

Effect of COVID-19 on Psychological Problems of Medical Department Students: A Systematic Review

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Abstract

Introduction: This systematic review aimed to examine the results of various studies on the effect of COVID-19 on the psychological problems of medical department students worldwide.

Methods: Our statistical population includes all English articles on the impact of the COVID-19 pandemic on stress, anxiety, and depression in medical students from January 1, 2019, to the end of December 2020. The articles were searched in Google Scholar, Pubmed, Web of Science, and SCOPUS databases using the keywords medical students, PTSD, depression, and anxiety, followed by a secondary search similar to the primary search.

Results: This study was conducted based on the PRISMA - statement. All included studies were performed using the cross-sectional analytical method. Out of 24 studies with a sample size of 12042 people, ten articles dealt with the anxiety topic, one article addressed the depression issue, and 13 articles discussed both the anxiety and depression topic in medical, dental and nursing students. Most studies have shown that women experienced more anxiety and depression during the COVID-19 pandemic than men. The level of anxiety of medical students was much lower than that of non-medical students.

Conclusion: A large number of students considered virtual education as an unusual and unfamiliar method and expressed their anxiety symptoms. There was a significant relationship between anxiety as well as depression levels and COVID-19. COVID-19-related anxiety and depression caused sleep, appetite and diet disorders, lack of energy and concentration, decreased self-confidence, and loss of the ability to overcome life problems in students.

Keywords: COVID-19 Pandemic, Anxiety, Depression, Medical Department Students

Introduction

COVID disease-19 is recognized as one of the world's most influential human health problems. The disease first appeared in Wuhan, China, in December 2019.¹ The cause of this disease was a new and genetically modified virus from the family of coronaviruses called SARS-COV2, named COVID-19.² The World Health Organization announced the new coronavirus in 2019 as a pandemic, a rapidly spreading disease with a high risk of death worldwide.

The virus threatens life, health, economy, families and communities.^{3,4} The psychological effects of this viral disease on the mental health of individuals at

different levels of society are of great importance.⁵ Individuals in different parts of a community may experience psychological symptoms of COVID-19 during the peak period and the spread of the disease. These symptoms are seen in patients with COVID-19, quarantined individuals, health care providers, staff members' families, children, students, pregnant women, and families.⁶ Facing prolonged home quarantine, decreased interpersonal communication, and changes in students' learning styles may be associated with adverse reactions such as stress and depression.⁴ During the pandemic period of the disease, several

psychological problems were reported, including depression, anxiety, stress, sleep disorders, anger, post-traumatic stress disorder (PTSD), low self-esteem, fear, and fatigue.³

In general, when stress increases, it affects people's health, which is a multidimensional concept associated with complete physical, mental, and social well-being.⁷ People's health is a major prerequisite for promoting public health, and the symptoms of stress in various forms may be problematic when the disease occurs.

Studies have shown that medical students, like medical staff, are more likely than others in the community to bear the risk of infection, fear, and stress due to disease transmission and strict health protocols.^{8,9} This can lead to the reluctance of medical students to attend hospital wards during epidemics.¹⁰ Challenges of distance education and lack of personal protection facilities in the workplace seem to be the factors that always cause anxiety and stress in students. Undoubtedly, these concerns will undeniably negatively affect their quality of life and education.¹¹

A study by Xie L., which examined the psychological effects of COVID-19 on medical and non-medical students in China, showed that students experienced more anxiety and stress at the time of the outbreak than non-medical students.¹² The case study of Hakami Z. found that dental students experienced high levels of anxiety, stress, and depression during the coronavirus pandemic.¹³ Another study by Risal A. et al. demonstrated that a significant number of medical students suffered from high levels of anxiety and depression during the coronavirus pandemic.³

Because students may be exposed to various psychological factors such as stress, anxiety, depression, and PTSD during the coronavirus pandemic period, this may be induced because of fear of infection, loss of various daily programs, and less physical activity, that in turn, create limited social connections. Since medical students are directly at risk for this infection, they appear to experience more stress and anxiety than other students. Therefore, the researchers decided to conduct a systematic review by examining the results of various studies on the effect of COVID-19 on the psychological problems of medical department students.

Materials and Methods

Design

In the present systematic review study, the statistical

population includes all English articles on the impact of the COVID-19 pandemic on stress, anxiety, and depression in medical students from December 1, 2019, to the end of December 2020.

Inclusion and Exclusion Criteria

The criteria for including articles in this study were those that examined the impact of the COVID-19 pandemic on medical students and the related demographic factors.

Exclusion criteria included:

- Non-English language articles.
- Lack of access to the full text of the articles.
- Conducting studies on non-medical students.

Search Strategy

The articles were searched in GOOGLE SCHOLAR, PUBMED, WEB OF SCIENCE, and SCOPUS databases from December 1, 2019, to the end of December 2020 using the keywords medical students, PTSD, depression, anxiety, and followed by a secondary search similar to the primary search. In the second stage, more specific keywords were used to investigate the effects of coronary heart disease on anxiety, and stress in medical students.

((nursing students[Tiab]) OR (medical education [Tiab]) OR (dentist students[Tiab]) OR (medical students[Tiab]) OR (medicine student[Tiab]) OR (student[Tiab]) OR (laboratory[Tiab]) OR (medical science[Tiab]) OR (radiology[Tiab])) AND ((COVID 19) OR (SARS-CoV-2) OR (coronavirus) OR (SARS-CoV2) OR (corona) OR (new corona))) AND ((mental) OR (psych*) OR (PTSD) OR (stress) OR (depression) OR (hopelessness) OR (distress) OR (anxiety) OR (concern) OR (worry) OR (fears))).

