ORIGINAL ARTICLE

Mental Health Status, Anxiety, and Depression Levels of Bangladeshi University Students During the COVID-19 Pandemic

Rajib Ahmed Faisal[1] • Mary C. Jobe[2] • Oli Ahmed[3] • Tanima Sharker[4]

Abstract

The current COVID-19 pandemic has affected people of all ages across the world both physically and psychologically. Understanding COVID-19's impact on university students' mental health status in Bangladesh has been limited, yet is a necessary population to study, since they are particularly vulnerable to stress and mental health issues. This study assessed anxiety, depressive symptoms, and mental health status among university students in Bangladesh. The Generalized Anxiety Disorder-7, Center for Epidemiological Studies Depression Revised Scale, and Mental Health Inventory-5 were translated into Bangla and administered to university students ($N = 874$) online. In total, 40% of the participants had moderate to severe anxiety, 72% had depressive symptoms and 53% had moderate to poor mental health status. Moreover, path analysis showed worrying about COVID-19 and knowledge about the virus predicted anxiety and moderate to poor mental health status; knowledge and belief about COVID-19's severity in Bangladesh predicted depressive symptoms. Thus, revealing that mental health issues were high and COVID-19 worry predicted psychopathology symptoms among Bangladeshi university students. Overall, these results, examining students' mental health during COVID-19, in April 2020, can be helpful to compare how students have adjusted over the pandemic's progression.

Keywords Anxiety · COVID-19 · Depression · Mental health · Pandemic · University students

✉ Rajib Ahmed Faisal
faisal.ier@cu.ac.bd

Mary C. Jobe
mary.jobe.16@cnu.edu

Oli Ahmed
oliahmed_polash131@cu.ac.bd

Tanima Sharker
tanima.bmb@nstu.edu.bd

Extended author information available on the last page of the article

The world is experiencing a pandemic after the first novel coronavirus disease 2019 case registered with the World Health Organization (WHO) in Wuhan, China on the last day of 2019. The COVID-19 disease (stemming from the virus: SARS-Cov-2), has affected almost all countries and territories in the world. On March 11, 2020, the WHO declared the outbreak of COVID-19 to be a global health crisis and a pandemic—which it has proven to be the second deadliest of this century so far (Goodman and Schulkin 2020; Washington Post 2020; Worldometer 2020, November 19). The COVID-19 pandemic has been a non-discriminatory health crisis that has impacted people from all countries, continents, races, and socioeconomic classes (Shanafelt et al. 2020).

Similar to others around the world, the number of COVID-19 positive cases as well as deaths continue to rise in Bangladesh. As of November 19, 2020, there were a total of 438,795 positive cases of COVID-19 and 6275 people who had died from the virus in Bangladesh (Institute of Epidemiology Disease Control and Research 2020, November 19). Pandemics, like COVID-19, or other outbreaks of infectious diseases are simply not reckoned by the medical field; they also reveal more nuanced aspects of human life (Ansari and Yousefabad 2020). Moreover, higher rates of dependency or assistance from others in times of difficulty are the weaknesses that can be experienced by a possible global health problem—such assistance from others in trying times is often difficult or requires the use of physical protection measures to be set in place, like spatial distancing, home quarantine, and school and work closures (Taylor et al. 2010). As the SARS-Cov-2 spreads around the world, it triggers widespread anxiety, apprehension, and stress, all of which are natural and common reactions to the evolving and unpredictable situation in which everyone finds themselves in (Limcaoco et al. 2020; WHO 2020). Overall, the outbreak of COVID-19 is an international public health emergency that constitutes a threat to psychological resilience (Wang et al. 2020).

Early published literature during this crisis predicted that a persisting pandemic would have a substantial impact in highlighting the importance of an individual's psychological needs during these times (Casale and Flett 2020). For example, within the first month after COVID-19 was declared a pandemic, Bangladesh, like others around the world, implemented precautionary measures (spatial distancing, quarantine, self-isolation, etc.) to prevent individuals from being exposed to COVID-19 contaminations. However, with such good intentioned practices at play, remaining indoors from quarantining for an extended period was shown to affect risk factors for anxiety and stress disorders (Ansari and Yousefabad 2020). Recent literature indicates this too, revealing that people who are held in isolation and quarantine experience considerable distress in the form of anxiety, frustration, uncertainty and symptoms of post-traumatic stress (Brooks et al. 2020). Overall, it has been found that as a result of COVID-19, people experience significant psychopathology (Lee 2020; Lee and Crunk 2020).

Since the outbreak, epidemiological data in Bangladesh has revealed that mental health issues due to the COVID-19 pandemic and mass isolation are prominent (Ahmed et al. 2020b; Mamun et al. 2020). Early on in the pandemic, one contributing factor to these mental health implications for Bangladeshis was found to be fear (Sakib et al. 2020). Studies have reiterated that COVID-19 related worries and fears for Bangladeshi samples are associated with increased COVID-19 anxiety, generalized anxiety, depression, and lower mental well-being (Ahmed et al. 2020a; Al Banna et al. 2020; Faisal et al. 2020; Zubayer et al. 2020). Thus, altogether, showing to some extent how the pandemic can impact Bangladeshis psychologically.

That said, tertiary level students may be especially vulnerable to COVID-19's psychological impact because they are in the transition stages of their academic and professional lives

and in general have been prone to experience high levels of stress, anxiety, and depression (APA 2013; Craven 2020; Zivin et al. 2009). These general mental health impacts for college students have also been found among Bangladeshi students—showing that they experience high levels of anxiety and depression than adults (Mamun et al. 2019). Within the pandemic context, Khan et al. (2020b) noted that Bangladeshi college students would specifically be an impacted group, due to these norm disruptions brought about by COVID-19.

As a part of curbing the spread of COVID-19 in its beginning months, educational institutions in Bangladesh closed, so students no longer had the sense of stability and stimulation offered by that community, and had less opportunity to be with their friends and have the social support that is necessary for good mental health (WHO 2020). On March 18, 2020, when there were only eight reported cases in Bangladesh, all the educational institutions were closed by the government for the remainder of the month, until further notice (UNICEF 2020). Dormitories of public universities in which spatial distancing could not be preserved have remained closed for the safety of their residents. Overall, this interruption, brought on by the pandemic, of normal daily operations had already been found to cause tension and anxiety (Ansari and Yousefabad 2020) and college students are no exception to these impacts (Khan et al. 2020b).

