (%)	Acceptable	204 (20.5%)	791 (79.5%)	$P = .011^*, \chi^2 = 6.485$ (linear association)
	Poor	505 (24.3%)	1573 (75.7%)	
	None	10 (31.3%)	22 (68.8%)	
How would you define your level of knowledge on COVID-19? n (%)	Acceptable	261 (20.7%)	999 (79.3%)	$P = .004^*, \chi^2 = 8.517$ (linear association)
	Poor	451 (24.6%)	1379 (75.4%)	
	None	7 (46.7%)	8 (53.3%)	
Do you think that enough measures have been taken in the world to be protected against COVID-19? n (%)	Yes	22 (16.3%)	113 (83.7%)	$P = .152, \chi^2 = 3.774$
	No	651 (23.5%)	2118 (76.5%)	
	Do not know	46 (22.9%)	155 (77.1%)	
Do you think that it would not be a serious problem for you if you acquire SARS-CoV-2, as you are young? n (%)	(a) Yes	178 (19.1%)	752 (80.9%)	$P = .002^*, \chi^2 = 12.366$ a-b: $P = .001^*, \chi^2 = 12.199$ a-c: $P = .030^*, \chi^2 = 4.714$ b-c: $P = .575, \chi^2 = 0.314$
	(b) No	415 (25.2%)	1234 (74.8%)	
	(c) Do not know	126 (24%)	400 (76%)	
Do you think that you have a higher risk for the transmission of coronavirus, as you are a medical student? n (%)	(a) Yes	526 (25.4%)	1541 (74.6%)	$P < .001^{**}, \chi^2 = 23.539$ a-b: $P < .001^{**}, \chi^2 = 23.240$ a-c: $P = .893, \chi^2 = 0.018$ b-c: $P = .013^*, \chi^2 = 6.225$
	(b) No	146 (17.2%)	704 (82.8%)	
	(c) Do not know	47 (25%)	141 (75%)	
Have you been exposed to a COVID-19 diagnosed patient? n (%)	(a) Yes	10 (45.5%)	12 (54.5%)	$P < .001^*, \chi^2 = 16.419$ a-b: $P = .016^*$ (Fisher's exact test) a-c: $P = .113, \chi^2 = 2.513$ b-c: $P = .001^*, \chi^2 = 10.278$
	(b) No	526 (21.7%)	1895 (78.3%)	
	(c) Do not know	183 (27.6%)	479 (72.4%)	
Do you have personal protective equipment? n (%)	Yes, good enough	369 (20.9%)	1396 (79.1%)	$P < .001^*, \chi^2 = 12.419$ (linear association)
	Yes, but insufficient	305 (25.7%)	884 (74.3%)	
	No	45 (29.8)	106 (70.2%)	
Getting anxiety by thinking "if I graduated, I would be on active duty," n (%)	Yes	572 (27.6%)	1497 (72.4%)	$P < .001^{**}, \chi^2 = 70.255$
	No	147 (14.2%)	889 (85.8%)	
Considering oneself unsuitable for being a working physician, n (%)	Yes	326 (38.4%)	523 (61.6%)	$P < .001^{**}, \chi^2 = 83.211$
	No	246 (20.2%)	974 (79.8%)	
Anxiety level for the continuing spread of COVID-19 in Turkey, Median (minimum-maximum)		9 (1-10)	8 (1-10)	$P < .001^{**}, Z = -8.963$
Anxiety level for transmitting coronavirus to another person, as you have undiagnosed COVID-19, Median (minimum-maximum)		9 (1-10)	8 (1-10)	$P < .001^{**}, Z = -6.680$
Anxiety level for having an interruption in their medical training, Median (minimum-maximum)		8 (1-10)	7 (1-10)	$P < .001^{**}, Z = -6.649$
Anxiety level for getting COVID-19, Median (minimum-maximum)		6 (1-10)	4 (1-10)	$P < .001^{**}, Z = -11.622$

Notes: a-b: results of the statistical analysis of comparing group a from group b; a-c: results of the statistical analysis of comparing group a from group c; b-c: results of the statistical analysis of comparing group b from group c.

Abbreviation: COVID-19: Coronavirus Disease 2019.

* $P < .05$, ** $P < .0001$.

