Review

Anxiety and Depression Disorders in Undergraduate Medical Students during the COVID-19 Pandemic: An Integrative Literature Review

Carlos Izaias Sartorao-Filho * and Ana Luisa Varrone Sartorao

Posted Date: 1 October 2024

doi: 10.20944/preprints202410.0037.v1

Keywords: anxiety; depression; medical students; pandemic; COVID-19; GAD-7; PHQ-9; mental health

Review

Anxiety and Depression Disorders in Undergraduate Medical Students during the COVID-19 Pandemic: An Integrative Literature Review

Ana Luisa Varrone Sartorao [1] and Carlos Izaias Sartorao-Filho [2]

[1] Undergraduate student at Educational Foundation of the Municipality of Assis. Faculty of Medicine
[2] Professor of Medicine at Educational Foundation of the Municipality of Assis. M.D.. Ph.D.
* Correspondence: carlos.filho@fema.edu

Abstract: *Introduction:* The COVID-19 pandemic has triggered several challenges on the mental health worldwide. Undergraduate medical students face considerable stress in their academic routines. Thus, there is a need to explore the implications of the mental health of undergraduate medical students during the COVID-19 pandemic. *Objective*: To review the global literature about anxiety and depression disorders in undergraduate medical students during the COVID-19 pandemic. *Method:* we developed an integrative literature review on the occurrence of anxiety and depression symptoms in undergraduate medical students during the COVID-19 pandemic. We assessed the results on the occurrence of anxiety and depression and the severity of symptoms in medical students during the COVID-19 pandemic using quantitative studies applying GAD-7 questionnaire for anxiety or PHQ-9 for depression. *Results:* We reviewed 85 selected studies, and the results showed a significant prevalence of moderate and severe symptoms of anxiety and depression with 28.2% of participants presenting scores ≥ 10 on the GAD-7 and 38.9% on the PHQ-9. Statistical analyses revealed associations between higher rates of anxiety symptoms in developing countries and data collected after the lockdown period, in 2020, at the Pandemic lockdown. *Conclusion:* Our findings highlight the need for specific interventions to support the mental health of undergraduate medical students, critically in the female students from developing countries during a Pandemic crisis.

Keywords: anxiety; depression; medical students; pandemic; COVID-19; GAD-7; PHQ-9; mental health.

1. Introduction

In December 2019, in Wuhan, the first case of a new respiratory disease caused by the SARS-CoV-2 virus was documented. (1). On March 11, 2020, the World Health Organization (WHO) executive director officially categorized COVID-19 as a pandemic. (2) In May 2023, the WHO declared the end of the Public Health Emergency of International Concern regarding this disease. (3)(4) Therefore, in response to the global health crisis, the most widely used approach was social isolation, which resulted in the transition of in-person educational activities to an online format. (5)

COVID-19 not only causes physical health problems but can also lead to a series of mental disorders. (6) Fear of death and the impacts on physical health, isolation, social distancing, the loss of family members, financial difficulties, misinformation, rumors, and uncertainty about the future are sources of distress. According to surveys conducted by the WHO, the COVID-19 pandemic triggered a 25% increase in the prevalence of depression and anxiety worldwide. (7) Thus, the effects of the COVID-19 pandemic provide an opportunity to reflect on the state of mental health and highlight the imminent need to implement fundamental preventive measures for collective well-being. (8) Hence, concerns arise regarding the mental health of undergraduate medical students, who represent a population that already suffers from the daily pressures of academic life, which can

 doi:10.20944/preprints202410.0037.v1

compromise mental, social, and physical health. (9) Furthermore, according to a research developed at our Brazilian medical institution in 2020, there was a higher prevalence of symptoms of anxiety and depression in medical students related to the COVID-19 pandemic. (10) Besides, the mental health of medical students is vital to analyze whether depression and anxiety symptoms represent obstacles to the academic career of medical students. (11)

Many studies have evaluated scales such as GAD-7 and PHQ-9 in medical students during the COVID-19 pandemic. The Generalized Anxiety Disorder (GAD-7) scale is a seven-item diagnostic tool that shows probable cases of generalized anxiety disorder, and assesses symptom severity. It has been confirmed in remote health surveys, epidemiological studies, and primary care settings. (12) This questionnaire is reliable and has a criterion validity. (13) However, this scale only provides probable diagnoses, which need to be confirmed through further assessment. (14) The Patient Health Questionnaire-9 (PHQ-9) is a nine-item questionnaire that screens for depression in primary care and other medical settings. (13) It is a quick, effective, simple, and reliable tool for screening and assessing the severity of depression symptoms. (15) However, this questionnaire does not necessarily match the lived experience of depression.(16) Thus, the PHQ-9 is not considered an instrument to confirm a depression diagnosis. (17)

Therefore, a literature review that analyzes the rates and severity of depression and anxiety symptoms in undergraduate medical students during the COVID-19 pandemic is essential. Although the emergency phase of this pandemic has already ended, it is essential to analyze the psychological effects on medical students, aiming to provide data that guide the development of strategies for future interventions in similar crises. We hypothesize that there is an increase in the occurrence and the severity of symptoms of anxiety and depression in medical students during the COVID-19 pandemic. Hence, we aimed primarily to review the global literature on anxiety and depression disorders with studies that used the PHQ-9 and GAD-7 questionnaires in undergraduate medical students during the COVID-19 pandemic. Moreover, the specific objectives were to analyze the predictive variables for increased symptoms of anxiety and depression in the medical educational institutions.

2. Methods

We performed an integrative literature review from February to July 2024 at FEMA (Educational Foundation of the Municipality of Assis) at the Faculty of Medicine. Regarding the eligibility and search criteria, we included the medical literature in English, Portuguese, and Spanish, using the following keywords: (COVID-19) and (Medical Students) and (anxiety) or (depression) or (mental health). We searched the indexed journals database from PubMed and Bvsalud and selected the manuscripts with data collection from December 2019 to July 2024. We included the manuscripts that used the PHQ-9 and/or GAD-7 questionnaires in their methodology. We excluded systematic reviews, narrative reviews, integrative reviews, meta-analyses, and qualitative analytical studies. We also excluded manuscripts from non-indexed and pre-printed journals.

To outline the search strategy, we followed the PICO strategy, obtaining several studies that were used to conduct the integrative literature review. We used the following variables: studies with data collected in 2020, during the lockdown period, and studies conducted after 2020, post lockdown period. Continent in which the institution was located: Europe, Asia, North America, Latin America, Oceania, and Africa. The actualized Human Development Index (HDI) of the country. Number of study participants, gender, percentile of women, average age of participants. Categorization of the GAD-7 questionnaire into: score 0-4; 5-9; 10-14; 15-21 and categorization into GAD 7 <10 or ≥ 10. Categorization of the PHQ-9 questionnaire into: score 0-4; 5-9; 10-14; 15-19 >19 and categorization into PHQ9 <10 or ≥ 10. The primary outcome was the prevalence of moderate or higher symptoms of anxiety and depression in medical students during the COVID-19 pandemic. The secondary outcome was the search for predictive variables about the severity of symptoms, in studies which GAD-7 and PHQ-9 scores ≥10.

We adjusted multiple linear regression models with normal response to explain the GAD-7 percentage greater than or equal to 10 points and the PHQ-9 percentage greater than or equal to 10

 doi:10.20944/preprints202410.0037.v1

points, including, in the deterministic component, only the variables that presented $p < .20$ in the bivariate investigation. The GAD-7 and PHQ-9 indexes equal or more than ten are a critical instrument for denote the moderate and high severity of the symptoms. (14) The quality of the adjustment of the multiple regression models was analysed by investigating the behavior of the residuals with the Shapiro-Wilk normality test, scatter plot between residuals and predicted values of the models to investigate homoscedasticity, and Cook's distance measure to investigate the influence of atypical points on the estimates of the model parameters.

The final models considered the associations statistically significant if $p < .05$. All analyses were performed with the SPSS 21 software by IBM trademark.

We searched the databases of manuscripts selected by the eligibility criteria. We evaluated the results regarding the occurrence of anxiety and depression through the PHQ-9 and GAD-7 questionnaires during the COVID-19 pandemic. Finally, we created a table summarizing identification data, objectives, and results of each study evaluated.

We collected studies from the literature using secondary data sources. We were concerned about bias risks in the analysis and interpretation of research data, as well as indirect risks to the physical, mental, spiritual, and social dimensions associated with human beings in any research. Regarding the benefits, we considered the manuscript vital for promoting a positive impact on medical practice in mental health.