For example, previous studies show that outbreaks of infectious diseases have adverse effects on mental health among students, like in the last SARS outbreak (Akan et al. 2010; Petrosillo et al. 2020); such impacts have also been found between the COVID-19 and SARS outbreaks demonstrating similar significant associations (Petrosillo et al. 2020; Wang et al. 2020). One sample in China found that, due to COVID-19, 24.9% of university students experienced anxiety (Cao et al. 2020). For COVID-19 experiences among Bangladeshi college students, one study found a high prevalence of mild to severe depressive symptoms, especially for those living with their families or in urban areas (Islam et al. 2020). In addition, nearly 88% of students experienced mild to severe anxiety symptoms (Islam et al. 2020). Another cross-sectional study among Bangladeshi university students, during COVID-19, found that about 47% of students reported mild to extremely severe depression levels and 69.3% reported mild to severe levels of psychological impact due to the pandemic (Khan et al. 2020a). Although early literature for this demographic is limited, these studies do demonstrate that Bangladeshi college students experienced mental health impacts as a result of COVID-19.

This study intends to add to the early conducted COVID-19 research—and is among the first few to explore Bangladeshi tertiary level students' psychological impact and mental well-being during the first month of the COVID-19 pandemic (Islam et al. 2020; Khan et al. 2020a). The present study aims to assess the prevalence of psychiatric symptoms and identify psychological stress causing vulnerability and protective factors. Ultimately, these findings can help enable university administrations, government agencies and healthcare professionals to secure students' mental well-being in the face of Bangladesh's COVID-19 outbreak. In addition, these findings can be used to compare how students are currently adjusting to the pandemic; they may also be useful in understanding university students in other areas of the world.

Method

Participants

The survey received 874 respondents from current Bangladeshi students attending universities either in Bangladesh or abroad, using the snowball sampling technique. The sample is

significant based on the sample size calculation: $x = Z(^c/_{100})^2 r(100\text{-}r)$. Bangladesh has roughly 1.3 million students currently pursuing higher education (Light Castle Analytics Wing 2019). Considering this population, we had 874 respondents as a sample where margin of error was 4.35%, confidence level was 99%, and response distribution was 50%. The minimum sample needed for 95% confidence would be 384, adding about 10 to 15% non-respondent error that becomes 423 to 442. Thus, our sample is significant, since 874 > 442.

Table 1 shows the demographic characteristics of the respondents. Respondents' ages ranged from 17 years to 38 years ($M = 22.83$, SD = 2.79). The difference between the response of residential (those attending a Bangladesh university) and nonresidential students (who are pursuing their higher education in a university located out of the country) is very high (96.90% and 3.10%, respectively). Roughly three-quarters (76.50%) of the respondents were from an undergraduate level of education, followed by graduate (20.4%), and then doctoral (3.1%). Participants from the Arts and Humanities discipline were higher in frequency (25.20%) than other subjects, while the rate of respondents from the Education discipline was similar (23.30%).

Procedure

The survey was distributed using Google Forms from April 10, 2020 through April 24, 2020. The inclusion criteria were that participants had to be a current student in higher education (undergraduate, graduate, doctoral student), from Bangladesh, and be able to read Bangla. The Google Form link, containing the survey questionnaire, was shared in different student groups on Facebook. In these groups, students were requested to participate in the survey. The survey link was also distributed to students over Facebook Messenger and email, requesting their participation and for them to share in their corresponding online student Facebook groups.

Table 1 Demographic characteristics of the respondents ($N = 874$)

Demographics	Number (percentage)
Gender	
Male	558 (63.8%)
Female	316 (36.2%)
Age group	
17–21 years	179 (20.5%)
21–30 years	674 (77.1%)
> 30 years	21 (2.4%)
Residential status	
Resident (attending university in Bangladesh)	847 (96.9%)
Non-resident (attending university abroad)	27 (3.1%)
Level of education	
Undergraduate	669 (76.5%)
Graduate	178 (20.4%)
Doctoral	27 (3.1%)
Educational discipline	
Arts and Humanities	220 (25.2%)
Business Administration	111 (12.7%)
Education	204 (23.3%)
Engineering	83 (9.5%)
Medical Science	42 (4.8%)
Science, Mathematics and Technology	116 (13.3%)
Social Science	98 (11.2%)

Measures

The online questionnaire included the Generalized Anxiety Disorder 7 (GAD-7; Spitzer et al. 2006), the Center for Epidemiologic Studies Depression Scale Revised (CESD-R-10; Andresen et al. 1994), the Mental Health Inventory-5 (MHI-5; Berwick et al. 1991), questions about beliefs, awareness, worry and knowledge about COVID-19, and demographic information—which asked gender, age, residential status (i.e., attending university in Bangladesh or not), level of education (i.e., undergraduate, postgraduate, doctoral), and educational discipline (i.e., Social Sciences, Arts and Humanities, Business Administration, etc.).

Generalized Anxiety Disorder 7 (GAD-7)

The GAD-7 is a 7-item valid and efficient tool for screening generalized anxiety symptoms (Spitzer et al. 2006). In this scale, participants rated their feelings in response to seven general statements on how often they have been bothered by the given problems over the last 2 weeks (e.g., "Feeling nervous, anxious, or on edge") using a 4-point Likert-type scale [from 0 (*not at all sure*) to 3 (*nearly every day*)]. Total scores could range from 0 to 21, higher scores indicated high anxiety. Spitzer et al. (2006) reported good reliabilities and criterion, construct, factorial, and procedural validities for this scale. To use this assessment, the GAD-7 was translated into the Bangla language following the International Test Commission's guideline (ITC; International Test Committee 2018). At first, this scale was translated into Bangla by two independent bilingual experts; then, these translations were synthesized into one. Next, this translated Bangla version was back-translated into English by two other bilingual experts and were similarly incorporated into one. Following that, the contents of the original and back-translated versions were compared to assess the discrepancy in meaning. Both had a minimal difference in meaning. Finally, this scale was placed in a pilot test where a cognitive interview was taken ($n = 10$). Results suggested that the items were evident in meaning to the participants. The analysis regarding the psychometric properties (see Tables 2 and 3) show that the GAD-7 Bangla version has good item discrimination (corrected item-total correlation ranged from .601 to .689), reliabilities (Cronbach's alpha = .869 and McDonald's omega = .872), and construct validity (the confirmatory factor analysis model fits: χ^2/df = 3.875, goodness-of-fit index (GFI) = .985, comparative fit index (CFI) = .987, Tucker-Lewis index (TLI) = .976, root mean square error of approximation (RMSEA) = .057, and standardized root mean square residual (sRMR) = .024). In the present study, the following cut-offs were used: scores 5 to 9 (mild anxiety), 10 to 14 (moderate anxiety), and 15 and above (severe anxiety) (Spitzer et al. 2006).