Study Screening & Selection

Titles and abstracts of all studies searched in Endnote were entered, and duplicates were removed. Two independent reviewers reviewed abstracts and titles, and the unrelated articles were deleted. In the next step, the full texts having the criteria for inclusion in the systematic review study were reviewed and entered into the study. In this study, the full texts of all eligible articles were available, and there was no need to contact the authors.

Study Quality Assessment

To evaluate the papers' quality, CASP "Critical

Appraisal Skills Program Checklists." This tool investigated all the entered studies to determine whether they deserve to be included in the study. Also, excluding the low-quality papers, all papers were assessed by two expert faculty members.

Results

This systematic review study was conducted using the PRISMA statement (Figure 1). In the initial stage of the search, 61 possible related articles were

retrieved from the PUBMED, WEB OF SCIENCE, SCOPUS, and GOOGLE SCHOLAR Search Engine databases. Of these, 15 articles were deleted due to duplication, and 19 articles were removed by studying the abstract of the articles and adapting them to the inclusion and exclusion criteria. By reading the full text of the articles in the next step, three articles were deleted due to the use of inappropriate assessment tools. The remaining 24 articles were included in the systematic review study.

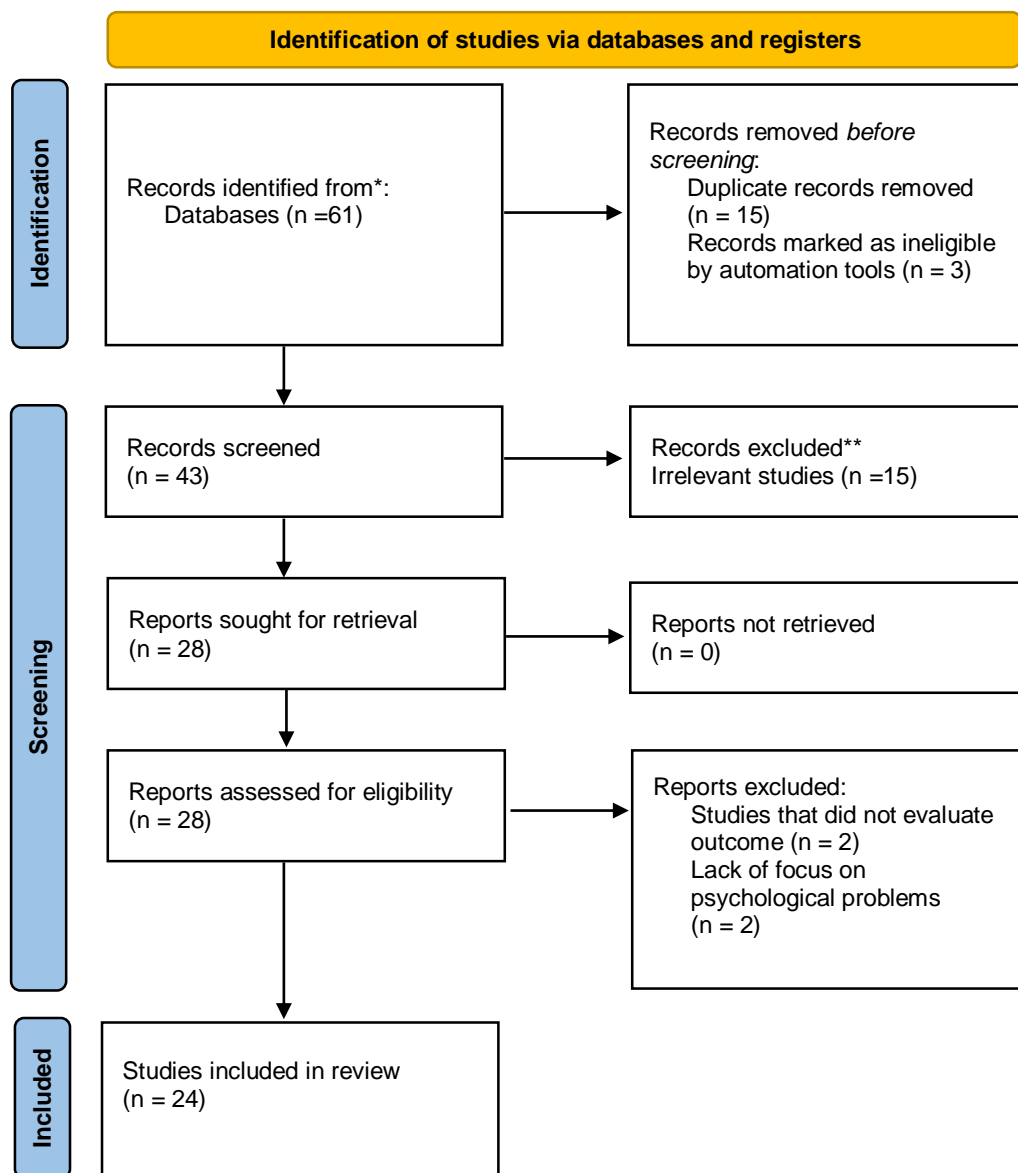


Figure 1. Search Strategy and Study Selection Flow Diagram.

