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Impact of the COVID-19 pandemic on the psychological status of undergraduate medical students in Saudi Arabia
A cross-sectional double-scale study

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Abstract

The COVID-19 pandemic is a major health care catastrophe that affects people's physical and mental well-being worldwide. Medical students are at an increased risk of mental health hazards during the COVID-19 pandemic. Sulaiman Al Rajhi University (SRU), the site of our study, is located in Qassim province in the Kingdom of Saudi Arabia. We conducted this study to assess the prevalence of depression, stress and anxiety symptoms among SRU medical students during the quarantine and while learning online shortly after the announcement of documented COVID-19 cases in Kingdom of Saudi Arabia. In this cross-sectional study, an online questionnaire was sent to all medical students of SRU; 278 students responded (71%). We collected participants' demographic, socioeconomic, and academic data. The Depression, Anxiety, and Stress scale and the Fear of COVID-19 Scale were used as the validated mental health assessment tools. Depression, anxiety and stress symptoms were found in 23%, 11%, and 6% of students, respectively. Females were more likely to have anxiety ($P = .03$) than males. Students who had close contact with COVID-19 cases, those whose lives were affected by COVID-19, and those with poor socioeconomic status had significantly higher levels of stress, anxiety, and depression compared to their counterparts ($P = .004$, .01, .01, respectively). Students from high-viral-load areas, unmarried students, and those who did not live with their families were more stressed ($P = .06$, .01, .01, respectively). The Fear of COVID-19 Scale was positively correlated with all Depression, Anxiety, and Stress components (depression: $r = 0.36$, anxiety: $r = 0.45$, and stress: $r = 0.39$, $P < .001$ for all). Medical students, especially female students, are at an increased risk of developing depression, anxiety, and stress symptoms with increased COVID-19 fear during the pandemic. The study highlights the importance of mental health screening for female students, students of low socioeconomic status, and relatives of COVID-19 cases. Our findings could help institutions adjust mental health services in the future amid such pandemics.

Abbreviations: DASS-21 = Depression, Anxiety, and Stress scale, FCV-19S = Fear of COVID-19 Scale, KSA = Kingdom of Saudi Arabia, SRU = Sulaiman Al Rajhi University.

Keywords: COVID-19, medical students, mental health, psychological status, public health

1. Introduction

COVID-19 emerged in Wuhan City, China, in December 2019 and has been spreading across the globe.[1] It has been an intense challenge for mankind with devastating consequences. As of July 2022, there were 557,917,904 confirmed cases with 6358,899 deaths, and the numbers are still rising.[2] The Kingdom of Saudi Arabia (KSA), with its previous infection control experience from the 2012 MERS-CoV outbreak, has successfully taken steps to curb the dangers of COVID-19.[3]

It is currently well established that COVID-19 has both short- and long-term effects on the mental and physical health of the

population.[4] From a mental health point of view, the COVID-19 pandemic created instability for many individuals worldwide, and consequently, had a negative impact on their general psychological health, especially among vulnerable members of the population. Social isolation, quarantine durations, economic changes, fear of infection, and uncertainty about the future all played a part.[5]

Several studies have investigated the psychological consequences of COVID-19 on the general population worldwide, including KSA.[6,7] In Saudi-based studies, moderate to severe depressive symptoms were reported in 17.1% to 28.3% of the study populations; 10% to 24% of participants reported moderate to severe anxiety symptoms, and 12% to 22.3% reported moderate to severe stress levels.[6,8]

Healthcare workers are more prone to mental health problems than the general population due to their occupational exposure and stressful work conditions in the emergency subspecialties.[9,10] Hence, it is of utmost importance to identify any deviation in the mental health of medical students, our future healthcare workers. Early identification during their undergraduate years will help avoid any future occupational hazards.

The literature has shown that students in general are at an increased risk of mental health issues due to their challenging and competitive study goals.[11] Medical students in particular are at higher risk for depression, anxiety and stress due to the huge study load, multiple assessments, lengthy and costly study programs, and possible contact with COVID-19 cases during hospital training.[12,13]

The literature prior to the COVID-19 pandemic demonstrated increased psychological hazards for medical students; the global anxiety prevalence rate for medical students was 33.8%,[14] and the global depression prevalence rate was 28.0%.[15] However, there is wide variability in the literature regarding fear perceptions, prevalence, and factors affecting depression, anxiety, and stress among medical students amid the COVID-19 pandemic.[13,16]

Accordingly, we aimed to further explore this issue among a sample of medical students in Saudi Arabia amid the COVID-19 pandemic. The study results could shed light on the mental health status of medical students in KSA as a crucial step in their preparation to become future frontline healthcare professionals.