3. Results

We identified 1.768 studies in the Pubmed database and 60 articles in Bvsalud. Applying the eligibility criteria, we selected 88 articles from the literature. Of these, 43 contained at least one of the questionnaires (GAD-7 or PHQ-9), while in 42 articles, both questionnaires were used. Figure 1 represents the flowchart of the selection process.

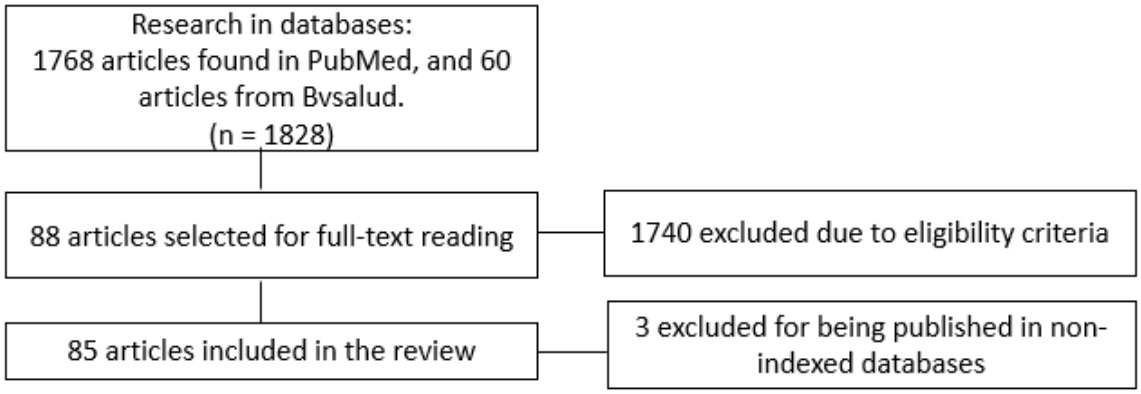

Figure 1. Flowchart of the selection process of the studies included in the review.

Table 1 contains the list of selected studies. Three manuscripts were excluded because they were published in non-indexed databases. Thus, the study was based on data from 85 manuscripts in the literature.

Table 1. List of the eligible studies and the percentiles of GAD-7 and / or PHQ-9 scores ≥10.

	Author	*Country*	*N*	*GAD-7 ≥10 (%)*	*PHQ-9 ≥10 (%)*
1	*Zheng (28)*	China	468	11.30	20.70
2	*Coico-Lama (29)*	Peru	431	29.50	28.50
3	Bhongade (30)	Emirates	107	25.30	
4	Din (31)	Pakistan	444	46.17	64.41
5	Reddy (32)	India	164	20.00	
6	Ortega-Moreno (33)	Mexico	384	24.50	43.00

 doi:10.20944/preprints202410.0037.v1

7	Shahzad (34)	Pakistan	585	41.00	
8	Iqbal (35)	India	261	51.70	58.70
9	Gomez-Duran (36)	Spain	175	34.70	26.60
10	Wiguna (37)	Indonesia	1023		77.40
11	Tanuseriawan (38)	Indonesia	635		63.40
12	Purnomo (39)	Indonesia	161		8.70
13	Yuryeva (40)	Ukraine	154	27.90	44.80
14	Arshad I (41)	India	261	65.50	67.80
15	Lakshmi (42)	India	200	83.00	
16	Ernst J (43)	Swiss	574	22.60	
17	Cao W (44)	China	7143	3.60	27.20
18	Chistophers B (45)	USA	1139	20.00	
19	Sartorao (10,46)	Brazil	340	[a]	[a]
20	Lin S (47)	USA	154		24.00
21	Huarccaya Victoria (48)	Colombia	1238	19.00	34.00
22	Pinsai (49)	Tailandia	37	51.35	
23	Verma (50)	India	267	28.50	
24	Alkwai (51)	Saudi Arabia	55	17.00	26.42
25	Bartra (52)	Peru	57	22.80	
26	Guralwar(52)	India	604	54.14	
27	Almarri(53)	India	7116	40.50	
28	Kamran(52)	Pakistan	324	44.50	
29	Porwal (55)	Saudi Arabia	22	13.60	40.90
30	Primatanti(56)	Indonesia	7949	13.90	
31	AbuDujain(57)	Saudi Arabia	345	13.90	
32	Imran(58)	Pakistan	1100	40.40	48.10
33	Rafsanjanipoor (59)	Iran	83	24.20	
34	Srivastava (60)	India	97	24.74	48.10
35	Pedraz-Petrozzi (61)	Colombia	125	12.80	34.40
36	Vajpeyi (62)	Emirates	798	39.10	
37	Alshehri (63)	Saudi Arabia	182	30.80	
38	Paz D (64)	USA	152	36.70	40.90
39	Schindler (65)	Germany	63		44.00
40	Lu (66)	China	519		41.50
41	Chakeyanunn(67)	Thailand	437		27.00
42	Huarcaya victoria (48)	Colombia	1238	19.00	
43	Camelier-Mascarenhas (68)	Brazil	310	33.50	42.60
44	Dziedzic (69)	Brazil	162	29.60	34.00
45	Eleftheriou (70)	Greece	559	67.60	43.70
46	Cheng(71)	China	947	37.80	39.30
47	Santander (72)	Peru	370	38.38	
48	Çimen (73)	Turkey	2778	44.50	46.21
49	VIillalon López (74)	Chile	359	41.50	60.10
50	Villagomes-Lopez (74)	Ecuador	1528	30.30	
51	Harries(75)	USA	741	25.60	
52	Liu (76)	China	29663	46.00	37.80
53	Pattanaseri (77)	Thailand	224	[a]	[a]
54	Teh(78)	Malaysia	371	37.00	35.70
55	Adhikari (79)	Nepal	223	[a]	[a]
56	Chalise (80)	Nepal	315	12.90	
57	Romic (81)	Croatia	280	32.50	52.20
58	Nguyen (82)	Vietnan	747	7.90	20.63

 doi:10.20944/preprints202410.0037.v1

59	Biswas (83)	Bangladesh	425		31.80
60	Song (84)	China	666	17.80	15.20
61	Guo (85)	USA	929	31.10	48.80
62	Essangri (86)	Morocco	549	25.70	45.70
63	Saali(87)	USA	108	32.40	
64	Nishimura (88)	Japan	473	7.20	74.70
65	Sserunkuuma (89)	Uganda	269		24.10
66	Batais (90)	Saudi Arabia	332	13.70	15.90
67	Crisol-deza (91)	Peru	1238	19.00	34.00
68	Tsiouris (92)	Germany	1438		34.00
69	Sudi(93)	Malaysia	196		38.90
70	Wercelens (94)	Brazil	150		40.70
71	Yin (95)	China	5982	4.20	9.90
72	Chwa (96)	USA	87	27.40	
73	Pandey (97)	India	83	9.80	24.70
74	Elhadi(99)	Libya	2430	27.00	
75	Xiao (100)	China	933	4.60	7.30
76	Essadek (101)	France	668		42.80
77	Liu (102)	China	217	7.40	
78	Chootong (103)	Thailand	325	12.90	7.60
79	Saeed (104)	Pakistan	234	62.40	64.10
80	Huang (105)	China	1021	10.98	38.17
81	Wang(106)	Korea	454	18.50	11.10
82	Halperin (107)	USA	1428	30.60	31.00
83	Bilgi (108)	Turkey	178	37.10	20.10
84	Alsairafi (109)	Kuwait	298	85.20	93.00
85	Allah (110)	Saudi Arabia	1591	19.20	
86	Khidri (111)	Pakistan	864		40.80
87	Shreevastava (112)	India	1208	40.30	
88	Afzal (113)	Pakistan	433		40.65

[a] The manuscripts referenced as 19, 53, and 55 were excluded due to non-indexed publication. .

Table 2 shows the manuscripts sample characteristics. Of the selected manuscripts, 28 collected information after 2020. About the institution continent area, 49 papers were from Asian institutions. On the HDI (Human Development Index), 35 were from countries with a very high HDI.Third-one from countries with a high HDI, and 22 from countries with a medium or low HDI.

Table 2. Manuscripts description variables.