In terms of research location, two studies were done in Africa,^{14,15} two studies in Europe,^{16,17} one study in the Americas,¹⁸ and 19 studies in Asia.^{1,3,4,11-13,19-31} The tools used to investigate the psychological effects of

COVID-19 in these studies included HADS (Hospital Anxiety and Depression Scale), GPAQ (General Practice Assessment Questionnaire), SHE (Sustainable and Healthy Environments), DASS-21 (Depression

Anxiety and Stress Scale-21), GAD-7 (General Anxiety Disorder-7), SAS (Self-Anxiety Scale), and K-6 (Kessler Psychological Distress Scale-6). In terms of methodology, all included studies were conducted using a cross-sectional analytical method. Out of 24 studies with a sample size of 12042 people, ten articles dealt with the anxiety topic, one article addressed the depression issue, and 13 articles discussed both the anxiety and depression topic in medical, dental and nursing students. In the current research, 18 studies were conducted on medical students,^{1,3,4,11,12,14,17-19,21-24,26,28-31} two studies on nursing students,^{11,16} and one study on dental students.²⁵ Two studies were performed on medical and dental students,^{13,27} and one study was conducted on medical and nursing students.¹⁵ The study of Uma Pandey had the lowest sample size, with 83 participants,²⁸ while the study of Mohammed Elhadi contained the highest sample size, with 2430 participants.¹⁴ In the present study, 66.17% of the subjects were female and 33.83% were male. Out of 12042 participants, 9874 were medical students, 1314 were dental students, and 854 were nursing students, and the average age of students was 22.37 years. According to some studies, the prevalence of depression caused by COVID-19 was estimated to be higher than that of anxiety.^{13,14,20-23} In other studies, however, the rate of anxiety was higher than that of depression.²⁴ In both groups of studies, despite a direct relationship between the COVID-19 pandemic and the level of anxiety, no association was found between depression and COVID-19 prevalence.^{18,31} In one study, despite a direct relationship between COVID-19 and anxiety and depression, this relationship was not significant.²⁴

Most studies have shown that women experienced more anxiety and depression during the COVID-19 pandemic than men.^{4,11,13,16,23,24,26-29} Having negative thoughts can exacerbate anxiety and depression (aOR 1.68; 95% CI: 1.50-1.88; $P < 0.001$).²³ In several studies, people over the age of 22 were at higher risk for depression and anxiety (AOR = 2.2, 2.5), and a significant relationship was found between the age of the participants and the rate of anxiety and depression.³ Several other studies showed that people under the age of 20 were more prone to anxiety and depression (OR = 4.147, 95% CI = 1.331-12.918; $P = 0.014$).^{20,29} Some studies have demonstrated that anxiety and depression are directly related to living conditions (aOR = 0.88; 95% CI: 0.79-0.97; $P =$

0.013). People who lived alone or single individuals had a higher risk of anxiety and depression than people living with their families (OR = 2.208, 95% CI = 1.127-4.325; $P = 0.021$).^{13,14,18,23,29} Several studies showed that with an increasing level of education, the level of anxiety had a decreasing trend, and there was a significant relationship between the level of education and anxiety and depression.^{14,26,29}

Another study found that there was a significant relationship between low income and anxiety and depression.²⁶

Despite all these findings, three studies did not show any significant relationship between gender, age, educational level, living conditions, as well as, other demographic factors and depression and anxiety among students.^{11,14,21}

Several studies have revealed that direct contact with COVID-19-affected patient's increases anxiety in students, which is why some students are reluctant to work in wards and want to discontinue any care and treatment activities for these patients.^{3,15,18,19} COVID-19-related fear and anxiety were so great that some nursing students sought to drop out of their field of study.¹⁵ In one study, however, no difference was found between the level of anxiety as well as depression of students who were in direct contact with COVID-19-affected patients and students working in other wards.²⁸

Access to vaccines, medication, and definitive treatment, and the provision of personal protective equipment and psychological and physical support have been reported to be the most important factors in reducing students' anxiety and encouraging them to participate in the pandemic.¹⁵

The level of anxiety of medical students was much lower than that of non-medical students. is because medical students have become more aware of the widespread dimensions of infection.^{12,27,29,30} Contrary to the findings of the above studies the results indicated that being more aware of the COVID-19 could increase the level of anxiety in one study.²⁷ Meanwhile, people who experienced COVID-19 symptoms showed more anxiety and depression.²⁴ The anxiety of dental students has been reported to be higher than medical students, which indicates that dental students have more contact with patients with COVID-19 and subject to increased risk of the disease (OR = 0.61, 95% CI, 0.45-0.84).^{13,15,27,29}

Table1. Research Articles Reviewed

Title	Author	Study equipment	Duration of study	Country of study	Study students' group	Number of students And sex and age	The most important health disorder assessed	Study method	The most important result	Final conclusion
Anxiety and Depression During COVID-19 Pandemic Among Medical Students in Nepal	Ajay Risal	Online questionnaire HADS	2020	Nepal	Medical students	416 medical students [mean age: 22.2 (2.1); males 57.7%, females 42.3%	Anxiety and depression.	Cross-sectional	HADS-anxiety scores [mean: 7.1(4.3)] were significantly and positively correlated with HADS-depression [mean: 5.9 (4.1)] ($r=0.695$; $P<0.001$). point prevalence of total HADS cases (HADS-T) was 26.7% anxiety (HADS-A) 11.8% depression (HADS-D) 5.5% comorbid anxiety and depression (HADS-CAD) 9.4%	A large number of medical students are suffering from high level anxiety and depression during Covid pandemic. Students who are older than 22 years and people with any history of mental disease are more depressed.
Knowledge, attitude and anxiety of medical students about the current COVID-19 outbreak in Turkey	Burkay Yakar	self-administered questionnaire state-trait anxiety inventory online	7-14 April, 2020	Turkey	Medical students	530 participants 58.3% female 41.7% male	anxiety	Cross-sectional	There was an inverse relationship between positive attitude score toward COVID and level of trait ($P<0.001$) and state($P=0.003$) anxiety.	Medical students had an acceptable knowledge and view about COVID-19
Concerns of Undergraduate Medical Students Towards an Outbreak of COVID-19	Naseem Ahmed	A Self-designed questionnaire was utilized which focused on	January 2020 - February 2020	Pakistan	Medical student	A total of 322 medical undergraduates (73.9% females and 26.1% males) aged	Anxiety and mental strategies	Cross-sectional	75.8% participants were found worrisome regarding probability of getting infected	Medical students, though agreeing with this as a necessary