2. Methods

2.1. Study design and participants

This cross-sectional study was approved by the Subcommittee of Health Research Ethics, through the Deanship of Scientific Research at Qassim University (reference number 19-11-13). All participants provided electronic informed consent in the first section of the online survey prior to completing the questionnaire.

We aimed to recruit all medical students in the College of Medicine at Sulaiman Al Rajhi University (SRU) using a population-targeted approach. An online self-administered dual-language (English and Arabic) survey was sent to all SRU medical students via their official email addresses. A total of 278 out of 389 medical students responded (response rate of 71.46%). Data were collected from June 2 to June 23, 2020. This period coincided with the peak of COVID-19 cases in KSA and during the quarantine, restrictions, and total online learning.

2.2. Measurements

The questionnaire (see Supplemental Digital Content, http://links.lww.com/MD/I773) consisted of the following 3 domains:

- The sociodemographic variables: age, gender, residence, habitat, study level, marital status, any confirmed case of COVID-19 among relatives or neighborhood, and presence of any healthcare workers in the family. We combined

study levels 1 and 2 as pre-clinical, while study levels 3 and above were clinical. The COVID-19 pandemic effect was assessed using a 4-point Likert scale (not affected, slightly affected, moderately affected, and heavily affected); we categorized "life affected by COVID-19" responses into not/slightly affected and moderately/heavily affected groups. Socioeconomic status was assessed using a 4-point Likert scale (quite poor, not well off, quite well off, wealthy); we combined "quite poor" and "not well off" into the poor group, while "quite well off" and "wealthy" were combined as the rich group. The current places of residence were divided into high-viral-load areas (Riyadh, Makkah, and Madinah) and low-viral-load areas (the other ten provinces of Saudi Arabia). High-viral-load areas were provinces that were subjected to strict public health measures (i.e., 24-hour lockdown and curfew).

- The validated Depression, Anxiety and Stress Scale (DASS-21); a self-reported questionnaire designed to assess the psychological states of depression, anxiety and stress through 21 items. We used the validated Arabic translation form of the DASS-21 scale.[17] The DASS-21 scale was chosen because of its well-known validity and internal consistency.

- The Fear of COVID-19 Scale (FCV-19S) questionnaire, a newly developed scale by Ahorsu et al[18] composed of 7 items rated on a 5-point Likert scale. The minimum and maximum scores were 7 and 35, respectively. A higher reported score on the FCV-19S indicated a higher level of fear of the COVID-19 pandemic. Scores higher or equal to the mean were labeled as "high fear," and scores less than the mean were labeled as "low fear." Since its development in March 2020, the FCV-19S scale has been validated for several populations.[19]

2.3. Statistical analysis

Following proper cleaning, the data was analyzed using SPSS 23 (IBM SPSS Statistics, New York, NY). We checked the normality of the data of the entered variables for necessary transformations.

Initially, we assessed the relationship of stress, anxiety, and depression with different variables. We also assessed the relationship of the fear of COVID-19 categories (less and more fear) with the same variables as above. Next, we assessed the correlations of the FCV-19S with the DASS-21 by Pearson's correlations. Taking all the significant variables from the univariate and bivariate analyses, we constructed 3 separate models on stress, anxiety and depression scales, respectively, to assess the effect of the FCV-19S scale. We also constructed scatter plots between the FCV-19S and each stress, anxiety and depression scale separately in Excel. Qualitative variables were expressed as frequency and percentage, while quantitative variables were shown as mean and standard deviation (M ± SD). We considered a P value of .05 or less to be significant.

3. Results

The mean age of the participants was 21.78 ± 2.11 years; male students constituted more than half of the sample (60.4%). On the depression scale, 77% were normal, 14.4% had mild, 6.8% had moderate, and 1.8% had severe depressive symptoms. On the anxiety scale, 89.2% were normal, 3.2% had mild, 6.1% had moderate, and 1.4% had severe anxiety symptoms. Finally, 93.9% reported no stress, 4.7% had mild, and 1.4% had moderate stress symptoms.

