

The Psychological Impact of COVID-19 on Medical Students: A Cross-Sectional Study

ABSTRACT

Objective: The coronavirus disease 2019 (COVID-19) pandemic has intensified anxiety levels among medical students, who are predisposed to anxiety. Understanding the impact of the pandemic on future physicians is crucial for preparing medical education processes for potential future pandemics. This study aimed to assess pandemic-induced anxiety levels among medical students and their influence on their professional attitudes and to establish a theoretical framework for psychological interventions.

Methods: This descriptive study surveyed 1,273 medical students from Terms 1 to 5 during the second semester of the 2020 academic year. Using an online platform via a distance education center, participants completed the Coronavirus Anxiety Scale (CAS) along with researcher-designed questions.

Results: Among the participants, 51% were female and 49% male. Of these, 21.7% attained a score of ≥ 9 on the CAS, with 60.4% of those being female, representing a statistically significant disparity. Notably, 86.1% of the Term-1 students who lacked prior medical coursework had registered scores ≤ 8 . Within Period 4, 29.1% surpassed the CAS threshold, indicating heightened anxiety compared with other periods. Families of students with CASs ≥ 9 presented a notably higher COVID-19 incidence rate, at 37.3%. During the pandemic, 31% of the students expressed apprehension regarding their chosen profession, with 46% surpassing the CAS threshold and 27% scoring ≤ 8 .

Conclusion: During the pandemic, 21.7% of the students experienced heightened anxiety, which was influenced by remote learning and family COVID-19 cases. The students who experienced anxiety questioned their professional path and considered changing their specialty. This highlights the need to prioritize protective measures and educational support for medical students during future crises.

Keywords: Anxiety, COVID-19, Medical students

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INTRODUCTION

The COVID-19 pandemic has profoundly impacted global health and society, affecting both physical and mental well-being. The rapid spread of the virus, a serious public health emergency, necessitated widespread quarantine measures to control its transmission. These measures have significantly impacted public health systems, economies, and societal mental health. Consequently, the pandemic has strained medical infrastructures and underscored the critical need for robust public health strategies to manage global health crises effectively.

The COVID-19 pandemic has increased not only the risk of death from infection but also the degree of psychological pressure. The increase in disease spread, especially after the emergence of virus mutations, indicates that the psychological and behavioral effects may persist longer than initially anticipated.¹ Various stressors are associated with pandemics and public health management, including disease unpredictability, loss of freedom, delayed information, the availability of personal protective equipment, abrupt changes, social distancing, and anticipated financial losses.²

The pandemic has had severe psychological impacts, exacerbating mental health issues such as anxiety, depression, and stress due to quarantine, isolation, and economic uncertainties.³ Quarantine and lockdown measures, while effective in reducing viral transmission, have worsened mental health outcomes and increased disparities in health determinants.⁴ Socioeconomic impacts, including economic downturns and increased poverty rates, have increased the risk of mental health issues and suicidal behavior.⁵ Vulnerable populations, such as children and those with preexisting mental health conditions, have experienced heightened mental health challenges.⁶ The pandemic has highlighted the urgent need for comprehensive public health strategies that address not only immediate medical needs but also long-term mental health impacts on society.

Pandemic-related stressors significantly impact mental health, with an amplified effect on healthcare providers. Exposure to COVID-19 has been linked to increased depression and anxiety among healthcare workers, who experience psychological pressure, anxiety, and stigmatization regarding their health, the health of their relatives, and the risk of being a transmission source. Similar effects were observed during previous outbreaks, such as SARS in 2003.^{1,7} Compared with the general population, medical students face higher rates of burnout, depression and anxiety, and one in three students experience generalized anxiety.⁸ Stress factors include academic pressure, peer competition, work–life balance, and economic difficulties.⁹

During the COVID-19 pandemic, medical students faced unique challenges, such as interrupted education, social disruptions, and high-risk exposures. In Turkey, the rapid transition from traditional to full-time distance medical education has led to increased anxiety among students, emphasizing the profound effects of these sudden educational and social changes.^{10,11}

The COVID-19 pandemic has intensified the challenges faced by medical students, negatively affecting their academic performance, professional attitudes and mental health. This increased stress may lead to decreased quality of patient care, depersonalization, a lack of empathy and increased substance abuse. Understanding these effects is crucial to developing effective preventive measures against future public health crises.^{12,13,14} This study aims to assess the prevalence and severity of anxiety, depression, and other mental health problems among medical students; identify contributing stressors; and propose evidence-based strategies to increase resilience and promote overall well-being during and after such crises.