		general perception, possibility of outbreak in local settings and institutional efficiency in fighting outbreak conditions, anxiety and mental strategy of participants				between 18-28 years			during medical rotations. Majority of the students thought that their institute associated hospital won't be able to handle the situation in case of an uncontrolled outbreak.	precautionary step are still having uncertainties about the loss of clinical exposure affecting their knowledge.
Academic Anxiety and Self-Handicapping Among Medical Students During the COVID-19 Pandemic: A Moderated Mediation Model	Jun Jia	Online survey that was designed to collect information. -The two-item Academic Anxiety Questionnaire. -The Self-Handicapping Scale (SHS). -General Procrastination Scale (GP). - Hardiness Scale for Chinese college	2020	China	Medical students	320 medical students 33.4 % male	Academic anxiety, Self-handicapping, Procrastination, Hardiness	Cross-sectional	that the result showed that procrastination and self-handicapping had no grade differences, whereas academic anxiety ($t=-4.82$, $P<0.001$) and hardiness ($t = 4.124$, $P<0.001$) showed significant grade differences.	Results showed that academic anxiety was positively correlated with procrastination and self-handicapping, and negatively correctly with hardiness.
Effect of lockdown due to COVID-19 pandemic on mental health of pre-medical students of Maharashtra	Moksh S. Khetan	DASS-21 questionnaire	10th May 2020 - 10th June 2020.	India	Pre-medical students	324 responses 104 males 220 females mean age of the respondents is 19.17 years	Depression Anxiety Stress	Cross-sectional	The result showed 13.58% had mild depression, 28.85% had moderate, 7.71% had severe and 12.03% had very severe depression. Whereas in regard of	The lockdown due to COVID-19 pandemic poses an extraordinary medical challenge to the premedical students

Psychological Impact of the Civil War and COVID-19 on Libyan Medical Students: A Cross-Sectional Study	Muhammed Elhadi	(GAD-7) scale PHQ-9	April 20 - May 1, 2020	Libya	Medical students	Of the 3,500 students, 2,430 completed the survey The mean age of the study participants was 23.30 +_ 2.61 years, 78.97% female	Anxiety depression	Cross-sectional	anxiety, results showed 5.86% had mild, 21.91% had moderate, 10.49% had severe and 10.80% of them had very severe anxiety. A total of 268 (11%) students had a GAD-7 score of ≥ 15 , which is indicative of moderate to severe anxiety. A total of 1,568 (64.5%) students showed different degrees of anxiety: mild, 910 (37.5%); moderate, 390 (16%); and severe, 268 (11%). The mean (+ SD) score of depressive symptoms determined by the PHQ-9 was 9.7 (6.3). A total of 525 (21.6%) students had a PHQ-9 score of ≥ 15 , which is indicative of moderate to severe depression.	The mental health status of Libyan medical students is at risk, especially in stressful situations such as the civil war and the outbreak of infectious disease. In addition to the Covid Pandemic, 19 other factors, such as the school year, the age of psychological stress caused by the urban war, living with family or friends, are among the factors influencing the mental state of medical students.
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Online Mental Health Survey in a Medical College in China During the COVID-19 Outbreak	Jia liu	(GAD-7) scale PHQ-9 WeChat-Based Survey	February 23, 2020 - April 2, 2020.	China	Medical students	217 students 127 females 90 males Mean age 21.7 ± 1.7 (18-27)	Depression and Anxiety	Cross-sectional	77 students (35.5%) who participated in the survey were in a state of depression, and 48 (22.1%) were in a state of anxiety. The majority of students who were in depressed (n=75) or anxiety (n=46) states had mild or moderate states.	The results of this study indicate that universities should review the criteria for prevention and recognition of psychological problems among students during severe large-scale stress and consider appropriate programs to prevent the effects of mental disorders in students' performance
Analysis of Anxiety Levels of Nursing Students Because of e-Learning during the COVID-19 Pandemic	Jessica Garcha-González	State-Trait Anxiety Inventory (STAI) questionnaire	15 - 22 March 2020 and 12 - 19 April 2020	Spain	Nursing student	460 individuals age 20.58±1.54 female78% male22%.	State-trait anxiety levels	Cohort cross-sectional but with a longitudinal component	During the first week of confinement, the score of state anxiety was 26.5±11.7, increasing to a value of 31.1±6.9 in the fourth week of confinement. The STAI score for trait anxiety in the first week was 23.9±10.7, and in the fourth week, increased to 28.7±6.5. The increase in trait	Following the Covid 19 pandemic, most educational institutions in the world had problems with student face-to-face education and turned to e-learning. The sudden shift of the traditional educational method