Variable	*n*	%
Data collection time		
After 2020	28	31.8
In 2020	60	68.2
Continent		
Europe	9	10.2
North America	8	9.1
Asia	49	55.7
Oceania	5	5.7
Latin America	14	15.9
Africa	3	3.4
Human Development Index (HDI)		
Very high	35	39.8
High	31	35.2

 doi:10.20944/preprints202410.0037.v1

Medium or low	22	25.0

Table 3 provides the variable range list and the interquerles. Concerning the HDI variable, the median of the countries was 0.79 (0.70-0.88). The median age of the participants was 22.0 years (20.0–23.0). The percentile of women who answered the questionnaires was 63.0% (52.3–68.7). Regarding the GAD-7 questionnaire, we observed a median of 28.2% (18.3 – 39.4) with a score ≥ 10. About the PHQ-9 questionnaire, the median score ≥10 was 38.9% (26.8 – 47.2).

Table 3. Variable range list and the interquartile ranges.

Variable	*Median*	*Q1*	*Q3*
Human Development Index	0.79	0.70	0.88
Number of participants	377.5	185,5	912,8
Male	160.0	89.0	322,0
Female	240.0	113,0	597,0
Percentual of women	63.0	52.3	68.7
Age	22.0	20.0	23.0
GAD-7 score 0-4	25.3	0.0	39.2
GAD-7 score 5-9	37.8	30.4	67.2
GAD-7 score 10-14	19.9	12.8	27.5
GAD-7 score 15-21	3.4	0.0	13.9
GAD-7 score ≥ 10	28.2	18.3	39.4
PHQ-9 score 0-4	0.0	0.0	28.4
PHQ-9 score <10	40.0	27.0	60.9
PHQ-9 score 10-14	23.0	19.0	36.8
PHQ-9 score 15-19	4.9	0.0	13.9
PHQ-9 score >19	0.0	0.0	6.2
PHQ-9 score ≥10	38.9	26.8	47.2

Q1: first interquartile range Q3: third interquartile rang.e.

Table 4 presents the bivariate associations by simple linear regression to explain the percentage of GAD-7 with a score ≥ 10 points (p < .20). We observed significant results (p < .20) regarding the variables: data collected in 2020, Latin America, Oceania, Asia (reference: Europe). And medium or low and high HDI (reference: very high HDI).

Table 4. Bivariate associations by simple linear regression to explain the percentage of GAD-7 score ≥ 10.

Variable	*b*	*IC95%*		*p*
Data Collection in 2020 (Ref: After 2020)	-15.16	-23.15	-7.17	*.000*
Africa	-13.48	-40.54	13.58	*.329*
Latin America	-13.22	-29.79	3.35	*.118*
Oceania	-25.93	-61.73	9.87	*.156*
Asia	-9.51	-23.98	4.95	*.198*
North America	-10.72	-29.16	7.72	*.255*
Continent (Ref: Europe)	0[a]			
Human Development Index	-34.12	-68.59	0.35	*.052*
Medium or low	9.23	-0.12	18.59	*.053*
High	-10.72	-19.10	-2.35	*.012*
Human Development Index (Ref: very high)	0[a]			
Number of participants	0.00	0.00	0.00	*.914*
Number of women	0.00	0.00	0.00	*.963*
Percentage of women	0.08	-0.30	0.46	*.684*

 doi:10.20944/preprints202410.0037.v1

Average age	0.67	-3.82	5.15	*.771*

B: beta coefficient; 95%CI: 95% confidence interval; P<.20.

Table 5 shows the data obtained after multiple linear regression to explain the percentage of GAD-7 scores ≥ 10 (p < .05). Table 5 shows the data obtained after multiple linear regression to explain the percentage of GAD-7 scores ≥ 10. After statistical analysis, we observed that studies with data collected in 2020 –during the lockdown in most of countries worldwide - had a GAD-7 response percentage ≥ 10, that was on average 14% lower compared to collected after 2020 (β: -14.02; 95% CI -21.63 to -6.40; p < .001). Countries with medium or low HDI had a GAD-7 response percentage ≥ 10 twelve percent higher than from countries with high or very high HDI (β: 12.61; 95%CI 2.93 to 22.29; p<.011).

Table 5. Multiple Linear Regression to Explain the Percentage of GAD-7 score ≥ 10.

Variable	*β*	*95%CI*		*p*
Data collection in 2020 (Ref: After 2020)	-14.02	-21.63	-6.40	*.000*
Africa	-6.26	-30.28	17.76	*.610*
Latin America	2.63	-13.92	19.18	*.755*
Oceania	-22.24	-53.37	8.90	*.162*
Asia	-7.25	-20.49	5.99	*.283*
North America	-5.38	-20.71	9.96	*.492*
Continent (Ref: Europe)	0[a]			
Medium or low	12.61	2.93	22.29	*.011*
High	-8.37	-18.37	1.63	*.101*
Human Development Index (Ref: very high)	0[a]			

p < .05; homoscedasticity; dCook < 1 = 100%; B: beta coefficient; 95%CI: 95% confidence interval.

Regarding studies using PHQ-9, Table 6 shows the bivariate associations by simple linear regression to explain the percentage of PHQ-9 scores ≥ 10. As a result, the percentage of women was the only association presenting a p-value under .20 on the bivariate analysis (β: 0.36; 95%CI -0.04 to 0.75; p < .077).

Table 6. Bivariate associations by simple linear regression to explain the percentage of PHQ-9 score ≥ 10.

Variable	*β*	*95%CI*		*p*
Data Collection in 2020 (Ref: After 2020)	1.42	-8.71	11.54	*.784*
Africa	-8.59	-35.82	18.64	*.536*
Latin America	-4.46	-21.19	12.28	*.602*
Oceania	3.61	-17.48	24.70	*.737*
Asia	-6.21	-19.92	7.49	*.374*
North America	-7.31	-28.40	13.78	*.497*
Continent (Ref: Europe)	0[a]			
Human Development Index	-22.58	-62.59	17.42	*.269*
Medium or Low	6.67	-5.34	18.68	*.276*
High	-6.14	-16.19	3.92	*.232*
Human Development Index (Ref: Very High)	0[a]			
Number of Participants	0.00	0.00	0.00	*.625*
Number of Women	0.00	0.00	0.00	*.665*
Percentage of Women	0.36	-0.04	0.75	*.077*
Average age	4.78	-5.13	14.70	*.344*

B: beta coefficient; 95%CI: 95% confidence interval; P<.20.

 doi:10.20944/preprints202410.0037.v1

4. Discussion

We found evidence that studies performed in 2020 showed students with an average 14% lower percentage of responses to the GAD-7 anxiety symptoms score ≥ 10 compared to studies after 2020. This may be explained by the lockdown period and the beginning of the Pandemic, a period of uncertainty. (18,19)

Furthermore, we observed that students from countries with medium or low HDI had a significant average 12% higher percentage of responses to the anxiety GAD-7 score ≥ 10 than those from countries with high or very high HDI. Finally, the higher percentage of female students was the only significant association found concerning the PHQ-9 depression symptoms score ≥ 10. It is known that female gender is related to be more affected during pandemic related stressors. (20,21) Moreover, it is important to highlight that low- and middle-income countries are also associated with a high burden of mental health disorders (22) with some studies suggesting that lower-income countries have a reduced capacity to provide access to depression treatment (23,24).

A study conducted at our Brazilian institution in 2020 applied the GAD-7 and PHQ-9 questionnaires to medical students during the beginning of the COVID-19 pandemic. The study found a higher prevalence of moderate and severe symptoms of anxiety and depression in students, especially in women. (10). Using a cut-off score of 10 for GAD-7 anxiety questionnaire, 46.17% of the students were identified with moderate or severe symptoms of anxiety, and 64.41% with PHQ-9 score ≥10. Sartorao-Filho et al. also observed after multivariate analysis, a positive significant relationship between GAD-7 total score and female students; r (340) 0.130, p: .016, and a positive significant relationship between PHQ-9 total score and female students; r (340) = 0.128, p : .018 (10). The prevalence of symptoms of anxiety and depression observed in this previous study has results similar to those of this review.