Center for Epidemiologic Studies Depression Scale Revised (CESD-R-10)

The Center for Epidemiologic Studies Depression Scale is a 20-item scale for screening depression symptoms developed by Radloff (1977). This scale has good reliabilities, construct, and concurrent validity to assess depression (Miller et al. 2008). There are several shorter versions of this scale; the revised version, the CESD-R-10, was used in this study as it has almost the same psychometric properties compared to a full-length scale (Andresen et al. 1994). The CESD-R-10 consists of 10-items (e.g., "I felt fearful," "I felt lonely"). Respondents rated their feelings over the past week on a 4-point Likert-type scale [from 0 (*Rarely or none of the time*) to 3 (*All of the time*)]. Total scores could range from 0 to 30, with higher scores

Table 2 Psychometric properties of the Bangla version of the GAD-7, CESD-R-10, and MHI-5 scales in item level

Item	GAD-7		CESD-R-10		MHI-5	
	Corrected item-total correlations	Factor loading	Corrected item-total correlations	Factor loading	Corrected item-total correlations	Factor loading
Item 1	.689	.724	.635	.716	.530	.776
Item 2	.659	.688	.604	.688	.750	.890
Item 3	.654	.730	.691	.771	.404	.362
Item 4	.670	.742	.403	.451	.722	.828
Item 5	.649	.671	.359	.388	.685	.678
Item 6	.605	.613	.596	.659		
Item 7	.601	.654	.466	.501		
Item 8			.469	.491		
Item 9			.541	.559		
Item 10			.661	.678		

GAD-7, Generalized Anxiety Disorder 7-item; *CESD-R-10*, Center for Epidemiologic Studies Depression Scale Revised; *MHI-5*, Mental Health Inventory-5

indicating depression. In the current study, CESD-R-10 was translated into the Bangla language following the same procedure as the GAD-7. The CESD-R-10 Bangla version was found to have good psychometric properties (see Tables 2 and 3) to use for assessing depressive symptoms among Bangladeshi people. This scale also has good item discrimination (corrected item-total correlation ranged from .388 to .771), reliabilities (Cronbach's alpha = .845 and McDonald's omega = .848), and construct validity (Confirmatory factor analysis model fits: χ^2/df = 2.956, GFI = .978, CFI = .974, TLI = .966, RMSEA = .047, and sRMR = .029). In the present study, the cut-off score for this scale that indicated depression was 10 (Radloff 1977).

Table 3 Psychometric properties of the Bangla version of GAD-7, CESD-R-10, and MHI-5 scales in scale level

	GAD-7	CESD-R-10	MHI-5	Cut off
Floor effect	3%	0.3%	0.6%	15%
Ceiling effect	2.4%	0.3%	3%	15%
Cronbach's alpha	.869	.845	.839	≥ .7
McDonald's omega	.872	.848	.850	≥ .7
Ferguson's delta	.989	.987	.989	≥ .9
Standard error of measurement	1.89	2.60	9.14	Less than SD/2
χ^2/df	3.875	2.956	3.913	3, but < 5 is acceptable
GFI	.985	.978	.994	.95
CFI	.987	.974	.993	.95
TLI	.976	.966	.985	.95
RMSEA	.057	.047	.058	.08
sRMR	.024	.029	.013	.08

GAD-7, Generalized Anxiety Disorder 7-item; *CESD-R-10*, Center for Epidemiologic Studies Depression Scale Revised; *MHI-5*, Mental Health Inventory-5; *SD*, standard deviation; *df*, degrees of freedom; *GFI*, goodness-of-fit index; *CFI*, comparative fit index; *TLI*, Tucker-Lewis index; *RMSEA*, root mean square error of approximation; *sRMR*, standardized root mean square residual

Mental Health Inventory-5 (MHI-5)

The Mental Health Inventory (MHI; Veit and Ware 1983) is a 38-item valid tool for assessing the mental health of general people that include both psychological well-being and distress. The MHI-5 (Berwick et al. 1991) is the shorter version of the MHI, containing only five items. MHI-5 is a reliable and valid tool for assessing mental health and provides a quick assessment of it (Berwick et al. 1991; Ware and Sherbourne 1992). Participants rated items based on the last month (e.g., "how much of the time, during the past month, have you been a very nervous person?") on a 6-point Likert-type scale [from 0 (*none of the time*) to 5 (*all of the time*)], with higher scores indicating poorer mental health. Raw scores on this scale (ranging from 5 to 25) are transformed to a 0 to 100 scale using the following formula: [(sum of the raw score of the 5 items/25) × 100]. The MHI-5 was translated into the Bangla language for the present study following the same procedures as the aforementioned scales. This scale also was found to have good psychometric properties to assess the mental health of the Bangladeshi people. Moreover, this scale has good item discrimination (corrected item-total correlation ranged from .404 to .722), reliabilities (Cronbach's alpha = .839 and McDonald's omega = .850), and construct validity (the confirmatory factor analysis model fits: $\chi^2/df = 3.913$, GFI = .994, CFI = .993, TLI = .985, RMSEA = .058, and sRMR = .013). The cut-off score for this scale was 60 to define moderate to poor mental health (Theunissen et al. 2011).

COVID-19 Severity Beliefs, Worry, and Awareness

To assess the beliefs about the severity of the COVID-19 outbreak, participants were asked two questions ("There is nothing to worry about with COVID-19" and "COVID-19 could not become a pandemic here"), rating their answers on a 5-point scale (from *strongly disagree* to *strongly agree*). These items were found to be significantly correlated ($r = .309$, $p < .001$). There were also two questions regarding worry about the effect of COVID-19 ("I feel tense when I think about the effects of COVID-19" and "Considering the impact of COVID-19, I am afraid of the days to come") rated on a 5-point scale, similar to the belief items. To assess awareness, two other questions ("I am aware of how to deal with COVID-19" and "I have changed my hygiene behaviors as a result of COVID-19") were asked on a 5-point scale (from *not at all* to *absolutely*). There were significant correlations between items for worry ($r = .528$, $p < .001$) and awareness ($r = .185$, $p < .001$). Lastly, a single question was asked regarding participants' knowledge about COVID-19 ("I have sufficient knowledge of COVID-19") on a 5-point scale (from *absolutely not* to *absolutely*).

Statistical Analysis

The collected data of the present study were maintained and analyzed using IBM SPSS version 26, IBM AMOS version 24, JASP 0.12.1.0, and Microsoft Excel 2013. At the first stage, psychometric properties of the translated scales were assessed via reliability analysis (corrected item-total correlation, Cronbach's alpha, and McDonald's omega), confirmatory factor analysis (the factor structure of the translated scales), Ferguson's delta, and the standard error of measurement (SEM). At the next stage, descriptive statistics (frequency and percentages), χ^2 test, and path analysis were run. In both the χ^2 test and path analysis, Bonferroni corrected p value was used to assess the level of significance. As there were 15 χ^2 tests, the corrected p value in the χ^2 test was .003. There were 12 tests in the path analysis; therefore, the Bonferroni corrected p value in the path analysis was .004.