TABLE 5 Odds ratios (OR) and confidence intervals (CI) of variables that have a significant association with being anxious

Factors ^a	OR	95% CI	P value
Being a female	2.82	2.31-3.43	<.001**
Anxious about getting COVID-19	1.82	1.47-2.25	<.001**
Anxious about being graduated and on active duty	1.68	1.36-2.08	<.001**
Class (5th class vs others)	1.53	1.16-2.02	.003 [†]
Exposed to a patient with COVID-19 diagnosis	1.44	1.17-1.77	.001 [†]
Anxious about the continuing spread of COVID-19 in Turkey	1.44	1.17-1.78	.001 [†]
Anxious about having an interruption in their education	1.36	1.12-1.65	.002 [†]
Assuming increased risk for the transmission of coronavirus because of being a medical student	1.25	1.01-1.55	.044 [†]

^aBackward stepwise logistic regression analyses were applied.

[†] $P < .05$, ** $P < .0001$.

and fear.²⁷ Only 40% of the students defined their knowledge of COVID-19 as acceptable. Consistent with our findings, a survey conducted in 2015 showed that only 24% of the participated medical students from Ireland believed that they had the necessary skills to be involved in an emergency situation.²⁹ There seems to be a global need to implement strategies to build up coping skills of students in a crisis and to take measures to prepare them for a disaster in medical schools, for building resilience.^{27,30,31} The fact that all medical students who had been restricted from clinical learning during the pandemic in Turkey lost their unique learning opportunities is a major issue to be considered. In the study of Compton et al 65% of the medical students preferred to return to the clinical settings if allowed during the pandemic.³² Anxiety about the continuous spread of the virus in Turkey may originate from this issue because the pandemic leads to an education interruption as well as creating a threat for future doctors who are expected to fight against this virus. In line with this, students who were worried about graduating and being on active duty during this pandemic had a 1.6-fold higher risk of experiencing anxiety than the students who did not report a concern.

Students who reported that they were not exposed to a patient with COVID-19 were less anxious than the remaining ones. Consistently healthcare workers in direct contact with COVID-19 patients were found to have a higher level of stress.³³ In addition, being uncertain about being exposed made students anxious. While this may be attributed to fear originating from the likely risk of being exposed, it may also be related to anxious students' uncertainty about their exposure. Besides, students who think that being a medical student does not increase the risk of transmitting coronavirus had a lower risk of experiencing anxiety. This finding shows

the important association between self-risk perception and anxiety. Students who are worried about getting COVID-19 had an almost 2-fold higher risk of experiencing anxiety.

The outcomes of our analysis indicate that students with higher perceived personal risk for COVID-19 had more risk of being anxious. Psychological distress may negatively impact academic performance.⁴ Therefore, it is essential to address the mental health of medical students. New multidisciplinary and multimodal methods of training about disaster medicine should be implemented globally in medical training that will improve students' knowledge, attitude and skills. Also, Nguyen et al showed that students with higher scores for COVID-19 fear were more likely to smoke and/or drink.²⁴ Therefore, medical educators should pay special attention to worries and fears of future doctors during the course of a pandemic.

Our study has several limitations. First, the data collection method may be biased because the sampling was not randomised and those who had more fears/worries for the COVID-19 epidemic might have shown more interest in responding to the survey. However, the relatively large sample size reduces the effect of sampling bias. Our study also inherits self-reporting bias. Face-to-face interviews might decrease answer falsification, whereas, in a time of an outbreak, on-line surveys are safer for the participants. Additionally, BAI provides useful clinical information and is easy to use in a large sample. As we received results via a questionnaire, further qualitative studies may be helpful to elucidate the rationale behind the students' responses. Since the study was cross-sectional, it was not possible to show a certain causal relationship between some characteristics of medical students and anxiety during the COVID-19 pandemic. The lack of a control group also makes it difficult to distinguish specific anxiety triggers of medical students from worries generalised in the overall population. Another important limitation is the lack of information on the pre-pandemic anxiety level and pre-existing psychiatric problems of the students. Additionally, we do not have information about their economic status, which may be another source of anxiety.

Based on our results we may suggest that anxiety is prevalent amongst Turkish medical students during the COVID-19 pandemic. Recognising the sources of their anxiety allows the medical educators to develop strategies and interventions to overcome them. Medical faculties should also pay attention to their female students during this pandemic. Authorities should take proactive measures to support the mental health of students, especially the vulnerable ones. University authorities should openly share their plans with future doctors to alleviate their sense of uncertainty and anxiety as much as possible, during these extraordinary times.

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DISCLOSURES

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DATA AVAILABILITY STATEMENT

Data available on request from the authors.

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