A meta-analysis published by Jia et al in 2022 demonstrated the pooled prevalence of depression in 37.9% of medical students (95%CI: 30.7-45.4%), and pooled anxiety prevalence of 33.7% (95%CI: 26.8-41.1%). In addition, their results varied by gender, country and continent. (25)

Another study, in 2024, from Lin et al. (26) reported the pooled prevalence for anxiety of 45% (95%CI: 40-49%) and for depression of 48% (95%CI:43-52%). For moderate and severe anxiety, 28% (95%CI 24-32%) and for moderate and severe depression, 30% (95%CI: 26-35%). After the meta-regression, medical students in Asia had a lower prevalence of anxiety and depression than from other regions. (27)

The critical limitations on the current review is that the study analyzed global data based on observational studies that used the questionnaires GAD-7 and PHQ-9, recognized as screening instruments for anxiety and depression symptoms. However, the diagnosis of depression and anxiety is not based solely on the application of the questionnaires and requires a detailed clinical evaluation. In addition, the results cannot be generalized due to the consideration of limitations inherent to observational studies, such as difficulty in controlling variables, potential confounders, temporal ambiguity, and the location where the studies were conducted, in addition to selection and information biases.

5. Conclusions

We found in the worldwide literature studies that demonstrated a high occurrence of symptoms of depression and anxiety in the population of undergraduate medical students. We observed a higher occurrence of anxiety symptoms in studies performed after the lockdown period, and studies in developing countries. We also described a higher occurrence of depression symptoms in the female population. These findings highlight the urgency of developing targeted intervention strategies to mitigate these symptoms in populations that demonstrate high susceptibility to mental disorders during pandemic periods.

Funding: This research was funded by the Educational Foundation of the Municipality of Assis as part of a Scientific Initiation Project.

 doi:10.20944/preprints202410.0037.v1

References

1. Wu F, Zhao S, Yu B, Chen YM, Wang W, Song ZG, et al. A new coronavirus associated with human respiratory disease in China. Nature. 2020 Mar 12;579(7798):265–9.
2. United Nations. COVID-19 and the Need for Action on Mental Health [Internet]. 2020 May. Available from: https://unsdg.un.org/sites/default/files/2020-05/UN-Policy-Brief-COVID-19-and-mental-health.pdf.
3. Pan American Health Organization. OMS declara fim da Emergência de Saúde Pública de Importância Internacional referente à Covid-19 [Internet]. 2023 May. Available from: https://www.paho.org/pt/noticias/5-5-2023-oms-declara-fim-da-emergencia-saude-publica-importancia-internacional-referente.
4. Mehraeen E, Salehi MA, Behnezhad F, Moghaddam HR, SeyedAlinaghi S. Transmission Modes of COVID-19: A Systematic Review. Infect Disord Drug Targets. 2021 Sep;21(6).
5. Leal Filho W, Wall T, Rayman-Bacchus L, Mifsud M, Pritchard DJ, Lovren VO, et al. Impacts of COVID-19 and social isolation on academic staff and students at universities: a cross-sectional study. BMC Public Health. 2021 Dec 24;21(1):1213.
6. Magalhães RA, Garcia JMM. Efeitos Psicológicos do Isolamento Social no Brasil durante a pandemia de COVID-19. Revista Científica Multidisciplinar Núcleo do Conhecimento. 2021 Jan 9;18–33.
7.
8. Xiang YT, Yang Y, Li W, Zhang L, Zhang Q, Cheung T, et al. Timely mental health care for the 2019 novel coronavirus outbreak is urgently needed. Lancet Psychiatry. 2020 Mar;7(3):228–9.
9. Ahmed I, Banu H, Al-Fageer R, Al-Suwaidi R. Cognitive emotions: Depression and anxiety in medical students and staff. J Crit Care. 2009 Sep;24(3):e1–7.
10. Izaias C, Filho S, Conte De Las W, Rodrigues V, Beauchamp De Castro R, Aparecida Marçal A, et al. Impact Of Covid-19 Pandemic On Mental Health Of Medical Students: A Cross-Sectional Study Using GAD-7 And PHQ-9 Questionnaires. medRxiv. 2020;
11. Mirza AA, Baig M, Beyari GM, Halawani MA, Mirza AA. Depression and anxiety among medical students: A brief overview. Vol. 12, Advances in Medical Education and Practice. Dove Medical Press Ltd; 2021. p. 393–8.
12. Sapra A, Bhandari P, Sharma S, Chanpura T, Lopp L. Using Generalized Anxiety Disorder-2 (GAD-2) and GAD-7 in a Primary Care Setting. Cureus. 2020 May;12.
13. Levis B, Benedetti A, Thombs BD. Accuracy of Patient Health Questionnaire-9 (PHQ-9) for screening to detect major depression: individual participant data meta-analysis. BMJ. 2019 Apr 9;365(l1476).
14. Spitzer RL, Kroenke K, Williams JBW, Löwe B. A Brief Measure for Assessing Generalized Anxiety Disorder. Arch Intern Med. 2006 May;166(10):1092–7.
15. Sun Y, Fu Z, Bo Q, Mao Z, Ma X, Wang C. The reliability and validity of PHQ-9 in patients with major depressive disorder in psychiatric hospital. BMC Psychiatry. 2020 Dec 29;20(1):474.
16. Malpass A, Dowrick C, Gilbody S, Robinson J, Wiles N, Duffy L, et al. Usefulness of PHQ-9 in primary care to determine meaningful symptoms of low mood: a qualitative study. British Journal of General Practice. 2016 Feb;66(643):78–84.
17. Ford J, Thomas F, Byng R, McCabe R. Use of the Patient Health Questionnaire (PHQ-9) in Practice: Interactions between patients and physicians. Qual Health Res. 2020 Nov 20;30(13):2146–59.
18. Wang C, Pan R, Wan X, Tan Y, Xu L, Ho CS, et al. Immediate Psychological Responses and Associated Factors during the Initial Stage of the 2019 Coronavirus Disease (COVID-19) Epidemic among the General Population in China. Int J Environ Res Public Health. 2020 Mar 6;17(5):1729.
19. Sazakli E, Leotsinidis M, Bakola M, Kitsou KS, Katsifara A, Konstantopoulou A, et al. Prevalence and Associated Factors of Anxiety and Depression in Students at a Greek University during Covid-19 Lockdown. J Public Health Res. 2021 Jun 24;10(3):jphr.2021.2089.
20. Wade M, Prime H, Johnson D, May SS, Jenkins JM, Browne DT. The disparate impact of COVID-19 on the mental health of female and male caregivers. Soc Sci Med. 2021 Apr;275:113801.
21. Brenneisen Mayer F, Souza Santos I, Silveira PSP, Itaqui Lopes MH, de Souza ARND, Campos EP, et al. Factors associated to depression and anxiety in medical students: a multicenter study. BMC Med Educ. 2016 Dec 26;16(1):282.
22. Lund C, Breen A, Flisher AJ, Kakuma R, Corrigall J, Joska JA, et al. Poverty and common mental disorders in low and middle income countries: A systematic review. Soc Sci Med. 2010 Aug;71(3):517–28.
23. Demyttenaere Koen, Bruffaerts Ronny, Posada-Villa Jose, Gasquet Isabelle. Prevalence, Severity, and Unmet Need for Treatment of Mental Disorders in the World Health Organization World Mental Health Surveys. JAMA. 2004 Jun 2;291(21):2581.
24. Rai D, Zitko P, Jones K, Lynch J, Araya R. Country- and individual-level socioeconomic determinants of depression: multilevel cross-national comparison. British Journal of Psychiatry. 2013 Mar 2;202(3):195–203.
25. Jia Q, Qu Y, Sun H, Huo H, Yin H, You D. Mental Health Among Medical Students During COVID-19: A Systematic Review and Meta-Analysis. Front Psychol. 2022 May 10;13.