Ethics

This research was carried out in compliance with the Helsinki Declaration and its corresponding modifications or similar ethical principles (World Medical Association 2001). The data was collected using an online survey where participants were informed about the study purposes, its costs and benefits, and conditions of confidentiality before starting the survey. Participants then expressed their consent, after reading the aforementioned, to participate in the study by clicking either "Yes" or "No." Those who did not consent, by clicking "No" were not given the survey. This study's protocol was approved by the ethical research committee at the Noakhali Science and Technology University (reference number: 19/2020).

Results

The findings show that the majority of this university student sample scored highly for anxiety and depression symptoms determined by the cut offs of those respective measures. Table 4 shows that 40.2% of students had moderate to severe anxiety symptoms (modest at 23.6% and critical at 16.6%) and 72.1% had depression symptoms. Besides these, Table 4 also shows that more than half of the participants' mental health statuses were in the moderate to poor range (53.9%). Regarding beliefs, 34.3% disagreed on "nothing to worry about," and approximately two-thirds (62.5%) strongly disagreed with the possibility of COVID-19 pandemic's presence in Bangladesh. Regarding worry, 77.1% felt tense when they thought about the effects of COVID-19, and 88.1% were afraid about the upcoming days. For knowledge, only 9.5% thought that they had an absolute understanding about COVID-19. Among the participants, 95.1% were aware of COVID-19, and about three-quarters (77.1%) changed their hygiene behaviors because of it.

Table 5 shows the non-significant interactions of having anxiety and depressive symptoms, and mental health status by gender, age group, residential status, level of education, and educational discipline. Figure 1 shows that worrying about the effects of COVID-19 ($\beta = .40$, $p < .004$) was a significant predictor of anxiety symptoms. Figure 1 also shows that COVID-19 related knowledge ($\beta = -.09$, $p = .004$) was negative and worrying about the effects of COVID-19 ($\beta = .32$, $p < .004$) were positive contributors for the depression symptoms. Furthermore, worry ($\beta = -.31$, $p < .004$) also significantly predicted mental health status. All of these predictors explained 18% of anxiety's variability, 14% of depression's variability, and 12% of mental health's variability.

Discussion

The COVID-19 pandemic affects all aspects of life, including the education sector. This is evident as all educational institutions during the early months of the pandemic closed or began meeting online since the outbreak started, in most countries. This study was undertaken to understand how Bangladeshi university students' mental health and well-being were doing, during this ongoing pandemic in April 2020. The results showed that university students have high rates of having anxiety and depression symptoms as well as moderate to poor mental health scores per their respective measures' cut scores. These high anxiety and depression frequencies are comparable to Bangladesh university student samples (Islam et al. 2020; Jamilah et al. 2020) and are higher than when studied in Bangladesh adult samples (Ahmed et al. 2020c; Mamun et al. 2020). Additionally, in terms of our study's sample experiencing

Table 4 Prevalence statistics of anxiety, depression, mental health status, belief, worry, awareness, and knowledge of the respondents during the COVID-19 pandemic ($N = 874$)

		Classification	Frequency	Percentages
1.	Anxiety symptoms	Mild	319	36.5
		Moderate	206	23.6
		Severe	145	16.6
2.	Depression symptoms	Depressive	630	72.1
3.	Mental health status	Moderate to poor	471	53.9
		Moderate to better	403	46.1
4.	There is nothing to worry about with COVID-19.	Strongly disagree	103	11.8
		Disagree	197	22.5
		Uncertain	151	17.3
		Agree	352	40.3
		Strongly agree	71	8.1
5.	COVID-19 could not become a pandemic here.	Strongly disagree	271	31.0
		Disagree	275	31.5
		Uncertain	296	33.9
		Agree	23	2.6
		Strongly agree	9	1.0
6.	I feel tense when I think about the effects of COVID-19.	Strongly disagree	28	3.2
		Disagree	84	9.6
		Uncertain	88	10.1
		Agree	558	63.8
		Strongly agree	116	13.3
7.	Considering the impact of COVID-19, I am afraid of the days to come.	Strongly disagree	8	.9
		Disagree	33	3.8
		Uncertain	63	7.2
		Agree	574	65.7
		Strongly agree	196	22.4
8.	I am aware of how to deal with COVID-19.	Not at all	0	0
		Somewhat	3	.3
		Uncertain	40	4.6
		Moderately	458	52.4
		Absolutely	373	42.7
9.	I have changed my hygiene behaviors as a result of COVID-19.	Not at all	28	3.2
		Somewhat	157	18.0
		Uncertain	15	1.7
		Moderately	335	38.3
		Absolutely	339	38.8
10.	I have sufficient knowledge about COVID-19.	Absolutely not	1	.1
		Somewhat	88	10.1
		Uncertain	5	.6
		Moderately	697	79.7
		Absolutely	83	9.5

Numbers 4 through 5 reference the belief measure; 6 to 7 reference worry; 8 to 9 reference awareness; and 10 references knowledge

these high anxiety and depression symptoms, studies have similarly found that college students generally have had higher levels of stress, anxiety, and depression during the COVID-19 pandemic (Ahmed et al. 2020b; Cao et al. 2020; Wang et al. 2020). Ahmed et al. (2020b) also found that higher anxiety and depression symptom levels among students were comparable to those who are full-time employees, have a business, or are unemployed. These findings relating to high depression, anxiety, and mental health statues due to the pandemic were also found to be consistent with COVID-19 literature among Bangladesh university student samples (Islam et al. 2020; Khan et al. 2020a) as well as a large Bangladeshi sample

Table 5 Differences in anxiety, depression, and mental health status among university students during COVID-19 pandemic