Students who had COVID-19 cases among their neighbors or relatives, those whose lives were affected by COVID-19, and those with poor socioeconomic status had significant stress, anxiety, and depression symptoms compared to others ($P <$

.05). Female students were more anxious than male students ($P = .03$). Furthermore, students from high-viral-load areas, unmarried students, and students who did not live with their families were more stressed than their counterparts ($P < .05$) (Table 1).

Based on the FCV-19S, the overall mean fear score was 8.13 ± 5.34, and the median was 7 (interquartile range = 4–12). Female students, students currently living in high-viral-load areas, unmarried students, and those whose lives were affected by COVID-19 had significantly higher levels of fear (Table 2).

We found a statistically significant weak-to-moderate positive correlation between the FCV-19S and DASS-21 subscales (depression, anxiety, and stress [$r = 0.36, 0.45,$ and $0.39,$ respectively] $P < .001$ for all) (Table 3 and Fig. 1). In addition, those with a high level of fear of the COVID-19 pandemic had significantly higher scores on all DASS-21 subscales ($P < .001$).

Finally, we conducted a multivariate linear regression analysis and found that the FCV-19S scores preserved a statistically significant positive, albeit weak, correlation with all DASS-21 subscales ($P < .001$ for all) after adjustment for other significant factors mentioned earlier (Table 4).

4. Discussion

In this study, we investigated the impact of the COVID-19 pandemic on the mental well-being of medical students. Our results indicated the following psychological burdens: depressive symptoms in 23%, anxiety symptoms in 10.7%, and stress symptoms in 10.8% of participants.

It is clear that the prevalence of depression, anxiety and stress symptoms in our study are far greater than those declared by the World Health Organization in 2019 and even greater than the prevalence for the 5 years prior to the pandemic. This reflects the abrupt implications and consequences of COVID-19 on mental health. Additionally, our study found that almost one-quarter of the participants had depression symptoms, which is higher than the recorded value (18.3%) found in a recent meta-analysis.[7]

Since the start of the pandemic, many studies have evaluated the mental health of medical students amid the pandemic, with great variability in their results. In a recent study conducted in Saudi Arabia, 28.9% of the respondents reported depressive symptoms, 16.4% reported anxiety symptoms, and 17.8% reported stress symptoms.[6]

In a recent Spanish study, 41% of the participants reported depressive symptoms, 25% showed anxiety, and 41% felt stressed.[20] Similar results were reported from Chinese studies; 1 study found that 35% of the participants experienced psychological distress, which was more evident among female respondents, young adults, and migrants.[21] In another Chinese study, 16.5% of the participants reported moderate to severe depressive symptoms, 28.8% had moderate to severe anxiety symptoms, and 8.1% had moderate to severe stress levels; the levels were higher among female students.[22]

A recent cross-sectional study conducted on university students in Saudi Arabia reported higher levels of depression (48.8%), anxiety (86.7%), and stress (40.8%)[23] than what we found. The difference between their finding and ours is likely because 80% of their sample were female students, which matches our findings that female students are more prone to psychological distress.

Higher values were also reported in a study of Egyptian university students. That study revealed a 70.5%, 53.6%, and 47.8% burden of depression, anxiety, and stress, respectively. Female students and medical students were at higher risk of psychological distress.[24]

Table 1

Demographic variables correlated to the DASS-21 subscale.

Variables	N (%)	Stress M	Stress SD	Stress P	Anxiety M	Anxiety SD	Anxiety P	Depression M	Depression SD	Depression P
Overall	278 (100%)	5.32	5.05	.26	2.63	3.69	.20	5.60	5.29	.16
Gender										
Male	168 (60.4)	4.91	4.84	.09	2.25	3.50	.03	5.33	5.16	.29
Female	110 (39.6)	5.94	5.32		3.22	3.91		6.01	5.49	
Current residence										
Low viral-load areas	152 (54.7)	4.79	4.96	.06	2.49	3.76	.47	5.13	5.04	.11
High viral-load areas	126 (45.3)	5.95	5.11		2.81	3.62		6.16	5.55	
Study level										
Preclinical	193 (69.4)	5.43	5.26	.57	2.81	3.83	.21	5.73	5.33	.54
Clinical	85 (30.6)	5.06	4.56		2.24	3.35		5.31	5.22	
Marital status										
Single	274 (98.6)	5.36	5.07	.01	2.65	3.71	.63	5.66	5.30	.003
Married	4 (1.4)	2	1.41		1.75	2.06		1	1.41	
Confirmed case among relatives or neighbors										
Yes	61 (21.9)	7.28	5.05	.001	3.69	4.03	.01	7.31	5.95	.004
No	217 (78.1)	4.76	4.92		2.34	3.55		5.12	5.00	
Currently living with family										
Yes	244 (87.8)	5.30	5.06	.01	2.62	3.72	.90	5.54	5.19	.64
No	34 (12.2)	5.41	5.05		2.71	3.52		6.00	6.04	
Family member health worker										
Yes	129 (46.4)	4.97	5.03	.29	2.34	3.20	.22	5.19	5.09	.24
No	149 (53.6)	5.62	5.06		2.89	4.06		5.95	5.46	
Life affected by COVID										
Not/slightly affected	102 (36.7)	3.37	4.22	<.001	2.00	3.62	.03	3.96	4.68	<.001
Moderately/heavily affected	176 (63.3)	6.44	5.16		3.00	3.69		6.55	5.41	
Socioeconomic status										
Poor	90 (32.4)	6.72	5.50	.001	3.77	4.29	.001	7.30	5.88	.001
Rich	188 (67.6)	4.64	4.69		2.09	3.24		4.78	4.79	