 doi:10.20944/preprints202410.0037.v1

26. Lin YK, Saragih ID, Lin CJ, Liu HL, Chen CW, Yeh YS. Global prevalence of anxiety and depression among medical students during the COVID-19 pandemic: a systematic review and meta-analysis. BMC Psychol. 2024 Jun 10;12(1):338.
27. Lin YK, Saragih ID, Lin CJ, Liu HL, Chen CW, Yeh YS. Global prevalence of anxiety and depression among medical students during the COVID-19 pandemic: a systematic review and meta-analysis. BMC Psychol [Internet]. 2024 Jun 10;12(1):338. Available from: https://bmcpsychology.biomedcentral.com/articles/10.1186/s40359-024-01838-y
28. Zheng X, Guo Y, Yang H, Luo L, Ya B, Xu H, et al. A Cross-Sectional Study on Mental Health Problems of Medical and Nonmedical Students in Shandong During the COVID-19 Epidemic Recovery Period. Front Psychiatry [Internet]. 2021 Jun 11;12. Available from: https://www.frontiersin.org/articles/10.3389/fpsyt.2021.680202/full
29. Coico-Lama AH, Diaz-Chingay LL, Castro-Diaz SD, Céspedes-Ramirez ST, Segura-Chavez LF, Soriano-Moreno AN. Asociación entre alteraciones en el sueño y problemas de salud mental en los estudiantes de Medicina durante la pandemia de la COVID-19. Educación Médica [Internet]. 2022 May;23(3):100744. Available from: https://linkinghub.elsevier.com/retrieve/pii/S1575181322000365
30. Bhongade B, Ali AA, Adam S. Assessment of Factors Associated with Generalized Anxiety Disorder and Psychological Distress amid COVID-19 Pandemic: Cross-Sectional Study on the Students of Ras Al Khaimah Medical and Health Sciences University. Indian Journal of Pharmaceutical Education and Research [Internet]. 2024 Feb 23;58(2):661–70. Available from: https://ijper.org/article/2260
31. Din M ud, Naveed HU, Tauseef M, Javed M, Sarfraz S, Waheed J. Anxiety And Depression Among Medical Students During Covid-19 Pandemic In Faisalabad. Journal of Rawalpindi Medical College [Internet]. 2023 Sep 1;27(3). Available from: https://www.journalrmc.com/index.php/JRMC/article/view/1791
32. Reddy CRE, Tekulapally K. Anxiety and Coping Strategies Among Medical Students During COVID-19 Pandemic: A Cross-sectional Study. JOURNAL OF CLINICAL AND DIAGNOSTIC RESEARCH [Internet]. 2022; Available from: https://jcdr.net/article_fulltext.asp?issn=0973-709x&year=2022&month=February&volume=16&issue=2&page=VC05-VC08&id=15981
33. Ortega-Moreno D, Botello-Hernández E, Aguayo-Samaniego R, García-Espinosa P. The COVID-19 Pandemic. A Psychosocial Approach in Mexican Medical Students. International Journal of Medical Students [Internet]. 2023 Feb 21;S214. Available from: https://ijms.pitt.edu/IJMS/article/view/1793
34. Saadia Shahzad, Sarosh Saleem. Reopening of Universities for On-Campus Teaching In COVID-19 Pandemic: Status of Generalized Anxiety in Medical Students. Proc West Mark Ed Assoc Conf [Internet]. 2022 Apr 29;36(2):7–13. Available from: https://proceedings-szmc.org.pk/index.php/szmc/article/view/237
35. Iqbal SP, Siddiqui N, Gul F, Jaffri SA. Anxiety and Depression among Medical Students of Karachi During the Covid-19 Pandemic. Journal of Bahria University Medical and Dental College [Internet]. 2023 Jul 16;13(02):217–22. Available from: https://jbumdc.bahria.edu.pk/index.php/ojs/article/view/1194
36. Gómez-Durán EL, Fumadó CM, Gassó AM, Díaz S, Miranda-Mendizabal A, Forero CG, et al. COVID-19 Pandemic Psychological Impact and Volunteering Experience Perceptions of Medical Students after 2 Years. Int J Environ Res Public Health [Internet]. 2022 Jun 20;19(12):7532. Available from: https://www.mdpi.com/1660-4601/19/12/7532
37. Wiguna T, Dirjayanto VJ, Maharani ZS, Faisal EG, Teh SD, Kinzie E. Mental health disturbance in preclinical medical students and its association with screen time, sleep quality, and depression during the COVID-19 pandemic. BMC Psychiatry [Internet]. 2024 Jan 31;24(1):85. Available from: https://bmcpsychiatry.biomedcentral.com/articles/10.1186/s12888-024-05512-w
38. Tanusetiawan AN, Surilena S, Tina Widjaja N, Agus D. Relationship of Depression and Sleep Quality among North Jakarta Medical Students during the COVID-19 Pandemic. Jurnal Kedokteran Brawijaya [Internet]. 2022 Apr 9; Available from: https://jkb.ub.ac.id/index.php/jkb/article/view/3070
39. Purnomo AE, Rivami DS. The Relationship between the Duration of Online Learning during the COVID-19 Pandemic and Symptoms of Depression in Medical Students of Pelita Harapan University: A Cross Sectional Study. Medicinus [Internet]. 2021 Nov 3;9(2):68. Available from: https://ojs.uph.edu/index.php/MED/article/view/4705
40. Yuryeva L, Tymofeyev R, Shornikov A, Kulbytska M. Prevalence of anxiety and depression and risk factors of their occurrence in medical students who had transferred COVID-19. Psychosomatic Medicine and General Practice [Internet]. 2021 Jul 30;6(3). Available from: https://e-medjournal.com/index.php/psp/article/view/309
41. Arshad I, Maryam L, Mendagudali RR, Agarwal N. Mental Health Effects of Online Education among Medical Students during the COVID-19 Pandemic in Kalaburagi, Karnataka, India: A Cross-sectional Study. JOURNAL OF CLINICAL AND DIAGNOSTIC RESEARCH [Internet]. 2023 [cited 2024 Apr 25]; Available from: https://www.jcdr.net/article_fulltext.asp?issn=0973-709x&year=2023&month=December&volume=17&issue=12&page=LC01-LC05&id=18764
42. Lakshmi V. IMPACT OF COVID-19 PANDEMIC ON THE QUALITY OF LIFE OF MEDICALUNDERGRADUATES AND THE PREVALENCE OF ANXIETY DISORDER AMONG THEM.

Int J Sci Res [Internet]. 2021 Dec 1;69–71. Available from: https://www.worldwidejournals.com/international-journal-of-scientific-research-(IJSR)/fileview/impact-of-covid19-pandemic-on-the-quality-of-life-of-medical-undergraduates-and-the-prevalence-of-anxiety-disorder-among-them_December_2021_6868638173_8907420.pdf