| Demographics	Anxiety			χ² (sig.)	Depression		χ² (sig.)	Mental health status		χ²(sig.)
	Mild	Moderate	Severe		No	Depressed		Poor	Better	
Gender										
Male	201 (36.0%)	124 (22.2%)	90 (16.1%)	4.94 (>.003)	174 (31.2%)	384 (68.8%)	8.18 (>.003)	281 (50.4%)	277 (49.6%)	7.75 (>.003)
Female	118 (37.3%)	82 (25.9%)	55 (17.4%)		70 (22.2%)	246 (77.8%)		190 (60.1%)	126 (39.9%)	
Age										
17–21 years	72 (40.2%)	42 (23.5%)	29 (16.2%)	2.47 (>.003)	53 (29.6%)	126 (70.4%)	.688 (>.003)	96 (53.6%)	83 (46.4%)	.095 (>.003)
21–30 years	238 (35.3%)	160 (23.7%)	113 (16.8%)		184 (27.3%)	490 (72.7%)		363 (53.9%)	311 (46.1%)	
>30 years	9 (42.9%)	4 (19.0%)	3 (14.3%)		7 (33.3%)	14 (66.7%)		12 (57.1%)	9 (42.9%)	
Residence										
Resident	307 (36.2%)	201 (23.7%)	142 (16.8%)	1.37 (>.003)	236 (27.9%)	611 (72.1%)	.04 (>.003)	457 (54.0%)	390 (46.0%)	.05 (>.003)
Nonresident	12 (44.4%)	5 (18.5%)	3 (11.1%)		8 (29.6%)	19 (70.4%)		14 (51.9%)	13 (48.1%)	
Level of education										
Undergraduate	253 (37.8%)	165 (24.7%)	101 (15.1%)	8.70 (>.003)	183 (27.4%)	486 (72.6%)	.66 (>.003)	364 (54.4%)	305 (45.6%)	.87 (>.003)
Graduate	56 (31.5%)	35 (19.7%)	40 (22.5%)		54 (30.3%)	124 (69.7%)		92 (51.7%)	86 (48.3%)	
Doctoral	9 (39.1%)	5 (21.7%)	4 (17.4%)		6 (26.1%)	17 (73.9%)		16 (60.9%)	9 (39.1%)	
Educational discipline										
Arts and Humanities	68 (30.9%)	64 (29.1%)	36 (16.4%)	28.72 (>.003)	63 (28.6%)	157 (71.4%)	17.05 (>.003)	127 (57.7%)	93 (42.3%)	15.38 (>.003)
Business Administration	47 (42.3%)	20 (18.0%)	24 (21.6%)		34 (30.6%)	77 (69.4%)		60 (54.1%)	51 (45.9%)	
Education	76 (37.3%)	53 (26.0%)	35 (17.2%)		43 (21.1%)	161 (78.9%)		115 (56.4%)	89 (43.6%)	
Engineering	29 (34.9%)	13 (15.7%)	16 (19.3%)		28 (33.7%)	55 (66.3%)		40 (48.2%)	43 (51.8%)	
Medical Science	13 (31.0%)	7 (16.7%)	4 (9.5%)		20 (47.6%)	22 (52.4%)		13 (31.0%)	29 (69.0%)	
Science, Mathematics, and Technology	44 (37.9%)	25 (21.6%)	18 (15.5%)		35 (30.2%)	81 (69.8%)		56 (48.3%)	60 (51.7%)	
Social Science	42 (42.9%)	24 (24.5%)	12 (12.2%)		21 (21.4%)	77 (78.6%)		60 (61.2%)	38 (38.8%)	
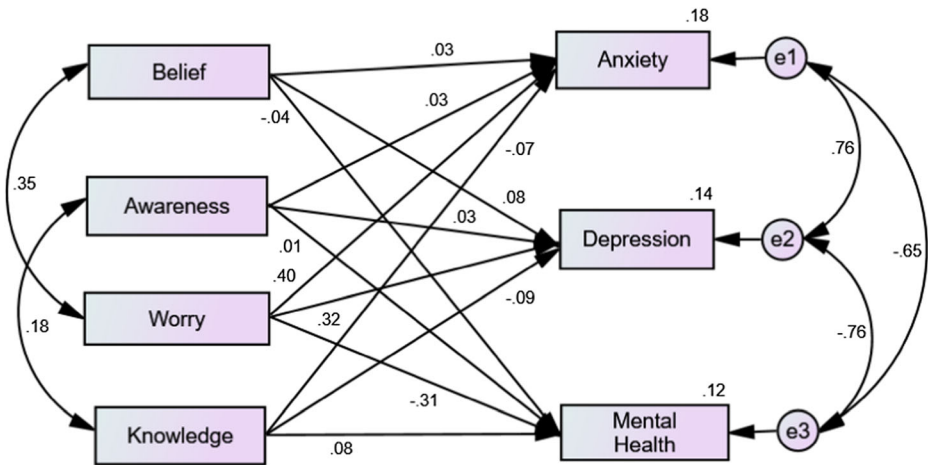
Fig. 1 Path analysis of the effect of belief, worry, awareness, and knowledge on anxiety, depression, and mental health

(Mamun et al. 2020). These findings also are supported in the notion that college students in particular are vulnerable population for these psychological pandemic-related impacts (Khan et al. 2020b). Overall, the anxiety, depression, and mental health dispositions for college students, as surveyed in April, may have been stemming from a more central fear construct—which was found to be high during the beginning months of the pandemic for Bangladeshis (Sakib et al. 2020).

Moreover, this study's results found that anxiety and depression symptoms as well as mental health status did not differ significantly by gender, age, residential status, education level, and educational discipline. In terms of age, residential status, education level, and educational discipline, literature on college students have also found insignificant differences across these groups (Ickes et al. 2015; Liu et al. 2019; Saleh et al. 2017). In terms of gender, there has been some inconsistency in the literature. For one Bangladeshi student population, Islam et al. (2020) found males experienced higher levels of psychopathology. However, Wang et al. (2020) found that females and students show significant associations with anxiety, depression, and stress during the COVID-19 outbreak, in China. Although there are contradictions with gender, Andrade et al. (2020) emphasized for a Brazilian sample, females in comparison to males may be more vulnerable to psychopathology as a result of COVID-19, due to biological and social factors. Conclusiveness regarding our study's result with gender may be worth replicating in a subsequent study.

The pandemic and the imminent danger of COVID-19 mean that it is now ubiquitous for people to be alert as well as mindful of their vulnerability to health-related threats, and to take precautionary and preventative steps to decrease them, such as by spatial distancing (Casale and Flett 2020). Our findings showed that the majority of the participants felt tense about the effects of the disease, and the rate for the respondents who were afraid of their future in the pandemic was even higher. Additionally, a small proportion of the respondents reported that they possessed adequate knowledge about COVID-19; the majority of those same respondents were also found to have positively changed their hygiene behaviors. At this stage of the pandemic, fear, anxiety, and worry were pervasive, anticipated, and present (Ahmed et al. 2020a; Lee 2020; Pakpour and Griffiths 2020; Sakib et al. 2020). That said, the public understanding of a pandemic is unpredictable, especially when the magnitude and naturally

occurring progress of its effects cannot be predicted correctly (Van et al. 2010). During April 2020, when participants were surveyed, only one-third of the participants felt worried about the pandemic, whereas two-thirds had confidence that COVID-19 pandemic would not be an issue in Bangladesh.

Even though some participants did not feel that the pandemic would be problematic for Bangladesh, all educational institutions closed beginning March 18, 2020, due to the COVID-19 outbreak in the country (UNICEF 2020). As a result of this first-line emergency response, all students returned to their homes or other private residences unaffiliated with their universities. Since then, students' daily lives became confined and government orders restricted them to remain home over the past 3 months. Such isolation changed the norms of everyday life. Staying home has been found, though, to significantly increase one's anxiety and depression symptoms (Brooks et al. 2020), especially for college students (Khan et al. 2020b). In a recent rapid review, Brooks et al. (2020) also found that reduced social contact, the altering of regular activities, norm changes contributed to distress. Moreover, uncertainty about a COVID-19 treatment plan and the lack of a vaccine to help COVID-19 infected patients may have also contributed to a much higher rate of anxiety and depression symptoms, since lack of information can often fuel fears (Taylor and Asmundson 2004). Zandifar and Badrfam (2020) have found support to this, as misinformation and uncertainty of treatment can often trigger stress, anxiety, depression, etc., in those who feel the pandemic's effects.