DASS-21 = Depression, Anxiety, and Stress scale.

Table 2

Demographic variables correlated with FCV-19S categories.

Variables	M ± SD/N (%)		P
	Low fear	High fear	
Age	21.76 ± 2.17	21.81 ± 2.06	.86
Gender			
Male	103 (61.3)	65 (38.7)	.01
Female	51 (46.4)	59 (53.6)	
Current residence			
Low viral-load areas	97 (63.8)	55 (36.2)	.002
High viral-load areas	57 (45.2)	69 (54.8)	
Study level			
Preclinical	103 (53.4)	90 (46.6)	.33
Clinical	40 (47.1)	45 (52.9)	
Marital status			
Single	150 (54.7)	124 (45.3)	.07
Married	4 (100.0)	0 (0.0)	
Confirmed case among relatives or neighbors			
Yes	29 (47.5)	32 (52.5)	.16
No	125 (57.6)	92 (42.4)	
Currently living with family			
Yes	137 (56.1)	107 (43.9)	.50
No	17 (50.0)	17 (50.0)	
Family member health worker			
Yes	75 (58.1)	54 (41.9)	.39
No	79 (53.0)	70 (47.0)	
Life affected by COVID			
Not/slightly affected	63 (61.8)	39 (38.2)	.009
Moderately/heavily affected	80 (45.5)	96 (54.5)	
Socioeconomic status			
Poor	42 (46.7)	48 (53.3)	.27
Rich	101 (53.7)	87 (46.3)	

FCV-19S = Fear of COVID-19 Scale.

Table 3

Correlation between the FCV-19S and DASS-21 subscales.

	FCV-19S categories					Pearson's correlation of FCV-19S and DASS-21	
	Less fear (154)		More fear (124)				
	Mean	SD	Mean	SD	P	r	P
Depression	4.30	4.328	7.21	5.917	<.001	0.36	<.001
Anxiety	1.42	2.574	4.14	4.281	<.001	0.45	<.001
Stress	3.76	4.241	7.25	5.315	<.001	0.39	<.001

DASS-21 = Depression, Anxiety, and Stress scale, FCV-19S = Fear of COVID-19 Scale.

We attribute the relatively low psychological burden reported by our participants to the following factors: the timing of our study was early in the pandemic when several measures to reduce the risk of contact with COVID-19 cases were in place, including switching to a well stabilized official online learning platform and suspending practical hospital training. Such protective measures might have provided a sense of security, reassured the students regarding their academic studies, and avoided possible contact with suspected COVID-19 cases in training hospitals, at the college campus, and in the students' accommodation.

Evidence supporting the above potential explanation is provided by a study conducted on 1485 medical and non-medical university students in the United Arab Emirates. The participating students were surveyed at 3 time points: during hospital rotations for medical students, before the beginning of online learning, and after the initiation of online learning. The authors found that medical students displayed more symptoms of anxiety during their hospital placements, which then decreased with the initiation of online learning.[25]

Additionally, most of the students traveled back to their family homes, which could have provided them with more psychological support and stress relief. A safe home environment is a cornerstone of psychological support as it provides students with a healthy lifestyle, including sufficient sleep, a healthy diet, social communication, and recreational opportunities.[26]