									anxiety was greater than the increase in state anxiety. Total anxiety levels also increased in the fourth week, as compared to the first week, from an average score of 50.4±20.8 to 59.9±10.6. All these results were statistically significant ($P < 0.001$)	towards e-learning increased the anxiety of nursing students.
Impact of Covid-19 Pandemic on Mental Health of Medical Students: A Cross-Sectional Study Using GAD-7 And PHQ-9 Questionnaires	Yoshito Nishimura	PHQ-9 GAD-7	June 8-14, 2020	Japan	Medical students	Out of 717 medical students, 473 (66.0%) participated in the study 311 females 161 males Age mean 22	Depression And anxiety	Cross-sectional	In total, 29.8% (141/473) of the students reported concerns about the shift toward online education, mostly because they thought online education would be ineffective compared with in-person learning. The participants' subjective mental health status significantly worsened after the SOE (state of emergency) was lifted ($P < .001$)	The results showed that most medical students had moderate and severe anxiety and also had depressive symptoms in this group during the Covid-19 pandemic.
Social Distancing among Medical	Huidi xiao	Online survey	4-12 February	China	Medical students	933 medical students	Depression and anxiety	Cross-sectional	. Prevalence of anxiety disorder	Despite medical

Students during the 2019 Coronavirus Disease Pandemic in China: Disease Awareness, Anxiety Disorder, Depression, and Behavioral Activities	KABP GAD-7 PHQ-9	2020				70.1% female Age: 17-24 (80.9%) 19.1% upper than 25 years			was 17.1% and depression was 25.3%. Multivariable logistic regression showed anxiety to be associated with graduate student status (odds ratio (aOR) = 2.0; 95% confidence interval (CI): 1.2–3.5), Beijing students were significantly less likely to have anxiety than those in the Wuhan epicenter (aOR = 0.9; 95% CI: 0.8–1.0), but depression did not differ.	students' knowledge of disease control and prevention, their lives were greatly affected by social distancing, especially in the Wuhan epicenter. Even well-informed students needed psychological support during these extraordinarily stressful times.
Depression and Anxiety among Iranian Medical Students during COVID-19 Pandemic	Amin Nakhostin-Ansari	Online survey BAI BDI-II	April 8 - April 10, 2020	Iran	Medical students	323 medical students 37.2% clerks 62.8% interns 52.3% female Average age: 23.73	Depression and anxiety	Cross-sectional	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. Also, 234 participants (72.4%) did not have depression,	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

									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. Depression and anxiety were more prevalent among those who had experienced COVID-19 symptoms than those who did not (P<0.05).	future similar situations. A higher GPA is related to lower anxiety and depression among medical students
Psychological impact of the coronavirus disease 2019 (COVID-19) pandemic on dental students: A nationwide study	Zaki Hakami	DASS-21	14-26 April 2020	Saudi Arabia	Dental students	697 students 54.7% female Average age: 21.76 ±1.859	Anxiety and stress depression	Cross-sectional	Overall elevated levels of depression, anxiety, and stress were seen among 60.64%, 37.02%, and 34.92% of the dental students, respectively. The combined scores categorized as severe and extremely severe accounted for 28.6% of the students in relation to depression, 17.43% for anxiety, and 14.66% for	The female students scored higher on the psychological symptoms compared to their male counterparts. Results of the current study can inform university efforts to assess and address current levels of stress, depression, and anxiety and guide program

									stress.	development and implementation of mental health programs.
Mental strain and changes in psychological health hub among intern-nursing students at pediatric and medical-surgical units amid ambience of COVID-19 pandemic: A comprehensive survey	Rasha Salah Eweida	GHQ-12	From the end of January to the middle of April 2020	Egypt	Intern-nursing students	150 participants 68.67% female Average age: 22	depression	Cross-sectional	Study results revealed that the most stressful factors were related to possibility of getting COVID-19 infection (2.89 ± 0.39) and transmitting it to their families (2.72 ± 0.62). Moreover, the availability of cure or vaccine for the disease was the most important motivational factor to participate in future outbreaks (2.64 ± 0.77).	COVID-19 pandemic was identified as a great source of mental strain among intern-nursing students at pediatric and medical-surgical units and it had a negative impact on their psychological health.
Views and Anxiety Levels of Turkish Dental Students During the Covid-19 Pandemic	Melih Uzdede	STAI-1 STAI-2	-	Turkey	Dental students	249 dental students 143 preclinical and 106 clinical students 61.8% females	VIEWS AND ANXIETY LEVELS	cross-sectional	Most students (81.1%) stated that they were concerned that the classes would be held in groups, with the transition to face-to-face education. Most of the participants (69.9%) stated that the idea of late graduation	The results of the study indicated that dental students were anxious about the COVID-19 pandemic. It should be emphasized that universities should establish crisis-oriented

									creates fear. Due to the COVID-19 pandemic, approximately a quarter of the students have the idea of changing professions.	psychological support programs for dentistry students during a pandemic.
The psychological impact of the COVID-19 pandemic on medical students in Turkey	Fuat Torun	PSS IES-R	between April 30, May 5, 2020	Turkey	Medical students	275 Students 60.7% female Average age 22.10±2.69	Stress Anxiety Psychological impact	Cross-sectional	The presence of chronic disease in the participants was found to be a factor that increased anxiety (P=0.01). Majority of participants (60.40%) stated that they agree with COVID-19 is a biological weapon. The mean scores of women 's total PSS and IES-R were higher than men. One-third of the students reported that sleep and appetite were impaired than the before pandemic. The announcements and website of Ministry of Health and the social media was the main source of information of the participants.	It was found that medical students were highly worried about being infected with COVID-19. The scores obtained from the pre-clinic students' anxiety to become infected with COVID-19, PSS and IES-R total scores were found to be significantly higher than their clinical students.
Anxiety and coping strategies	Bella Savitsky	Online survey	During the third	Israel	Nursing students	244 participants	Anxiety	Cross-sectional	The percentage of students with	The staff of the nursing