43. Ernst J, Jordan KD, Weilenmann S, Sazpinar O, Gehrke S, Paolercio F, et al. Burnout, depression and anxiety among Swiss medical students – A network analysis. J Psychiatr Res [Internet]. 2021 Nov 1 [cited 2024 Apr 25];143:196–201. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0022395621005562
44. Cao W, Fang Z, Hou G, Han M, Xu X, Dong J, et al. The psychological impact of the COVID-19 epidemic on college students in China. Psychiatry Res [Internet]. 2020 May 1 [cited 2024 Apr 25];287:112934. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0165178120305400
45. Christophers B, Nieblas-Bedolla E, Gordon-Elliott JS, Kang Y, Holcomb K, Frey MK. Mental Health of US Medical Students During the COVID-19 Pandemic. J Gen Intern Med [Internet]. 2021 Oct 5;36(10):3295–7. Available from: https://link.springer.com/10.1007/s11606-021-07059-y
46. Sartorão Filho CI, Rodrigues WC de LV, Castro RB de, Marçal AA, Pavelqueires S, Takano L, et al. Moderate and severe symptoms of anxiety and depression are increased among female medical students during the COVID-19 pandemic. Research, Society and Development [Internet]. 2021 Jun 1 [cited 2024 Apr 20];10(6):e34610615406. Available from: https://rsdjournal.org/index.php/rsd/article/view/15406
47. Lin S, Chong AC, Su EH, Chen SL, Chwa WJ, Young C, et al. Medical student anxiety and depression in the COVID-19 Era: Unique needs of underrepresented students. Educ Health (Abingdon) [Internet]. 2022 May 1 [cited 2024 Apr 20];35(2):41–7. Available from: http://www.ncbi.nlm.nih.gov/pubmed/36647931
48. Huarcaya-Victoria J, Elera-Fitzcarrald C, Crisol-Deza D, Villanueva-Zúñiga L, Pacherres A, Torres A, et al. Factors associated with mental health in Peruvian medical students during the COVID-19 pandemic: a multicentre quantitative study. Rev Colomb Psiquiatr [Internet]. 2023 Jul [cited 2024 Apr 20];52(3):236–44. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0034745021001086
49. Pinsai S, Klaipim C. 1294. Covid-19: Impacts on Medical Students' Mental Health in Medical Education Center of Chaophya Abhaibhubejhr Hospital. Open Forum Infect Dis [Internet]. 2022 Dec 15;9(Supplement_2). Available from: https://academic.oup.com/ofid/article/doi/10.1093/ofid/ofac492.1125/6903456
50. Verma S, Mahajan R, Gupta VV. An assessment of the impact of COVID-19 on the mental health of medical students across various medical colleges of Punjab. International Journal of Advanced Research in Medicine [Internet]. 2021 Jan 1;3(1):389–94. Available from: https://www.medicinepaper.net/archives/2021.v3.i1.G.167
51. Alkwai HM. Graduating from Medical School amid a Pandemic: A Study of Graduates' Mental Health and Concerns. Rachid A, editor. Educ Res Int [Internet]. 2021 Jan 23;2021:1–5. Available from: https://www.hindawi.com/journals/edri/2021/8854587/
52. Saravia-Bartra MM, Cazorla-Saravia P, Cedillo-Ramirez L. Anxiety level of first-year medical students from a private university in Peru in times of Covid-19. Revista de la Facultad de Medicina Humana [Internet]. 2020 Sep 11;20(4):568–73. Available from: http://revistas.urp.edu.pe/index.php/RFMH/article/view/3198
53. Guralwar C, Kundawar A, Sharma SK. Impact of COVID-19 pandemic on education and mental health of medical students: a nation-wide survey in India. Int J Community Med Public Health [Internet]. 2022 Aug 26;9(9):3491. Available from: https://www.ijcmph.com/index.php/ijcmph/article/view/10033
54. Almarri FK, Alshareef RI, Hajr EA, Alotabi FZ. Impact of COVID-19 pandemic on Saudi medical students' career choices and perceptions of health specialties: findings from a national cross-sectional study. BMC Med Educ [Internet]. 2022 Dec 14;22(1):174. Available from: https://bmcmededuc.biomedcentral.com/articles/10.1186/s12909-022-03224-x
55. Kamran R, Tufail S, Raja HZ, Alvi RU, Shafique A, Saleem MN, et al. Post COVID-19 Pandemic Generalized Anxiety Status of Health Professional undergraduate students. Pakistan Journal of Medical and Health Sciences [Internet]. 2022 Dec 31;16(12):144–6. Available from: https://pjmhsonline.com/index.php/pjmhs/article/view/3525
56. Porwal A, Masmali SM, Mokli NK, Madkhli HY, Nandalur RR, Porwal P, et al. Assessment of Mental Health in Medical and Dental College Students in Jazan Province to See the Delayed Psychological Impact of COVID-19 Pandemic: An Online Survey. World Journal of Dentistry [Internet]. 2023 Mar 25;14(1):36–40. Available from: https://www.wjoud.com/doi/10.5005/jp-journals-10015-2105
57. Primatanti PA, Turana Y, Sukarya WS, Wiyanto M, Duarsa ABS. Medical students' mental health state during pandemic COVID-19 in Indonesia. Bali Medical Journal [Internet]. 2023 Apr 27;12(2):1295–301. Available from: https://balimedicaljournal.org/index.php/bmj/article/view/4104
58. AbuDujain NM, Almuhaideb QA, Alrumaihi NA, Alrabiah MA, Alanazy MH, Abdulghani H. The Impact of the COVID-19 Pandemic on Medical Interns' Education, Training, and Mental Health: A Cross-Sectional Study. Cureus [Internet]. 2021 Nov 4; Available from: https://www.cureus.com/articles/75175-the-impact-of-the-covid-19-pandemic-on-medical-interns-education-training-and-mental-health-a-cross-sectional-study

59. Imran N, Haider II, Mustafa AB, Aamer I, Kamal Z, Rasool G, et al. The hidden crisis: COVID-19 and impact on mental health of medical students in Pakistan. Middle East Current Psychiatry [Internet]. 2021 Dec 1;28(1):45. Available from: https://mecp.springeropen.com/articles/10.1186/s43045-021-00123-7
60. Hossini Rafsanjanipoor SM, Zakeri MA, Dehghan M, Kahnooji M, Zakeri M. Psychological Consequences of the COVID-19 Disease among Physicians and Medical Students: A Survey in Kerman Province, Iran, in 2020. Journal of Occupational Health and Epidemiology [Internet]. 2021 Oct 1;10(4):274–81. Available from: http://johe.rums.ac.ir/article-1-447-en.html
61. Srivastava S, Jacob J, Charles AS, Daniel P, Mathew JK, Shanthi P, et al. Emergency remote learning in anatomy during the COVID-19 pandemic: A study evaluating academic factors contributing to anxiety among first year medical students. Med J Armed Forces India [Internet]. 2021 Feb 1 [cited 2024 Apr 19];77(Suppl 1):S90–8. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0377123720302720
62. Pedraz-Petrozzi B, Krüger-Malpartida H, Arevalo-Flores M, Salmavides-Cuba F, Anculle-Arauco V, Dancuart-Mendoza M. Emotional Impact on Health Personnel, Medical Students, and General Population Samples During the COVID-19 Pandemic in Lima, Peru. Rev Colomb Psiquiatr [Internet]. 2021 Jul 1 [cited 2024 Apr 19];50(3):189–98. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0034745021000822
63. Vajpeyi Misra A, Mamdouh HM, Dani A, Mitchell V, Hussain HY, Ibrahim GM, et al. Impact of COVID-19 pandemic on the mental health of university students in the United Arab Emirates: a cross-sectional study. BMC Psychol [Internet]. 2022 Dec 16 [cited 2024 Apr 19];10(1):312. Available from: https://bmcpsychology.biomedcentral.com/articles/10.1186/s40359-022-00986-3
64. Alshehri A, Alshehri B, Alghadir O, Basamh A, Alzeer M, Alshehri M, et al. The prevalence of depressive and anxiety symptoms among first-year and fifth-year medical students during the COVID-19 pandemic: a cross-sectional study. BMC Med Educ [Internet]. 2023 Jun 6 [cited 2024 Apr 19];23(1):411. Available from: https://bmcmededuc.biomedcentral.com/articles/10.1186/s12909-023-04387-x
65. Paz DC, Bains MS, Zueger ML, Bandi VR, Kuo VY, Payton M, et al. Impact of COVID-19 on Rocky Vista University medical students' mental health: A cross-sectional survey. Front Psychol [Internet]. 2023 Feb 6 [cited 2024 Apr 19];14. Available from: https://www.frontiersin.org/articles/10.3389/fpsyg.2023.1076841/full
66. Schindler AK, Polujanski S, Rotthoff T. A longitudinal investigation of mental health, perceived learning environment and burdens in a cohort of first-year German medical students' before and during the COVID-19 'new normal.' BMC Med Educ [Internet]. 2021 Dec 2 [cited 2024 Apr 19];21(1):413. Available from: https://bmcmededuc.biomedcentral.com/articles/10.1186/s12909-021-02798-2
67. Lu L, Wang X, Wang X, Guo X, Pan B. Association of Covid-19 pandemic-related stress and depressive symptoms among international medical students. BMC Psychiatry [Internet]. 2022 Dec 7 [cited 2024 Apr 19];22(1):20. Available from: https://bmcpsychiatry.biomedcentral.com/articles/10.1186/s12888-021-03671-8
68. Chakeeyanun B, Wongpakaran N, Wongpakaran T, Oon-arom A. Resilience, Perceived Stress from Adapted Medical Education Related to Depression among Medical Students during the COVID-19 Pandemic. Healthcare [Internet]. 2023 Jan 12 [cited 2024 Apr 19];11(2):237. Available from: https://www.mdpi.com/2227-9032/11/2/237
69. Camelier-Mascarenhas M, Jesuino TA, Queirós VO de, Brito LLC, Fernandes SM, Almeida AG de. Mental health evaluation in medical students during academic activity suspension in the pandemic. Rev Bras Educ Med [Internet]. 2023;47(3):e087–e087. Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0100-55022023000300201&tlng=en
70. Dziedzic DM, Dell'Agnelo GS, Schindler Junior E, Lindstron OA, Andrade FA, Nisihara R. Anxiety and insecurity in medical interns: the impact of the pandemic COVID-19. Medicina (Ribeirão Preto) [Internet]. 2022 Jul 6;55(2). Available from: https://www.revistas.usp.br/rmrp/article/view/191222
71. Eleftheriou A, Rokou A, Arvaniti A, Nena E, Steiropoulos P. Sleep Quality and Mental Health of Medical Students in Greece During the COVID-19 Pandemic. Front Public Health [Internet]. 2021 Nov 19 [cited 2024 Apr 19];9:775374. Available from: http://www.ncbi.nlm.nih.gov/pubmed/34869189
72. Cheng J, Liao M, He Z, Xiong R, Ju Y, Liu J, et al. Mental health and cognitive function among medical students after the COVID-19 pandemic in China. Front Public Health. 2023;11.
73. Santander-Hernández FM, Peralta CI, Guevara-Morales MA, Díaz-Vélez C, Valladares-Garrido MJ. Smartphone overuse, depression & anxiety in medical students during the COVID-19 pandemic. PLoS One [Internet]. 2022 Aug 1 [cited 2024 Apr 19];17(8). Available from: https://pubmed.ncbi.nlm.nih.gov/36040873/
74. Çimen İD, Alvur TM, Coşkun B, Şükür NEÖ. Mental health of Turkish medical students during the COVID-19 pandemic. International Journal of Social Psychiatry [Internet]. 2022 Sep 28 [cited 2024 Apr 19];68(6):1253–62. Available from: http://journals.sagepub.com/doi/10.1177/00207640211066734
75. Villalón López FJ, Moreno Cerda MI, GonzáLez Venegas W, Soto Amaro AA, Arancibia Campos JV. [Anxiety and depression among medical students during COVID-19 pandemic]. Rev Med Chil [Internet]. 2022 Aug 1 [cited 2024 Apr 19];150(8):1018–25. Available from: http://www.ncbi.nlm.nih.gov/pubmed/37358149