SRU students are taught using problem-based methodology with a student-centered approach. This learning system could have a positive effect, enabling the students to gain leadership capabilities, augment their self-esteem, and increase their resilience. These factors have been found to help students cope with different stressors and support their mental health.[27]

An additional factor that could have been a buffer against the increased psychological burden of the pandemic is the religious assistance that was offered to the students and general population in Saudi Arabia during the pandemic. This has been highlighted in the literature as a factor for stress management and spiritual peace.[28]

Cognitive behavioral therapy offered to the students is also a proven way to decrease their anxiety level and modify their
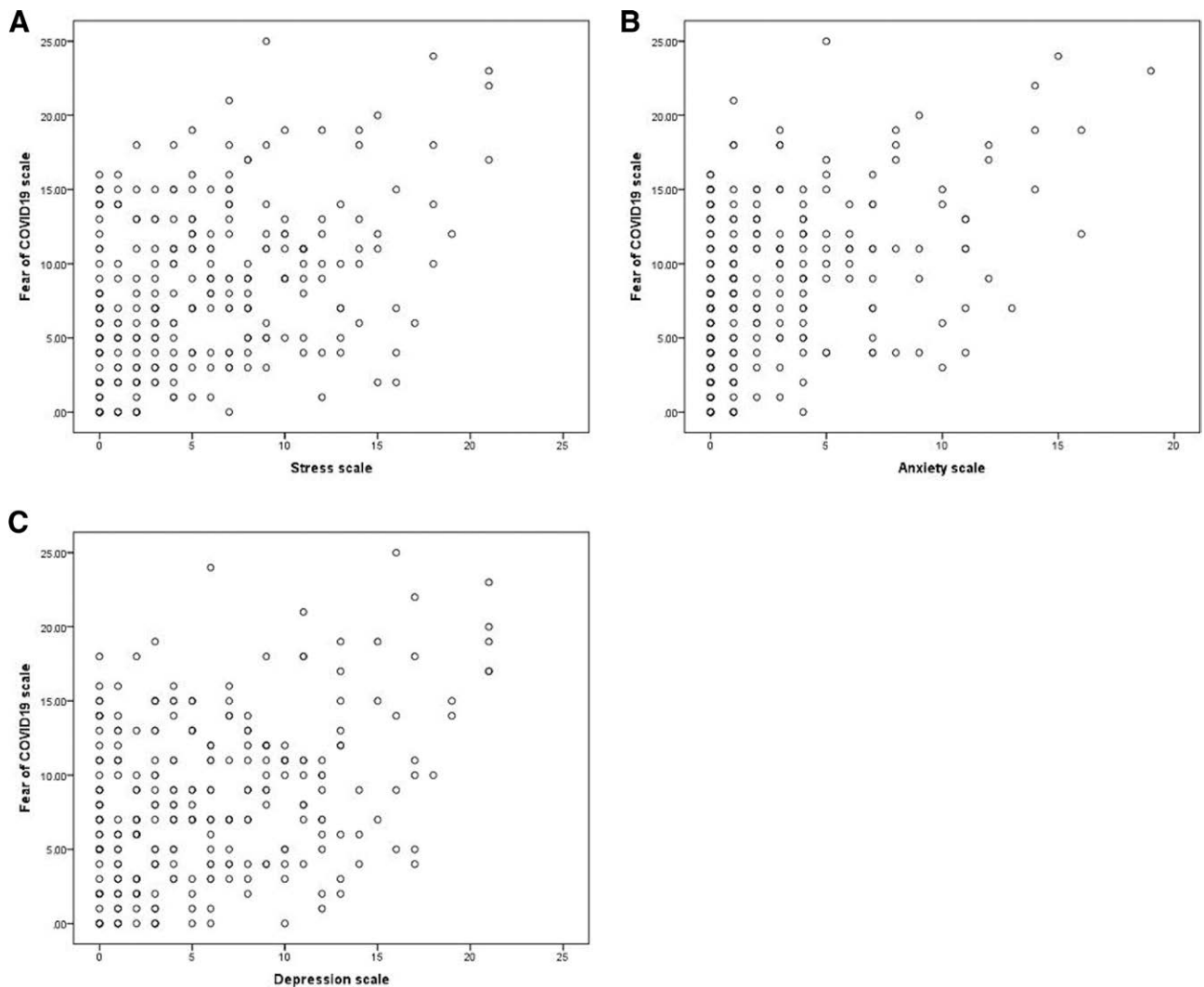
Figure 1. (A–C) Scatter plots illustrating correlation between the FCV-19S and DASS-21 subscales. (A) FCV-19S versus stress subscale. (B) FCV-19S versus anxiety subscale. (C) FCV-19S versus depression subscale. DASS-21 = Depression, Anxiety, and Stress scale, FCV-19S = Fear of COVID-19 Scale.