METHODS

This study was designed as a descriptive cross-sectional study aimed at understanding the psychological well-being of medical students during the COVID-19 pandemic.

The study was approved by the Kocaeli University Non-Interventional Clinical Research Ethics Committee with decision number 2020-19, Approval:80418770-730.99/40456 Date: 19/06/2020)

Study Setting and Duration

The study was conducted at Kocaeli University Faculty of Medicine. Data were collected online through the distance education center in May and June 2020.

Study Population and Sample

The population consisted of 1411 undergraduate students enrolled at Kocaeli University Faculty of Medicine. The sample included 1273 students who volunteered to participate in the study, selected through cluster sampling among students from Years 1–5. The plan was to include students in classes that participated in online medical education during the COVID-19 period in the study. Sixth grade students are not involved because they do not have online learning. Data belonging to students who registered without completing all the questionnaires were excluded from the study.

Data collection instruments

Information Form

The questionnaire, prepared by researchers on the basis of the literature, expert opinions, and the undergraduate medical

education committee, included demographic data, the Coronavirus Anxiety Scale (CAS), and seven descriptive questions. These questions aimed to capture the unique challenges faced by medical students during the pandemic. The questions included whether being away from school negatively affected their education process, concerns about family health, worries about their chosen profession, family diagnoses of COVID-19, living arrangements during the pandemic, considerations about changing their intended specialty, and their perceived level of information about the pandemic. The CAS was applied separately to assess anxiety levels.

Coronavirus Anxiety Scale

Originally developed by Lee,¹⁵ the CAS identifies cases of dysfunctional anxiety associated with the coronavirus crisis. It is a brief self-reported mental health screening tool developed to help clinicians and researchers recognize individuals with impaired functioning due to coronavirus-related anxiety. The scale consists of five items, each rated on a 5-point Likert scale reflecting symptom frequency over the past two weeks, ranging from 0 (not at all) to 4 (almost every day).

The validity and reliability of the scale were confirmed by Biçer et al..¹⁶ The factor structure is similar to the original structure,

consisting of a single dimension with factor loadings between .625 and 0.784 and a Cronbach's alpha of .832. A cutoff score of ≥ 9 was used to screen at-risk or anxious groups, which is particularly relevant in hospital environments during the pandemic.

Statistical Analyses

Statistical analysis was performed via SPSS Statistics 21 (IBM SPSS Corp., Armonk, NY, USA). Descriptive statistics and the nonparametric chi-square test were used to examine the distribution of CAS scores by gender, academic year, and response to the descriptive questions. A p value less than .05 was considered statistically significant.

RESULTS

Among the students who participated in the study, 51% were female, and 49% were male. In our study, 21.7% of the students had a total CAS score of ≥ 9 , indicating significant anxiety levels. Table 1 shows the gender distribution of the students and the distribution of the students according to their CAS scores. Among those who scored above the cutoff score (≥ 9), 60.4% were female, a statistically significant difference, highlighting a gender disparity in anxiety levels.

Table 1. Students' Gender Distribution and Distribution on the basis of Their CAS Scores

CAS score	Gender	Number of people n (%)	Total n (%)	Year 1 %	Year 2 %	Year 3 %	Year 4 %	Year 5 %
Score 0-8	Male	515 (82.53)	997 (78.3)	86.11	71.48	81.86	70.91	81.58
	Female	482 (73.23)						
Score 9 – 20	Male	109 (17.47)	276 (21.7)	13.89	28.52	18.14	29.09	18.42
	Female	167 (25.77)						

CAS Coronavirus Anxiety Scale

As shown in Table 1, first-year students who had not yet undergone clinical rotation presented lower anxiety levels, with 86.1% scoring ≤ 8 . The percentage of students scoring above the CAS cutoff score was as follows: 13.9% in first-year students, 28.5% in Year 2 students, 18.14% in Year 3 students, 29.1% in

Year 4 students, and 18.4% in Year 5 students. These results suggest that anxiety levels increase with academic progress, peaking in Year 4, when students are more likely to be exposed to clinical environments and high-risk situations.