76. Villagómez-López AM, Cepeda-Reza TF, Torres-Balarezo PI, Calderón-Vivanco JM, Villota-Acosta CA, Balarezo-Díaz TF, et al. [Depression and anxiety among medical students in virtual education during COVID-19 pandemic]. Rev Med Inst Mex Seguro Soc [Internet]. 2023 Sep 4 [cited 2024 Apr 19];61(5):559–66. Available from: https://pubmed.ncbi.nlm.nih.gov/37756704/
77. Harries AJ, Lee C, Jones L, Rodriguez RM, Davis JA, Boysen-Osborn M, et al. Effects of the COVID-19 pandemic on medical students: a multicenter quantitative study. BMC Med Educ. 2021 Dec 1;21(1).
78. Liu Z, Liu R, Zhang Y, Zhang R, Liang L, Wang Y, et al. Latent class analysis of depression and anxiety among medical students during COVID-19 epidemic. BMC Psychiatry [Internet]. 2021 Oct 12 [cited 2024 Apr 19];21(1):498. Available from: http://www.ncbi.nlm.nih.gov/pubmed/34641795
79. Pattanaseri K, Atsariyasing W, Pornnoppadol C, Sanguanpanich N, Srifuengfung M. Mental problems and risk factors for depression among medical students during the COVID-19 pandemic: A cross-sectional study. Medicine [Internet]. 2022 Sep 23 [cited 2024 Apr 19];101(38):e30629. Available from: https://journals.lww.com/10.1097/MD.0000000000030629
80. Teh BL Sen, Ang JK, Koh EBY, Pang NTP. Psychological Resilience and Coping Strategies with Anxiety among Malaysian Medical Students during the COVID-19 Pandemic. Int J Environ Res Public Health [Internet]. 2023 Jan 19 [cited 2024 Apr 19];20(3):1894. Available from: https://www.mdpi.com/1660-4601/20/3/1894
81. Adhikari A, Sujakhu E, GC S, Zoowa S. Depression among Medical Students of a Medical College in Nepal during COVID-19 Pandemic: A Descriptive Cross-sectional Study. Journal of Nepal Medical Association [Internet]. 2021 Aug 1 [cited 2024 Apr 19];59(239):645–8. Available from: http://www.jnma.com.np/jnma/index.php/jnma/article/view/5441
82. Chalise PC, Singh A, Rawal E, Budhathoki P, Sharma S, Jyotsana P, et al. Composite Anxiety-depression among Medical Undergraduates during COVID-19 Pandemic in a Tertiary Care Hospital: A Descriptive Cross-sectional Study. Journal of Nepal Medical Association [Internet]. 2021 Sep 11 [cited 2024 Apr 19];59(241):881–5. Available from: https://www.jnma.com.np/jnma/index.php/jnma/article/view/6947
83. Romic I, Silovski H, Mance M, Pavlek G, Petrovic I, Figl J, et al. (COVID-19 PANDEMIC AND EARTHQUAKES) ON CROATIAN MEDICAL STUDENTS. Medicina Academica Mostariensia. 2021;33(1):120–5.
84. Nguyen DT, Ngo TM, Nguyen HLT, Le MD, Duong MLN, Hoang PH, et al. The prevalence of self-reported anxiety, depression, and associated factors among Hanoi Medical University's students during the first wave of COVID-19 pandemic. PLoS One [Internet]. 2022 Aug 1 [cited 2024 Apr 19];17(8). Available from: https://pubmed.ncbi.nlm.nih.gov/35960717/
85. Biswas MAAJ, Hasan MT, Samir N, Alin SI, Homaira N, Hassan MZ, et al. The Prevalence and Associated Factors of Depressive Symptoms Among Medical Students in Bangladesh During the COVID-19 Pandemic: A Cross-Sectional Pilot Study. Front Public Health [Internet]. 2021 Jan 31 [cited 2024 Apr 19];9:811345. Available from: http://www.ncbi.nlm.nih.gov/pubmed/35174136
86. Song Y, Sznajder K, Cui C, Yang Y, Li Y, Yang X. Anxiety and its relationship with sleep disturbance and problematic smartphone use among Chinese medical students during COVID-19 home confinement - A structural equation model analysis. J Affect Disord [Internet]. 2022 Jan 1 [cited 2024 Apr 19];296:315–21. Available from: https://pubmed.ncbi.nlm.nih.gov/34600968/
87. Guo AA, Crum MA, Fowler LA. Assessing the Psychological Impacts of COVID-19 in Undergraduate Medical Students. Int J Environ Res Public Health [Internet]. 2021 Mar 13 [cited 2024 Apr 19];18(6):2952. Available from: https://www.mdpi.com/1660-4601/18/6/2952
88. Essangri H, Sabir M, Benkabbou A, Majbar MA, Amrani L, Ghannam A, et al. Predictive Factors for Impaired Mental Health among Medical Students during the Early Stage of the COVID-19 Pandemic in Morocco. Am J Trop Med Hyg [Internet]. 2021 Jan 6 [cited 2024 Apr 19];104(1):95–102. Available from: https://www.ajtmh.org/view/journals/tpmd/104/1/article-p95.xml
89. Saali A, Stanislawski ER, Kumar V, Chan C, Hurtado A, Pietrzak RH, et al. The Psychiatric Burden on Medical Students in New York City Entering Clinical Clerkships During the COVID-19 Pandemic. Psychiatric Quarterly [Internet]. 2022 Jun 7 [cited 2024 Apr 19];93(2):419–34. Available from: https://link.springer.com/10.1007/s11126-021-09955-2
90. Nishimura Y, Ochi K, Tokumasu K, Obika M, Hagiya H, Kataoka H, et al. Impact of the COVID-19 Pandemic on the Psychological Distress of Medical Students in Japan: Cross-sectional Survey Study. J Med Internet Res [Internet]. 2021 Feb 18 [cited 2024 Apr 19];23(2):e25232. Available from: http://www.jmir.org/2021/2/e25232/
91. Sserunkuuma J, Kaggwa MM, Muwanguzi M, Najjuka SM, Murungi N, Kajjimu J, et al. Problematic use of the internet, smartphones, and social media among medical students and relationship with depression: An exploratory study. Ballarotto G, editor. PLoS One [Internet]. 2023 May 26 [cited 2024 Apr 19];18(5):e0286424. Available from: https://dx.plos.org/10.1371/journal.pone.0286424
92. Batais MA, Temsah MH, AlGhofili H, AlRuwayshid N, Alsohime F, Almigbal TH, et al. The coronavirus disease of 2019 pandemic-associated stress among medical students in middle east respiratory syndrome-

CoV endemic area. Medicine [Internet]. 2021 Jan 22 [cited 2024 Apr 19];100(3):e23690. Available from: https://journals.lww.com/10.1097/MD.0000000000023690