Table 4

Multiple linear regressions on DASS-21 subscales.

Variables in the model	Depression		Anxiety		Stress	
	β	*P*	β	*P*	β	*P*
FCV-19S	0.29	<.001	0.29	<.001	0.29	<.001
Life affected by COVID	1.40	.03	−0.07	.88	1.92	.001
Rich socioeconomic status	−1.99	.002	−1.45	.001	−1.51	.01
Female	0.41	.50	0.76	.06	0.65	.27
Confirmed case in neighborhood	1.56	.03	0.83	.08	1.75	.009
Unmarried	3.81	.12	−	-	2.34	.31
Currently living with family	−	−	−	−	−0.32	.722
↑ Viral load	−	−	−	−	0.08	.90
R^2	Model: 0.206 Adjusted: 0.188		Model: 0.258 Adjusted: 0.244		Model: 0.243 Adjusted: 0.220	

DASS-21 = Depression, Anxiety, and Stress scale, FCV-19S = fear of COVID-19 Scale.

emotions and behaviors amid such emergencies.[29] It also could have contributed positively in our case as cognitive behavioral therapy was available at both the local university level through the counseling unit and at the public level through specialized COVID-19 clinics.

Research is still ongoing for a better and more in-depth understanding of the psychological status of medical students. Li et al[30] compared students' pre- and post-pandemic parameters, with the available data pointing to an increased prevalence of anxiety and depression symptoms after the COVID-19 pandemic.

In the current study, we found the following factors were significantly associated with a higher risk of psychological distress: being female, living in high-viral-load areas, having a poor socioeconomic status, having a relative with a confirmed

case of COVID-19, and reporting that one's life was affected by COVID-19. Our findings match those of previous studies that have consistently revealed a positive correlation between young women and increased psychological burden.[13,31,32]

Additionally, the COVID-19 pandemic brought economic challenges and financial burdens that affected many people across the world, including medical students' families. This effect was clear in our study; students with a poor socioeconomic status and those who reported being affected by the virus had more psychological distress. Our finding is congruent with those of previous studies that investigated COVID-19 economic burdens.[33,34]

Finally, our finding of a positive correlation between the FCV-19S and DASS-21 scores is supported by previous studies[35,36] and encourages the utilization of the FCV-19S as an emerging rapid and simple mental health assessment tool.

4.1. Limitations

Our study had some limitations, including its cross-sectional design, which precluded us from attributing causality of students' psychological distress to COVID-19. Also, the online nature of the questionnaire prevented us from directly interacting with the non-responders to determine their psychological status. Furthermore, we were unable to determine the reason for not responding. In addition, we did not follow up with the students to monitor their mental wellbeing over time.

4.2. Strengths

Both male and female medical students with various study levels were represented in the sample, and there was a good response rate to the questionnaire. An important strength was the use of more than one validated scale to measure the students' mental health. In addition, this study was conducted during the events of quarantine, online learning, and restrictions, so it is likely that our findings are related and specific to the effects of the pandemic.

4.3. Recommendations

Our results could be beneficial to the education and public health authorities as they plan future preventive measures, screenings, and management policies/strategies for the mental wellbeing of undergraduate medical students. For example, early exclusion of students from training in facilities where patients are cared for or pausing the hospital training during peak transmission are two of the measures likely to reduce any negative mental impact on the students.

Moreover, we recommend that all medical teachers to be trained to monitor students' behavior during such pandemics, to deliver basic cognitive behavioral therapy, and to provide the necessary counseling and social support when needed.

Finally, we recommend further prospective and follow-up studies, supported by direct interviews, to explore the long-term impact of the COVID-19 pandemic on medical students throughout Saudi Arabia and to investigate the best coping strategies for such catastrophes.

5. Conclusion

Medical students, especially female students, are at risk of fear and psychological ill effects, including increased risk of depression, anxiety and stress symptoms amid the COVID-19 pandemic. Our findings shed light on the importance of mental health screening for medical students in Saudi Arabia, especially for those at risk during such pandemics, and the need to curb any psychological hazards they endured during the pandemic.

Author contributions

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