Recommendations

Due to confined living, brought on by the pandemic, Bangladeshi people have become more active on social media to pass the time and remain connected (Statista 2020). Gao et al. (2020) suggest that a higher frequency of social media exposure is positively associated with mental health problems. Additionally, one study by Lin et al. (2020) found a mediating effect for COVID-19 fear with social media use and distress; another found that anxiety sensitivity mediates problematic Internet use and fear of COVID-19 among an Iranian sample (Hashemi et al. 2020). Therefore, we recommend that future researchers examine the potential mediating roles social media, and misinformation can play in the psychological distresses and COVID-19 affectivity relationship among a Bangladeshi sample. Additionally, we recommend that other measures be incorporated into the study, such as an assessment of stress levels—during and after the semester—as well as students' present feelings about the current and upcoming semesters. We also recommend that such research be explored on various populations, not just students, in other areas of the world to determine the applicability of these findings. Finally, we recommend that with these findings governments and higher education institutions create disease regulation interventions and practices that require a thorough and systematic mental health treatment plan and consideration; as it is clear that students—a specific proportion of the population—have been negatively impacted psychologically by the coronavirus' effects so early on in the pandemic.

Limitations

The present study has some limitations. First, self-report measures were utilized in this study to assess anxiety and depression symptoms and mental health status. The collected self-reported data may have been subjected to social desirability bias, memory recall bias, as well as common methods bias. In addition, the present study's data were collected using snowball sampling on social media—thus, there may be issues with representativeness, since only those

on social media and with Internet access would have the ability to take the survey. In addition, this study was conducted early on in the pandemic, therefore, although these findings may serve as useful to compare mental health from this period to how university students are currently impacted, these results should not be taken out of context and applied to how university students are presently feeling about the pandemic.

Conclusion

In brief, the results of this study reveal that Bangladeshi university students, only 1 month into the COVID-19 pandemic, experienced high levels of psychological distress based on the measures' cut scores. University students are an especially vulnerable population since the experience has been shown to be stressful in non-pandemic times. This study does show university students experienced high levels of anxiety, depression symptoms, and low mental health statuses, when transitioning to the coronavirus' new norms in April 2020. Now that students have returned to a virtual or hybrid learning environment, these findings may bring to light how the pandemic's uncertainty is negatively impacting university students in Bangladesh. To address these high levels of symptoms and low statuses, universities should be understanding of and have plans to help those whose mental health may be affected as a result of COVID-19. Finally, these findings can provide insights to university administrations, government agencies, and health professionals to ensure the psychological well-being of students in the face of the ongoing COVID-19 outbreak as well as future infections disease outbreaks in Bangladesh. For further research, we recommend that this study be replicated among a Bangladeshi university student sample to compare whether mental health has changed over the pandemic's progression—especially now with the prospect of a SARS-Cov-2 vaccine.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

References

Ahmed, O., Faisal, R. A., Sharker, T., Lee, S. A., & Jobe, M. C. (2020a). Adaptation of the Bangla version of the COVID-19 Anxiety Scale. *International Journal of Mental Health and Addiction*. https://doi.org/10.1007/s11469-020-00357-2.

Ahmed, M. Z., Ahmed, O., Aibao, Z., Hanbin, S., Siyu, L., & Ahmad, A. (2020b). Epidemic of COVID-19 in China and associated psychological problems. *Asian Journal of Psychiatry, 51*, 102092. https://doi.org/10.1016/j.ajp.2020.102092.

Ahmed, O., Ahmed, Z. M., Alim, S. M. A. H. M., Khan, M. D. A. U., & Jobe, M. C. (2020c). COVID-19 outbreak in Bangladesh and associated psychological problems: an online survey. *Death Studies*, 1–10. https://doi.org/10.1080/07481187.2020.1818884.

Akan, H., Gurol, Y., Izbirak, G., Ozdatlı, S., Yilmaz, G., Vitrinel, A., & Hayran, O. (2010). Knowledge and attitudes of university students toward pandemic influenza: a cross-sectional study from Turkey. *BMC Public Health, 10*(1), 413. https://doi.org/10.1186/1471-2458-10-413.

Al Banna, M. H., Sayeed, A., Kundu, S., Christopher, E., Hasan, M. T., Begum, M. R., Kormoker, T., Dola, S. T. I., Hassan, M. M., Chowdhury, S., & Khan, M. S. I. (2020). The impact of COVID-19 pandemic on the mental health of the adult population in Bangladesh: a nationwide cross-sectional study. *International Journal of Environmental Health Research*, 1–12. https://doi.org/10.1080/09603123.2020.1802409.

American Psychological Association. (2013). C*ollege students' mental health is a growing concern, survey finds.* APA https://www.apa.org/monitor/2013/06/college-students

Andrade, E. F., Pereira, L. J., de Oliveira, A. P. L., Orlando, D. R., Alves, D. A. G., de Sales Guilarducci, J., & Castelo, P. M. (2020). Perceived fear of COVID-19 infection according to sex, age and occupational risk using the Brazilian version of the fear of COVID-19 Scale. *Death Studies*, 1–10. https://doi.org/10.1080/07481187.2020.1809786.

Andresen, E. M., Malmgren, J. A., Carter, W. B., & Patrick, D. L. (1994). Screening for depression in well older adults: evaluation of a Short Form of the CES-D. *American Journal of Preventive Medicine, 10*(2), 77–84. https://doi.org/10.1016/S0749-3797(18)30622-6.

Ansari, M., & Yousefabad, S. A. (2020). Potential threats of COVID-19 on quarantined families. *Public Health, 183*, 1. https://doi.org/10.1016/j.puhe.2020.04.014.

Berwick, D. M., Murphy, J. M., Goldman, P. A., Ware, J. E., Barsky, A. J., & Weinstein, M. C. (1991). Performance of a five-item mental health screening test. *Medical Care, 29*(2), 169–176. https://doi.org/10.1097/00005650-199102000-00008.

Brooks, S. K., Webster, R. K., Smith, L. E., Woodland, L., Wessely, S., Greenberg, N., & Rubin, G. J. (2020). The psychological impact of quarantine and how to reduce it: Rapid review of the evidence. *The Lancet, 395*(10227), 912–920. https://doi.org/10.1016/S0140-6736(20)30460-8.

Cao, W., Fang, Z., Hou, G., Han, M., Xu, X., Dong, J., & Zheng, J. (2020). The psychological impact of the COVID-19 epidemic on college students in China. *Psychiatry Research, 287*. https://doi.org/10.1016/j.psychres.2020.112934.