among nursing students during the covid-19 Pandemic

GAD-7
CA
COPE

week of the lockdown

87.65 % female

Average age:
First year:23.4
Second year:
25.1
Third year:26.1
Fourth year: 27.9

GAD-7 of 10 and above (moderate anxiety) was 42.8% (30.8% among males and 44.7% among the females, p value of X² test = 0.21). The percentage of students with GAD-7 of 15 and above (severe anxiety) was 13.1% (0% among males and 14.9% among the females, p value of X² test = 0.03). Males had significantly lower anxiety scores. Students who were more concerned with the future continuation of this academic year had a significantly higher anxiety score (median = 9, IQR:6.0–14.0) than those who were concerned at a low or moderate level (median = 7, IQR:2.0–12.0) (*P*

department believe that the most important way to help students during this period is to stay in continuous contact with them beyond online teaching. Students face severe anxiety related to economic uncertainty, fear for health of their families, fear of infection, the need to support and care for children, and to deal with the challenges of distance education.

<p>Increased Levels of Anxiety Among Medical and Non-Medical University Students During the COVID-19 Pandemic in the United Arab Emirates</p>	<p>Basema Saddik</p>	<p>Online platform GAD-7</p>	<p>11-21 march 2020</p>	<p>United Arab Emirates</p>	<p>Medical and dental and nonmedical students</p>	<p>1385 participants 71.8 % female Average age: 20.5±2.3</p>	<p>Anxiety</p>	<p>Cross-sectional</p>	<p>= 0.024) The anxiety score increased among those students who are the parents of young children [median = 11.5 Non-medical students exercised higher compliance with social restrictions, while medical students practiced better hand hygiene. Almost half of students reported anxiety levels ranging from mild to severe with females reporting higher anxiety scores during hospital visits (OR=2.02, 95% CI, 1.41 to 2.91) and medical students reporting lower anxiety levels in comparison to dental students (OR=0.61, 95% CI, 0.45 to 0.84). Medical students reported higher levels of anxiety during their clinical rotations which decreased with the introduction of</p>	<p>The findings from study can be used to support the development of effective screening strategies and interventions to build psychological resilience among university students during the COVID-19 pandemic or any other public health emergencies in the future.</p>
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Physical and psychological health of medical students involved in the COVID-19 response in Switzerland	Aebischer Oriane	Online study GAD-7 PHQ-9	9-14 May 2020	Switzerland	Medical students residents	550 medical students 66.7% female Average age:23 227 residents 70.5% female Average age:30	Anxiety Depression Burnout Emotional exhaustion	Cross-sectional	online learning, yet, non-medical students' anxiety levels increased with online learning. Both medical students and residents reported high access to PPE, support and information by employer. Students involved in the COVID-19 response reported a similar proportion of COVID-19 symptoms or confirmed diagnoses ($P=0.81$), but lower levels of anxiety ($P<0.001$), depression ($P<0.001$) and burnout ($P<0.001$ for depersonalization item), compared with their non-involved peers. Health outcomes of frontline students did not differ significantly compared with their non-frontline peers. Frontline students had lower levels of burnout than frontline residents ($P<0.01$ for emotional	In a snowball sample of Swiss medical students involved in the response to the first wave of the COVID-19 pandemic, we observed similar physical and psychological health outcomes compared with their non-involved peers. The context in which medical students are involved is certainly critical. Access to PPE, perceived support by employers and perceived passage of information by employers could explain these findings.
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									exhaustion item); the remaining health outcomes did not significantly differ.	
The immediate psychological effects of Coronavirus Disease 2019 on medical and non-medical students in China	Lin Xie	Online survey IES-R	4-7 February 2020	China	Medical and non-medical students	805 medical students 1900 non-medical students 77.24% female	Anxiety and depression	Cross-sectional	Medical students estimated COVID-19 to be more serious and disastrous than non-medical students, while they scored lower than non-medical students on the Impact of Event Scale-Revised (IES-R), and less severe anxiety and depression than non-medical students. The students experienced greater impact from the outbreak and a higher rate of anxiety and depression with increased time focusing on the outbreak. The difference in psychological effects between medical and non-medical students was further enlarged when focusing time was prolonged.	Medical students experienced lower psychological impact of COVID-19 than non-medical students, although they thought the epidemic more serious. Time spent focusing on epidemic-related information affected the psychological effects of COVID-19, and the difference in the psychological effects experienced by medical and non-medical students increased with time prolonged.
Anxiety, Depression and	Uma Pandey	Online questionnaire	19 April 2020	India	Junior Doctors and Medical	83 medical students	Depression, Anxiety and Stress	Cross-sectional	Formal anxiety and depression	Female students/juni

