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Prevalence and Factors associated with Mental health impact of COVID-19 Pandemic in Bangladesh: A survey-based cross-sectional study — [Source link](#)

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Prevalence and Factors associated with Mental health impact of COVID-19 Pandemic in Bangladesh: A survey based cross sectional study

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Article Type: Original Research.

Keywords: mental health; depression; anxiety; stress; coronavirus; divisions; Bangladesh

Ethics Statement: Ethical permission for this study was obtained from the Institutional Review Board of Dr Wazed Research and Training Institute, Begum Rokeya University, Rangpur (#BRUR/DWRTI/a.n.004) and the study adhered to the tenets of the Declaration of Helsinki as revised in Fortaleza. All the participants were informed about the specific objective of this study before proceeding to the questionnaire. Consent was obtained from all participants prior to completing the questionnaire through an online preamble. Participants were able to complete the survey only once and could terminate the survey at any time they desired. Anonymity and confidentiality of the data were ensured.

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Abstract

Background: Feelings of isolation, insecurity, and instability triggered by COVID-19 could have a long-term impact on the mental health status of individuals. This study examined the prevalence and factors associated with the mental health symptoms of anxiety, depression, and stress during the COVID-19 pandemic in Bangladesh.

Methods: From 1st – 30th April 2020, we used a validated self-administered questionnaire to conduct a cross-sectional study on 10,609 participants through an online survey platform. We assessed mental health status using the Depression, Anxiety, and Stress Scale (DASS-21). The total depression, anxiety, and stress subscale scores were divided into normal, mild, moderate, severe, and multinomial logistic regression was used to examine associated factors.

Results: The prevalence of depressive symptoms was 15%, 34%, and 15% for mild, moderate, and severe depressive symptoms, respectively. The prevalence of anxiety symptoms was 59% for severe anxiety symptoms, 14% for moderate anxiety symptoms, and 14% for mild anxiety symptoms while, the prevalence for stress levels were 16% for severe stress level, 22% for moderate stress level and 13% for mild stress level. Multivariate analyses revealed that the most consistent factors associated with mild, moderate, and severe of the three mental health subscales (depression, anxiety, and stress) were respondents who lived in Dhaka and Rangpur division, females, those who self-quarantine in the previous 7 days before the survey and those respondents who experienced chills, breathing difficulty, dizziness, and sore throat.

Conclusion: Our results showed that about 64%, 87%, and 61% experienced depressive symptoms, anxiety symptoms, and levels of stress, respectively. In Bangladesh, there is a need for better mental health support for females especially those that lived in Dhaka and Rangpur division and experienced chills, breathing difficulty, dizziness, and sore throat during COVID-19 and other future pandemics.

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Introduction

As the global population tries to make sense of the transformations including personal adjustments to lifestyle brought about by the COVID-19 pandemic, residents of low to middle-income countries (LMIC) including Bangladesh face greater challenges due to the fragile health systems [1, 2], the dense population of Bangladesh and the fact that the country houses a million stateless Rohingya refugees in sprawling refugee camps that are conducive to the spread of epidemics. Bangladesh also has significant migrant populations living in Italy, a COVID-affected country [1]. Whilst the mortality rates in Bangladesh have remained low, due to the timing of the infection, the early transmission of the virus, and the response to the pandemic by authorities, the low socio-economic status of the country and the existing health inequalities usually lead to worse effects [3].

Science has played a significant role in improving people's understanding of the virus, finding effective ways of containment through timely sequencing of the virus and rapid sharing of the data [4], and most recently the development of different vaccines. Unraveling the genetic sequence of the SARS-COV-2 virus about 4 weeks after the outbreak of the SARS-COV-2 virus [5], which was shorter compared to the Spanish flu which took almost seven decades for the scientist to unravel the genetic sequence of the disease [6], which is crucial to the development of a diagnostic test and potential treatment [7, 8].

Globally, the virus has infected over 84 million people, including 1.8 million reported deaths from the infection. In Bangladesh, there have been 515,000 confirmed cases as of 2nd January 2021, with 7576 deaths reported to the WHO [9]. The COVID- 19 pandemic spread faster, and the mortality rate is higher than those attributed to the Middle Eastern respiratory syndrome (MERS) and Severe acute respiratory syndrome (SARS). Thus, there was fear and panic among residents as news about its fatal nature spread very easily through traditional and social media outlets, leaving behind a trail of despair and disruptions in lifestyle. The

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high mortality rate, closure of businesses, and strict containment measures by national governments also added to the hidden and unhidden mental health burden of the pandemic [10, 11]. However, no one has been able to report comprehensively the mental health impact of the pandemic in most Low and Middle Income Countries (LMIC).

Despite the delay in COVID 19 cases in Bangladesh (the first case reported 18th March 2020), the country's global supply chain of International fashion brands and human resource exports suffered a huge set-back with devastating psychosocial consequences emanating from the International and local economic impacts [12]. The rapid spread of the infection and the business climate in Bangladesh, caused fear, worry, and stress as restrictions were put in place by the government. Post-traumatic stress symptoms as well as delayed grief and the sense of loss after multiple deaths and loss of jobs and avenue to socialize have been reported in previous studies [13].

Studies have reported that the COVID-19 pandemic has significant negative impacts on the mental health of college students, with female students reporting higher levels of perceived stress and inability to focus on their academic work [14]. Similarly, couples undergoing Assisted Reproductive Treatment showed the severe psychological impact of the pandemic particularly among women who were more emotionally distressed, anxious, and depressed than their men counterparts. This is because Assisted Reproductive Treatment was stopped in many centers due to rising concern on the impact of COVID-19 on pregnancy [15]. Coupled with these, are the uncertainties about effective treatment, availability of effective vaccine as well as whether life could return to normal.