Table 2. CAS Analysis

		CAS ≤8 (n)	CAS ≥9 (n)	χ ²	P
Gender	Male	515	109	13.185	.00
	Female	482	167		
Year	1	248	40	29.327	.00
	2	183	73		
	3	185	41		
	4	195	80		
	5	186	42		
<i>1. Being away from school during the pandemic negatively affected my education process</i>	Strongly Disagree	42	7	36.676	.00
	Disagree	81	6		
	Undecided	88	12		
	I agree	356	79		
	Strongly Agree	430	171		
<i>2. I was concerned about my family's health due to the pandemic</i>	Strongly Disagree	7	5	54.867	.00
	Disagree	30	2		
	Undecided	28	1		
	I agree	349	43		
	Strongly Agree	583	224		
<i>3. The pandemic process made me worried about my chosen profession of medicine.</i>	Strongly Disagree	245	34	70.204	.00
	Disagree	356	73		
	Undecided	119	40		
	I agree	197	61		
	Strongly Agree	80	68		
<i>4. Has anyone in your family been diagnosed with Covid-19 during the pandemic?</i>	No one in my family has been diagnosed	849	173	69.731	.00
	Some of my close family members have been diagnosed	104	72		
	1 of my first-degree relatives was diagnosed	24	19		
	More than one person in my immediate family has been diagnosed	18	9		
	I have been diagnosed	2	3		
<i>5. Where did you stay during the pandemic?</i>	Alone in a student house	44	16	7.873	.096
	With my family in Kocaeli	163	43		
	Back home with my family	759	210		
	With my friends in the student house	25	2		
	At a relative's house in Kocaeli	6	5		
<i>6. After the pandemic process, I thought about changing my intended specialty.</i>	Strongly Disagree	219	49	37.760	.00
	Disagree	498	99		
	Undecided	194	78		
	I agree	60	34		
	Strongly Agree	26	16		
<i>7. As a physician candidate, I think I have enough information about the pandemic.</i>	Strongly Disagree	30	24	26.207	.00
	Disagree	182	57		
	Undecided	328	69		
	I agree	406	100		
	Strongly Agree	51	26		

CAS Coronavirus Anxiety Scale

According to Table 2, the percentage of COVID-19 cases in the families of students with a CAS score ≥ 9 was 37.3%, which was significantly higher than that of students with lower anxiety levels. This finding indicates a strong correlation between personal experience with COVID-19 within the family and increased anxiety among students. During the pandemic, 31% of the students were concerned about their chosen profession. Among students with a CAS score ≥ 9 , 46% were worried about their profession, compared with 27% among those with a CAS score ≤ 8 , suggesting that higher anxiety levels were associated with greater uncertainty about their future careers.

Furthermore, the study revealed that the percentage of students who did not want to change their targeted specialty after the pandemic was 67.6%. Among those who wanted to change their intended specialty, 17.65% had a CAS score of ≥ 9 , indicating that significant anxiety influenced career considerations. Table 2 also shows a correlation between the students' semester, gender, and CAS score, underscoring the multifaceted impact of the pandemic on medical students' mental health and professional outlook. These findings highlight the urgent need for tailored mental health support and career counseling for medical students during such crises.

DISCUSSION

The COVID-19 pandemic has undeniably affected various aspects of life globally, with significant psychological impacts observed across different populations. During the pandemic, medical students, like the general population, have experienced a significant increase in reports of stress, anxiety, depression, and sleep disturbances.^{12,17} This study provides critical insights into how the pandemic has exacerbated mental health issues such as anxiety, depression, and stress. These findings align with the literature and underscore the need for support and interventions tailored specifically for medical students.¹⁰

Our study underscores the profound psychological impact of the COVID-19 pandemic on medical students, highlighting elevated anxiety levels, significant educational disruptions, and professional concerns. These findings are consistent with the literature, emphasizing the need for targeted mental health support and interventions for medical students during and beyond the pandemic. The implementation of comprehensive mental health strategies and the provision of adequate resources can help mitigate these adverse effects and support the well-being of future healthcare professionals.