Behavioural Changes in Junior Doctors and Medical Students Associated with the Coronavirus Pandemic	GAD-7 and PHQ-9	22 April 2020	Students	47 (56.6%) females 36 (43.4%) males 80 (96.4%) were aged less than 30 years old	scores using the GAD-7 and PHQ-9 tools indicated 15/82 (18.3%) had anxiety scores of 0 (lowest possible) and 21/82 (25.6%) had the lowest possible depression score of 0. However, 6/82 (7.3%) had scores that were classified as severe depression. Females had significantly higher median anxiety (5 v 2, $P < 0.002$) and depression scores (5 v 3, $P = 0.025$) than male participants. Direct patient care and care of patients with Covid-19 did not result in significant deterioration in anxiety and depression.	or doctors showed higher anxiety and depression scores than males. Direct patient care and care of patients with Covid-19 did not result in a measurable deterioration in anxiety and depression in this study. In this stressful pandemic situation, it is imperative to look after the mental health of healthcare workers as well as patients.			
Psychological Impact of COVID-19 and Lockdown among University Students in Malaysia: Implications and Policy	Sheela Sundaraseen	Online survey Zung's SAS	Between 20 April and 24 May 2020	Malaysia Pre-University Management Studies Sciences Arts/Communication/Languages	983 Respondents Health Sciences 273 (%27.8)	Anxiety	Cross-sectional	The main stressors include financial constraints, remote online teaching and uncertainty about the future with regard to	With regard to the field of study, students in management-related studies seemed to have a higher level of

Recommendations	Health Sciences (University Students)				academics and career. The main findings of this study were: Normal anxiety:258 (94.5%) Mild to moderate anxiety:12 (4.4%) Moderate to severe anxiety: 3 (1.1%)	anxiety compared to healthcare and medical students. This is contrary to another study which conjectured that medical and healthcare students experience a higher level of anxiety during times of epidemic or pandemics.			
Knowledge, Anxiety, Fear, and Psychological Distress About COVID-19 Among University Students in the United Arab Emirates	Coumaravelou Saravanan	k-6	United Arab Emirates	Students	433 Students Arts: 200 (46.2) Engineering: 115 (26.5) Health science/science: 74 (17.1) Medical: 44 (10.2)	Anxiety, Fear, and Psychological Distress	Cross-sectional	Psychological distress: Health sciences/sciences: No n (%) :32 (43.2) Yes n (%): 42 (56.8) Medical: No n (%) :18 (40.9) Yes n (%) :26 (59.1) COVID-19 anxiety: Health sciences/sciences: No n (%) :63 (85.1) Yes n (%):11 (14.9) Medical: No n (%): 33 (75) Yes n (%): 11	Students have sufficient knowledge of COVID-19. Students in this study were found to have slightly less anxiety and fear of COVID-19 than was found in studies conducted overseas, while psychological distress was higher. Students studying arts and sciences are experiencing more

									(25)	psychological distress than students studying in medical and health science programs. The COVID-19 pandemic appears to negatively affect the mental health of the undergraduate medical students with the prevalence and levels of anxiety and stress being increased, and depression symptoms remaining unaltered. Addressing and mitigating the negative effect of COVID-19 on the mental health of this population is crucial.
Impact of COVID-19 outbreak on the mental health status of undergraduate medical students in a COVID-19 treating medical college: a prospective longitudinal study	Ilango Saraswathi	DASS21 before and during the COVID-19 outbreak	December 2019 and June 2020	Chennai, India	Undergraduate medical students in a medical college at Chennai, India	217 undergraduates medical students (78 males and 139 females); the average age was 20 ± 1.6 years.	Depression, anxiety, and stress levels	Prospective longitudinal study cross-sectional	The average scores of depression, anxiety, and stress during the baseline survey was 7.55 ± 7.86 , 4.6 ± 6.19 and 7.31 ± 7.34 and in follow-up survey, the mean scores were 8.16 ± 8.9 , 6.11 ± 7.13 and 9.31 ± 8.18 respectively.	
Exposure to COVID-19 patients increases physician trainee	Thomas G. Kannampallil	DASS-21 scale	10 to 25 April 2020	Washington	Physician trainees (residents and clinical fellows)	393 trainees completed the survey (29% response rate)	Depression, Anxiety, Stress	Cross-sectional	The exposed group had a higher prevalence of stress (29.4% vs.	To address these challenges, wellness programs

stress and
burnout

18.9%, $P=0.016$, and burnout (46.3% vs. 33.7%, $P=0.011$); and marginally higher prevalence of anxiety (21.6% vs. 14.9%, $P=0.089$). Both groups had similar prevalence of depression (28% vs. 26.3%, $P=0.70$).

should focus on sustaining current programs, develop new and targeted mental health resources that are widely accessible and devise strategies for creating awareness regarding these resources.

A large number of students considered virtual education as an unusual and unfamiliar method and expressed their anxiety symptoms. This anxiety was more evident in students with lower levels of education, indicating their lack of experience and knowledge of the technique and pattern of university exams.²⁰ In another study, however, students preferred virtual learning conditions and exams to physical presence at universities and hospitals.²² A group of studies showed that e-learning style is a factor raising the level of anxiety ([OR] 1.97, 95% CI 1.19-3.28).^{16,20,22,25} However, other studies found that virtual and distance education reduced students' anxiety and recommended the widespread use of this method.^{11,27}

In addition, several studies have reported students' anxiety due to fear of transmitting the virus to their families, children, and relatives.^{3,11,27,28} Anxiety of some students has also been due to a lack of control and definitive treatment of the disease.¹⁹

Anxiety and depression were found to be higher in students with a history of mental health problems (AOR = 4.7, 3.2, 2.6, and 3.2) and physical illnesses (AOR = 2.4) than those in other students.³