93. Crisol-Deza D, Poma-Ramírez D, Pacherres-López A, Noriega-Baella C, Villanueva-Zúñiga L, Salvador-Carrillo J, et al. Factors associated with suicidal ideation among medical students during the initial phase of the COVID-19 pandemic in Peru: A multicenter study. Death Stud [Internet]. 2023 Feb 7 [cited 2024 Apr 19];47(2):183–91. Available from: https://www.tandfonline.com/doi/full/10.1080/07481187.2022.2042752
94. Tsiouris A, Werner AM, Tibubos AN, Mülder LM, Reichel JL, Heller S, et al. Mental health state and its determinants in German university students across the COVID-19 pandemic: findings from three repeated cross-sectional surveys between 2019 and 2021. Front Public Health [Internet]. 2023 May 9 [cited 2024 Apr 19];11. Available from: https://www.frontiersin.org/articles/10.3389/fpubh.2023.1163541/full
95. Sudi R, Chang WL, Arshad NH, Zainal Abidin SN, Suderman U, Woon LSC. Perception of Current Educational Environment, Clinical Competency, and Depression among Malaysian Medical Students in Clinical Clerkship: A Cross-Sectional Study. Int J Environ Res Public Health [Internet]. 2022 Dec 1 [cited 2024 Apr 19];19(23). Available from: https://pubmed.ncbi.nlm.nih.gov/36498345/
96. Wercelens VO, Bueno ML, Bueno JL, Abrahim RP, Ydy JGM, Zanetti HR, et al. Empathy and psychological concerns among medical students in Brazil during the COVID-19 pandemic. The International Journal of Psychiatry in Medicine [Internet]. 2023 Sep 23 [cited 2024 May 2];58(5):510–21. Available from: http://journals.sagepub.com/doi/10.1177/00912174231179069
97. Yin Y, Yang X, Gao L, Zhang S, Qi M, Zhang L, et al. The Association Between Social Support, COVID-19 Exposure, and Medical Students' Mental Health. Front Psychiatry [Internet]. 2021 May 24 [cited 2024 Apr 19];12. Available from: https://www.frontiersin.org/articles/10.3389/fpsyt.2021.555893/full
98. Chwa WJ, Chong AC, Lin S, Su EH, Sheridan C, Schreiber J, et al. Mental Health Disparities among Pre-Clinical Medical Students at Saint Louis University during the COVID-19 Pandemic. Behavioral Sciences [Internet]. 2024 Jan 26 [cited 2024 Apr 19];14(2):89. Available from: https://www.mdpi.com/2076-328X/14/2/89
99. Pandey U, Corbett G, Mohan S, Reagu S, Kumar S, Farrell T, et al. Anxiety, Depression and Behavioural Changes in Junior Doctors and Medical Students Associated with the Coronavirus Pandemic: A Cross-Sectional Survey. The Journal of Obstetrics and Gynecology of India [Internet]. 2021 Feb 24 [cited 2024 Apr 19];71(1):33–7. Available from: https://link.springer.com/10.1007/s13224-020-01366-w
100. Elhadi M, Buzreg A, Bouhuwaish A, Khaled A, Alhadi A, Msherghi A, et al. Psychological Impact of the Civil War and COVID-19 on Libyan Medical Students: A Cross-Sectional Study. Front Psychol [Internet]. 2020 Oct 26 [cited 2024 Apr 19];11:570435. Available from: http://www.ncbi.nlm.nih.gov/pubmed/33192858
101. Xiao H, Shu W, Li M, Li Z, Tao F, Wu X, et al. Social Distancing among Medical Students during the 2019 Coronavirus Disease Pandemic in China: Disease Awareness, Anxiety Disorder, Depression, and Behavioral Activities. Int J Environ Res Public Health [Internet]. 2020 Jul 14 [cited 2024 Apr 19];17(14):5047. Available from: https://www.mdpi.com/1660-4601/17/14/5047
102. Essadek A, Gressier F, Robin M, Shadili G, Bastien L, Peronnet JC, et al. Mental health of medical students during the COVID19: Impact of studies years. J Affect Disord Rep [Internet]. 2022 Apr 1 [cited 2024 Apr 19];8. Available from: https://pubmed.ncbi.nlm.nih.gov/35165671/
103. Liu J, Zhu Q, Fan W, Makamure J, Zheng C, Wang J. Online Mental Health Survey in a Medical College in China During the COVID-19 Outbreak. Front Psychiatry [Internet]. 2020 May 13 [cited 2024 Apr 19];11:459. Available from: http://www.ncbi.nlm.nih.gov/pubmed/32574242
104. Chootong R, Sono S, Choomalee K, Wiwattanaworaset P, Phusawat N, Wanghirankul N, et al. The association between physical activity and prevalence of anxiety and depression in medical students during COVID-19 pandemic: A cross-sectional study. Ann Med Surg (Lond) [Internet]. 2022 Mar 1 [cited 2024 Apr 19];75:103408. Available from: http://www.ncbi.nlm.nih.gov/pubmed/35251604
105. Saeed N, Javed N. Lessons from the COVID-19 pandemic: Perspectives of medical students. Pak J Med Sci [Internet]. 2021 Jul 15 [cited 2024 Apr 19];37(5):1402–7. Available from: http://pjms.org.pk/index.php/pjms/article/view/4177
106. Huang W, Wen X, Li Y, Luo C. Association of perceived stress and sleep quality among medical students: the mediating role of anxiety and depression symptoms during COVID-19. Front Psychiatry [Internet]. 2024 [cited 2024 Apr 19];15:1272486. Available from: http://www.ncbi.nlm.nih.gov/pubmed/38304285
107. Yun JY, Kim JW, Myung SJ, Yoon HB, Moon SH, Ryu H, et al. Impact of COVID-19 on Lifestyle, Personal Attitudes, and Mental Health Among Korean Medical Students: Network Analysis of Associated Patterns. Front Psychiatry [Internet]. 2021 Aug 18 [cited 2024 May 3];12. Available from: https://www.frontiersin.org/articles/10.3389/fpsyt.2021.702092/full
108. Halperin SJ, Henderson MN, Prenner S, Grauer JN. Prevalence of Anxiety and Depression Among Medical Students During the Covid-19 Pandemic: A Cross-Sectional Study. J Med Educ Curric Dev [Internet]. 2021 Jan 15 [cited 2024 Apr 19];8:238212052199115. Available from: http://journals.sagepub.com/doi/10.1177/2382120521991150

 doi:10.20944/preprints202410.0037.v1

109. Bilgi K, Aytaş G, Karatoprak U, Kazancıoğlu R, Özçelik S. The Effects of Coronavirus Disease 2019 Outbreak on Medical Students. Front Psychiatry [Internet]. 2021 Mar 16 [cited 2024 Apr 19];12. Available from: https://www.frontiersin.org/articles/10.3389/fpsyt.2021.637946/full
110. Alsairafi Z, Naser AY, Alsaleh FM, Awad A, Jalal Z. Mental Health Status of Healthcare Professionals and Students of Health Sciences Faculties in Kuwait during the COVID-19 Pandemic. Int J Environ Res Public Health [Internet]. 2021 Feb 23 [cited 2024 Apr 19];18(4):2203. Available from: https://www.mdpi.com/1660-4601/18/4/2203
111. Allah AA, Algethami NE, Algethami RA, ALAyyubi RH, Altalhi WA, Atalla AAA. Impact of COVID-19 on psychological and academic performance of medical students in Saudi Arabia. J Family Med Prim Care [Internet]. 2021 Oct [cited 2024 Apr 19];10(10):3857–62. Available from: https://journals.lww.com/10.4103/jfmpc.jfmpc_1004_21
112. Khidri FF, Riaz H, Bhatti U, Shahani KA, Kamran Ali F, Effendi S, et al. Physical Activity, Dietary Habits and Factors Associated with Depression Among Medical Students of Sindh, Pakistan, During the COVID-19 Pandemic. Psychol Res Behav Manag [Internet]. 2022 [cited 2024 Apr 19];15:1311–23. Available from: http://www.ncbi.nlm.nih.gov/pubmed/35642191
113. Shreevastava AK, Mavai M, Mittal PS, Verma R, Kaur D, Bhandari B. Assessment of the psychological impact of COVID-19 pandemic on undergraduate medical students in India. J Educ Health Promot [Internet]. 2022 Jan [cited 2024 Apr 19];11(1):214. Available from: https://journals.lww.com/10.4103/jehp.jehp_1273_21
114. Afzal SS, Qamar MA, Dhillon R, Bhura M, Khan MH, Suriya Q, et al. BUDDING MEDICAL PROFESSIONALS AND COVID-19: THE IMPACT OF COVID-19 ON MENTAL HEALTH AND MEDICAL STUDENTS. Journal of Ayub Medical College Abbottabad [Internet]. 2022 Jun 21 [cited 2024 Apr 19];34(3):483–8. Available from: https://jamc.ayubmed.edu.pk/jamc/index.php/jamc/article/view/9572