Casale, S., & Flett, G. L. (2020). Interpersonally-based fears during the COVID-19 pandemic: reflections on the fear of missing out and the fear of not mattering constructs. *Clinical Neuropsychiatry, 17*(2), 88–93. https://doi.org/10.36131/CN20200211.

Craven, J. (2020). *Stress, COVID-19 affecting college students' mental health*. Medscape Medical News. https://www.medscape.com/viewarticle/934452#vp_1

Faisal, R. A., Jobe, M. C., Ahmed, O., & Sharker, T. (2020). Replication analysis of the COVID-19 Worry Scale. *Death Studies*, 1–7. https://doi.org/10.1080/07481187.2020.1815104.

Gao, J., Zheng, P., Jia, Y., Chen, H., Mao, Y., Chen, S., Wang, Y., Fu, H., & Dai, J. (2020). Mental health problems and social media exposure during COVID-19 outbreak. *PLoS One, 15*(4), e0231924. https://doi.org/10.1371/journal.pone.0231924.

Goodman, R., & Schulkin, D. (2020). *Timeline of the coronavirus pandemic and U.S. response*. Just Security. https://www.justsecurity.org/69650/timeline-of-the-coronavirus-pandemic-and-u-s-response/

Hashemi, S. G. S., Hosseinnezhad, S., Dini, S., Griffiths, M. D., Lin, C.-Y., Pakpour, A., & H. (2020). The mediating effect of the cyberchondria and anxiety sensitivity in the association between problematic internet use, metacognition beliefs, and fear of COVID-19 among Iranian online population. *Heliyon, 6*(10), e05135. https://doi.org/10.1016/j.heliyon.2020.e05135.

Ickes, M. J., Brown, J., Reeves, B., & Zephyr, P. M. D. (2015). Differences between undergraduate and graduate students in stress and coping strategies. *Californian Journal of Health Promotion, 13*(1), 13–25.

Institute of Epidemiology Disease Control and Research. (2020). *Bangladesh covid-19 update*. Institute of Epidemiology Disease Control and Research. https://www.iedcr.gov.bd/. Accessed 19 Nov 2020.

International Test Commission. (2018). ITC guidelines for translating and adapting tests (second edition). *International Journal of Testing, 18*(2), 101–134. https://doi.org/10.1080/15305058.2017.1398166.

Islam, A. M., Barna, S. D., Raihan, H., Khan, M. N. A., & Hossain, M. T. (2020). Depression and anxiety among university students during the COVID-19 pandemic in Bangladesh: a web-based cross-sectional survey. *PLoS One, 15*, e0238162. https://doi.org/10.1371/journal.pone.0238162.

Jamilah, A., Haque, M. I., Muhammad, F., Harun, M. G. D. H., Chowdhury, A. B. M. A., Akramuzzaman, M., Arafat, S. M. Y., & Kabir, R. (2020). Depression and associated factors among international students in a private university of Bangladesh. *Global Psychiatry, 0*. https://doi.org/10.2478/gp-2020-0021.

Khan, A. H., Sultana, M. S., Hossain, S., Hasan, M. T., Ahemd, H. U., & Sikder, M. T. (2020a). The impact of COVID-19 pandemic on mental and wellbeing among home-quarantined Bangladeshi students: a cross-sectional pilot study. *Journal of Affective Disorders, 1*(277), 121–128. https://doi.org/10.1016/j.jad.2020.07.135.

Khan, K. S., Mamun, M. A., Griffiths, M. D., & Ullah, I. (2020b). The mental health impact of the COVID-19 pandemic across different cohorts. *International Journal of Mental Health and Addiction*. https://doi.org/10.1007/s11469-020-00367-0.

Lee, S. A. (2020). Coronavirus anxiety scale: a brief mental health screener for COVID-19 related anxiety. *Death Studies, 44*(7), 393–401. https://doi.org/10.1080/07481187.2020.1748481.

Lee, S. A., & Crunk, E. A. (2020). Fear and psychopathology during the COVID-19 crisis: neuroticism, hypochondriasis, reassurance-seeking, and coronaphobia as fear factors. *OMEGA-Journal of Death and Dying*. https://doi.org/10.1177/2F0030222820949350.

Light Castle Analytics Wing. (2019). *Tertiary education in Bangladesh: a sector in need of reform.* DATABD.CO. https://databd.co/stories/tertiary-education-in-bangladesh-a-sector-in-need-of-reform-5290#:~:text=With%2037%20public%20and%2082,20%20percent%20in%20the%20country.

Limcaoco, R. S. G., Mateos, E. M., Fernandez, J. M., & Roncero, C. (2020). Anxiety, worry and perceived stress in the world due to the COVID-19 pandemic, March 2020. Preliminary results. *medRxiv.* https://doi.org/10.1101/2020.04.03.20043992.

Lin, C.-Y., Broström, A., Griffiths, M. D., & Pakpour, A. H. (2020). Investigating mediated effects of fear of COVID-19 and COVID-19 misunderstanding in the association between problematic social media use, psychological distress, and insomnia. *Internet Interventions*, 100345. https://doi.org/10.1016/j.invent.2020.100345.

Liu, X., Ping, S., & Gao, W. (2019). Changes in undergraduate students' psychological well-being as they experience university life, *International Journal of Environmental Research and Public Health., 16*(16), 2864. https://doi.org/10.3390/ijerph16162864.

Mamun, M. A., Hossain, M. S., & Griffiths, M. D. (2019). Mental health problems and associated predictors among Bangladeshi students. *International Journal of Mental Health and Addiction.* https://doi.org/10.1007/s11469-019-00144-8.

Mamun, M. A., Sakib, N., Gozal, D., Bhuiyan, A. K. M. I., Hossain, S., Bodrud-Doza, M., Mamun, F. A., Hosen, I., Safiq, M. B., Abdullah, A. H., Sarker, M. A., Rayhan, I., Sikder, M. T., Muhit, M., Lin, C.-Y., Griffiths, M. D., & Pakpour, A. H. (2020). The COVID-19 pandemic and serious psychological consequences in Bangladesh: a population-based nationwide study. *Journal of Affective Disorders.* https://doi.org/10.1016/j.jad.2020.10.036.

Miller, W. C., Anton, H. A., & Townson, A. F. (2008). Measurement properties of the CESD scale among individuals with spinal cord injury. *Spinal Cord, 46*(4), 287–292. https://doi.org/10.1038/sj.sc.3102127.

Pakpour, A., & Griffiths, M. (2020). The fear of COVID-19 and its role in preventive behaviors. *Journal of Concurrent Disorders, 2*(1), 58–63 https://concurrentdisorders.ca/2020/04/03/the-fear-of-covid-19-and-its-role-in-preventive-behaviors/.