According to the findings of the present study, medical students experienced dysfunctional anxiety related to the COVID-19 crisis. The CAS suggests that approximately one out of four students has impaired functionality due to coronavirus anxiety, and these students require further evaluation and treatment. This finding aligns with a study conducted by Cao et al. with 7,143 medical school students, which reported that approximately 24.9% of the students experienced anxiety disorders due to the COVID-19 outbreak.¹⁸

In a meta-analysis of 89 observational studies involving 1,441,828 students during the COVID-19 pandemic, the prevalence rates of depressive symptoms, anxiety symptoms, and sleep disorders among higher education students were 34%, 32%, and 33%, respectively.¹⁹ Our study revealed similar anxiety prevalence rates among medical students, highlighting the severe impact of the pandemic on this group. Anxiety in medical students negatively affects their quality of life, relationships, academic performance, and professionalism, leading to burnout.²⁰ Consistent with these findings, our research revealed elevated levels of anxiety and depression among medical students during the pandemic, which contributed to academic and personal disruptions.

Our study revealed that more than half of the students with dysfunctional anxiety (total score ≥ 9 on the CAS) were female. Like in the literature, female sex appears to be a risk factor for experiencing anxiety.¹⁷

The study also revealed that the rate of dysfunctional anxiety was higher in fourth-year students who were newly introduced to the clinic than in those in other periods. The prevalence of dysfunctional anxiety was lowest in first-year students, with more than three-quarters of these students being in the risk-free group with respect to anxiety disorders. This can be attributed to fourth-year students' contact with high-risk patients during clinical rotations and their increased knowledge about the prognosis and transmission of COVID-19.²¹

A meta-analysis revealed that the transition from traditional face-to-face education to virtual learning during the COVID-19 pandemic caused significant psychological stress, worsening mental health issues.²² Another study showed that delays in academic activities were linked to increased anxiety symptoms.¹⁸ Despite evidence that online learning can be effective, students need time to adapt to such drastic changes. The quality of prerecorded videos, clarity in exam information, and regular updates from the university were crucial for student satisfaction during the pandemic.²³ Our findings are in line with these observations, as we also found that among medical students, a small number of our students had increased levels of anxiety due to the sudden transition to online education and the uncertainties it brought. Notably, they expressed concern about their chosen profession, especially during the pandemic, and this concern was even more pronounced among those with high anxiety levels (CAS score ≥ 9).

Our study revealed that the percentage of COVID-19 cases in families of students with dysfunctional anxiety was significantly greater than that in families of students with low anxiety levels. Students with COVID-19 cases in their families experienced much more intense anxiety. This aligns with the literature, which identifies having a family member, relative, or friend infected with COVID-19 as a significant risk factor for anxiety disorders.¹² These findings underscore the heightened vulnerability of students with affected family members and highlight the need for targeted mental health support for this group. In the literature, factors such as living in urban areas, residing with parents or friends, having a regular income, and receiving social support are noted to protect university students against anxiety during the COVID-19 pandemic.^{14,18} However, our research also revealed that even students with these protective factors experienced significant anxiety if they had family members infected with COVID-19.

One out of every four students among all the students and one out of every two students with high anxiety levels reported that they were concerned about their chosen profession. As the anxiety level increases, the perspective on the profession is negatively affected. The intense anxiety experienced by medical

students may increase their vulnerability to the effects of COVID-19. Therefore, it is important to recognize and support students at risk and encourage help-seeking behavior in situations of increased mental distress.

Limitations

This study has several limitations. It is cross-sectional, capturing data at one point in time, which limits causal inferences. The study is based on self-report questionnaires, which can introduce bias due to subjective perceptions and potential inaccuracies. Future research should use longitudinal designs to track changes over time.

CONCLUSION

Our results emphasize the need for comprehensive, tailored interventions to support the mental well-being of medical students, both during the pandemic and in the years to come. The development of personalized psychological support programs that address the unique challenges faced by this population, from remote learning to the personal impact of COVID-19, is crucial for fostering resilience and ensuring long-term success.

Ethics Committee Approval: The study was approved by the Kocaeli University Non-Interventional Clinical Research Ethics Committee with decision number 2020-19, Approval:80418770-730.99/40456 Date: 19/06/2020)

Informed Consent: Consent was obtained through an online consent form, which participants agreed to before completing the survey.

Peer-review: Externally peer-reviewed.

Conflict of Interest: The author have no conflicts of interest to declare.

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