Students who lived in apartments (OR = 2.48, 95% CI = 1.44-4.24; $P = 0.001$) and spent more than four hours a day reading COVID-19 news (OR = 11.20) had higher levels of anxiety.³⁰

Most students followed the daily news of COVID-19-related mortality and stated they had enough information about the virus and how to spread and prevent it.^{1,20,27,30} People who did not know enough about transmitting and preventing it were more anxious.²⁶ However, another group of students refused to follow COVID-19 news on social networks and tried to entertain themselves with other things to overcome their anxiety.¹⁵ In a study on students' opinions about the origins of the coronavirus, most students considered the COVID-19 to be a biological weapon made in laboratories, which increased their anxiety. In contrast, people who did not believe in the biological weapon's hypothesis were less prone to anxiety.²⁶ Many students have expressed dissatisfaction with the quarantine caused by the disease and found life in this situation boring. This issue even became controversial in their families. In addition, worries about end-of-semester exams have contributed to an increase in depression and mental

disorders.^{20,21}

A group of students were anxious about the impact of quarantine conditions on their economic situation.^{1,22} COVID-19-related anxiety and depression caused sleep, appetite and diet disorders, lack of energy and concentration, decreased self-confidence and lack of ability to overcome life problems in students.^{15,22,24,26} Students who had a family member or relatives with COVID-19 also had higher levels of anxiety and depression.³¹

The final results of the data of this review study showed that the overall prevalence of depression was 42.22% and that of anxiety was 32.21%. In our study, a significant relationship was found between the level of anxiety as well as depression and COVID-19. Moreover, the prevalence of anxiety and depression in women was higher than that in men.

Discussion

The present study showed a significant relationship between anxiety as well as depression levels and COVID-19. In contrast a study by Isabel Lasheras found that the prevalence of anxiety in medical students after the pandemic is 28%, and the rate of anxiety in medical students did not increase during the pandemic of COVID-19.³² According to a meta-analysis, the prevalence of pre-pandemic anxiety resulted from COVID-19 was estimated to be 33.8%.³³ A study conducted by Nader Salari on a statistical population of 9074 people demonstrated that the rate of stress in the general population during the pandemic period was 29.6%, depression 33.7%, and anxiety 31.9%.³⁴ Most of the studies included in this systematic review showed that the prevalence of anxiety and depression was higher in women than in men. Also, a study by Nader Salari found that anxiety, depression, and stress were higher in women than in men.³⁴

This study demonstrated that living conditions are the additional factors in the prevalence of anxiety and depression, meaning that people who live apart from the family suffer from anxiety and depression more. Another study conducted by Cao. W. found that students living in rural areas were more likely to be anxious due to poor economic conditions, fewer health resources and preventative strategies.³⁵ A study demonstrated that the rate of depression in Asian students was higher than that in other continents.³⁶ The findings indicated that the level of anxiety in students

decreased as the level of education increased. There was a significant relationship between other demographic factors such as fear of infection, low income, direct contact with COVID-19-affected patients and attending bedside, fear of transmitting the virus to family, as well as living in an apartment, and anxiety and depression. In this regard, a study conducted by Cao.W. showed that economic issues, delays in education, and its effects on daily life were among the stressors on employees working in medical sciences.³⁵ In another study, living with family and social support, living in urban areas, and family income stability were considered protective factors against anxiety.³² In general, the level of anxiety of medical students was found to be much lower than that of non-medical students, and the level of anxiety of dental students was observed to be more than that of medical students in this study. A study by Isabel Lasheras showed that knowledge about COVID-19 transmission, treatment, prognosis, and prevention were key factors in reducing the anxiety of medical students compared to non-medical students.³² Another study demonstrated that the prevalence of depression in dental students is much higher than that in the general population.³⁶ In our study, many of students considered e-learning to be an unusual and unfamiliar method, and this educational method caused them anxiety. In this regard, the results of our study were consistent with those of the study conducted by Mirna Fawaz indicating that the sudden change of education towards virtualization caused anxiety and depression in students.³⁷

In our study, anxiety and depression caused by COVID-19-induced sleep, appetite, and diet disorders, lack of energy and concentration, decreased self-confidence, and loss of ability to overcome life problems in students. A study conducted by Cristina Romero-Blanco on nursing students showed that although students' sleep time increased, their sleep quality decreased significantly during the COVID-19 pandemic.³⁸

Conclusion

The purpose of this systematic review was to evaluate the level of anxiety and depression in medical students during the COVID-19 pandemic. Evidence has shown a significant impact of the COVID-19 pandemic on anxiety and depression, as well as the sleep and

nutrition patterns of medical students. The prevalence of anxiety and depression was higher in women than in men. Living conditions are other factors affecting in the prevalence of anxiety and depression, meaning that people who live far away from their families are more prone to anxiety and depression. This study showed that COVID-19-related quarantine has increased the prevalence of anxiety and depression among students. Many students found e-learning an unusual and unfamiliar method, and this appeared to cause anxiety to them.

In our study, COVID-19-related anxiety and depression caused sleep, appetite and diet disorders, lack of energy, and concentration decreased self-confidence, and loss of the ability to overcome life problems in students. These findings help identify the factors affecting anxiety and depression in medical students. Meanwhile, it is possible to reduce anxiety and depression by increasing awareness, making prevention tools available, and providing an appropriate learning environment. Therefore, students, especially medical students, need extensive psychological support from the government and their educational institutions to be able to overcome this crisis with the least psychological damage.

Conflict of Interest

The authors declare no conflicts of interest.

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