Petrosillo, N., Viceconte, G., Ergonul, O., Ippolito, G., & Petersen, E. (2020). COVID-19, SARS and MERS: are they closely related? *Clinical Microbiology and Infection: the Official Publication of the European Society of Clinical Microbiology and Infectious Diseases, 26*, 729–734. https://doi.org/10.1016/j.cmi.2020.03.026.

Radloff, L. S. (1977). The CES-D Scale: a self-report depression scale for research in the general population. *Applied Psychological Measurement, 1*(3), 385–401. https://doi.org/10.1177/014662167700100306.

Sakib, N., Bhuiyan, A. K. M. I., Hossain, S., Mamun, F. A., Hosen, I., Abdullah, A. H., Sarker, M. A., Mohiuddin, M. S., Rayhan, I., Hossain, M., Sikder, M. T., Gozal, D., Muhit, M., Islam, S. M. S., Griffiths, M. D., Pakpour, A. H., & Mamun, M. A. (2020). Psychometric validation of the Bangla Fear of COVID-19 Scale: confirmatory factor analysis and Rasch analysis. *International Journal of Mental Health and Addiction, 11*, 1–12. https://doi.org/10.1007/s11469-020-00289-x.

Saleh, D., Camart, N., & Romo, L. (2017). Predictors of stress in college students. *Frontiers in Psychology, 8*(19). https://doi.org/10.3389/fpsyg.2017.00019.

Shanafelt, T., Ripp, J., & Trockel, M. (2020). Understanding and addressing sources of anxiety among health care professionals during the COVID-19 pandemic. *JAMA, 323*, 2133–2134. https://doi.org/10.1001/jama.2020.5893.

Spitzer, R., Kroenke, K., Williams, J., & Löwe, B. (2006). A brief measure for assessing generalized anxiety disorder: the GAD-7. *Archives of Internal Medicine, 166*(10), 1092–1097. https://doi.org/10.1001/archinte.166.10.1092.

Statista. (2020). *Increased time spent on media consumption due to the coronavirus outbreak among internet users worldwide as of march 2020, by country.* Statista. https://www.statista.com/statistics/1106766/media-consumption-growth-coronavirus-worldwide-by-country/

Taylor, S., & Asmundson, G. J. G. (2004). *Treating health anxiety: a cognitive-behavioral approach.* New York: Guildford.

Taylor, M., Barr, M., Stevens, G., Bryson-Taylor, D., Agho, K., Jacobs, J., & Raphael, B. (2010). Psychosocial stress and strategies for managing adversity: measuring population resilience in New South Wales, Australia. *Population Health Metrics, 8*(1), 28. https://doi.org/10.1186/1478-7954-8-28.

Theunissen, M.-J., Jansen, M., & van Gestel, A. (2011). Are mental health and binge drinking associated in Dutch adolescents? Cross-sectional public health study. *BMC Research Notes, 4*(100). https://doi.org/10.1186/1756-0500-4-100.

UNICEF. (2020). *Students in Bangladesh adjust to remote learning via national TV during COVID-19 lockdown.* UNICEF. https://www.unicef.org/bangladesh/en/stories/students-bangladesh-adjust-remote-learning-national-tv-during-covid-19-lockdown

Van, D., McLaws, M.-L., Crimmins, J., MacIntyre, C. R., & Seale, H. (2010). University life and pandemic influenza: attitudes and intended behaviour of staff and students towards pandemic (H1N1) 2009. *BMC Public Health, 10*(1), 130. https://doi.org/10.1186/1471-2458-10-130.

Veit, C. T., & Ware, J. E. (1983). The structure of psychological distress and well-being in general populations. *Journal of Consulting and Clinical Psychology, 51*(5), 730–742. https://doi.org/10.1037/0022-006X.51.5.730.

Wang, C., Pan, R., Wan, X., Tan, Y., Xu, L., Ho, C. S., & Ho, R. C. (2020). Immediate psychological responses and associated factors during the initial stage of the 2019 Coronavirus Disease (COVID-19) epidemic among the general population in China. *International Journal of Environmental Research and Public Health, 17*(5), 1729. https://doi.org/10.3390/ijerph17051729.

Ware, J. E., & Sherbourne, C. D. (1992). The MOS 36-Item Short-Form Health Survey (SF-36): conceptual framework and item selection. *Medical Care, 30*(6), 473–483. https://doi.org/10.1097/00005650-199206000-00002.

Washington Post. (2020). *History's deadliest pandemics, from ancient Rome to modern America.* https://www.washingtonpost.com/graphics/2020/local/retropolis/coronavirus-deadliest-pandemics/

World Health Organization. (2020). *WHO/Europe | Coronavirus disease (COVID-19) outbreak—Mental health and psychological resilience during the COVID-19 pandemic.* http://www.euro.who.int/en/health-topics/health-emergencies/coronavirus-covid-19/news/news/2020/3/mental-health-and-psychological-resilience-during-the-covid-19-pandemic

World Medical Association. (2001). World medical association declaration of Helsinki. Ethical principles for medical research involving human subjects. *Bulletin of the World Health Organization, 79*(4), 373–374 https://apps.who.int/iris/handle/10665/268312.

Worldometer. (2020). *Coronavirus death toll: 1,354,813 deaths.* Retrieved November 19, 2020 from https://www.worldometers.info/coronavirus/coronavirus-death-toll. Accessed 19 Nov 2020.

Zandifar, A., & Badrfam, R. (2020). Iranian mental health during the COVID-19 epidemic. *Asian Journal of Psychiatry, 51*, 101990. https://doi.org/10.1016/j.ajp.2020.101990.

Zivin, K., Eisenberg, D., Gollust, S. E., & Golberstein, E. (2009). Persistence of mental health problems and needs in a college student population. *Journal of Affective Disorders, 117*, 180–185. https://doi.org/10.1016/j.jad.2009.01.001.

Zubayer, A. A., Rahman, M. E., Islam, B. M., Babu, S. Z. D., Rahman, Q. M., Bhuiyan, M. R. A. M., Khan, M. K. A., Chowdhury, M. A. U., Hossain, L., & Habib, R. B. (2020). Psychological states of Bangladeshi people four months after the COVID-19 pandemic: an online survey. *Heliyon, 6*(9), e05057. https://doi.org/10.1016/j.heliyon.2020.e05057.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Affiliations

Rajib Ahmed Faisal[1] · Mary C. Jobe[2] · Oli Ahmed[3] · Tanima Sharker[4]

[1] Institute of Education and Research (IER), University of Chittagong, Chittagong, Bangladesh

[2] Department of Brain and Psychological Sciences, The George Washington University, Washington, DC, USA

[3] Department of Psychology, University of Chittagong, Chittagong, Bangladesh

[4] Department of Biochemistry and Molecular Biology, Noakhali Science and Technology University, Noakhali, Bangladesh