All these could negatively affect the mental health of the populace and by extension, the productivity of the country that depends largely on international trading, which has so far been decimated by the pandemic. Health care delivery in Bangladesh has major challenges including weak governance and over-centralized framework, the fact that over 58% of all the

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physicians work in the private sector that is poorly regulated, and the lack of funding for the public sector [16]. Layered on top of these, are the lack of resources and disproportionate distribution of mental health services in Bangladesh, leading to poor access to mental health facilities and care [17]. Therefore, this study aims to determine the prevalence and factors associated with mental health symptoms in the population, which could drive the people's economy and wellbeing during and after the pandemic.

Methods

Study Design

This cross-sectional online study was conducted from April 1-30, 2020 corresponding to the mandatory lockdown period imposed in different parts of Bangladesh. The Institutional Review Board of Dr. Wazed Research and Training Institute, Begum Rokeya University, Rangpur (#BRUR/DWRTI/a.n.004), approved the study. This study follows the tenets of the Declaration of Helsinki as revised in Fortaleza. Informed consent was obtained through an online preamble before the respondents began the questionnaire. The participants were assured of the confidentiality of the information provided and their freedom of choice of participation.

A self-administered survey was created using a google form, and since traditional face-to-face interviews were not possible due to the lockdown, social media platforms (e.g. Facebook, Google Plus, and Google Form) were used for the distribution of the survey to reach the target respondents living in different parts of Bangladesh. The respondents clicked the link on the platform and responded to the survey voluntarily. This was a convenient sample, and the survey was anonymous, and confidentiality of data was ensured.

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Study Population

The respondents had to be resident in Bangladesh and able to provide online informed consent. To be eligible for participation, participants had to be 18 years and over, and should be able to provide online consent.

Measurements and Covariates

The covariates, which are shown in Table 1, were classified into four parts: demographic, household factors, compliance with health measures, and health-related factors. The first part gathered demographic information of the participants, including gender, age, living area (division), level of education, marital status, and working status. The second part was the household factors, which asked about living arrangements, the number living together, and the third part included COVID-19 factors, which asked whether the participants have been tested for COVID-19. The fourth part evaluated the compliance to WHO recommended precautionary measures, which included avoiding crowded gatherings, handshaking and use of public transport, wear of facemask when going out, advocate other people about the health risk of the infection. The fifth part evaluated the history of health-related symptoms (if the respondents had experienced any of the following symptoms: fever, pain, headache, chills persistent, dizziness, and breathing difficulties, a couple of weeks before data collection). The information about these five parts is listed in Supplementary Table 1.

The Depression, Anxiety and Stress Scale - 21 Items (DASS-21) is a set of three self-report scales designed to measure the emotional states of depression, anxiety, and stress and were calculated based on a previous study [18]. Responses to each item were rated from 0 to 3, where “never” (score ‘0’) to ‘almost always’ (score ‘3’). Item 3, 5, 10, 13, 16, 17, and 21 (see supplementary table 1) were classified as the depression subscale, and the total depression subscale score was multiplied by 2 to calculate the final score and divided into normal (0–9), mild depression (10–13), moderate depression (14–20), severe depression (21+). The

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Cronbach's alpha coefficients measuring internal consistency among the depression subscale score ranged from 0.75 to 0.77, indicating a satisfactory level of reliability.

The items 2, 4, 7, 9, 15, 19, and 20 (see supplementary table 1) formed the anxiety subscale, and the total anxiety subscale score was multiplied by 2 to calculate the final score and divided into normal (0–7), mild anxiety (8–9), moderate anxiety (10–14), severe anxiety (15+) [18]. The Cronbach's alpha coefficient for anxiety subscale scores ranged from 0.65 to 0.77, indicating acceptable internal consistency.

Items 1, 6, 8, 11, 12, 14, and 18 (see supplementary table 1) were classified as the stress subscale. The total stress subscale score was multiplied by 2 to calculate the final score and was divided into normal (0–14), mild stress (15–18), moderate stress (19–25), severe stress (26+), and extremely severe stress (35–42) [18]. The Cronbach's alpha coefficient of stress subscale scores ranged from 0.78 to 0.81, indicating an acceptable level of internal consistency.

Statistical Analysis

Descriptive statistics using frequency tabulations were used to present the sample characteristics. The prevalence and 95% confidence intervals of symptoms of depression, anxiety, and levels of stress were calculated for normal, mild, moderate, and severe. The association was further tested by odds ratios (OR) using univariate multinomial logistic regression, and multiple multinomial logistic regression analyses were performed to identify significant factors associated with symptoms of depression, anxiety, and levels of stress.

In the multiple multinomial logistic regression analyses, four-stage modeling was employed. In the first stage, the demographic factors were entered into the first stage model. We conducted a manually executed elimination method to determine factors associated with symptoms of depression, anxiety, and levels of stress at ($p < 0.05$). The significant factors in the first stage were added to the household factors in the second stage model; this was then

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followed by the elimination procedure. We used a similar statistical approach for compliance with public health and Health condition factors in the third and fourth stages, respectively. Associations were presented as unadjusted OR (95% CI) for all explanatory variables and then adjusted OR (95% CI) for the variables retained in the final step. All statistical analyses were conducted using STATA/MP Version.14.1 (Stata Corp, College Station, TX, USA).

Spatial Analysis

We conducted spatial distribution for mental health which consisted of depression, anxiety, and stress subscales. A series of maps were prepared using ArcGIS Desktop 10.8 [19]. The average level of depression, anxiety, and stress for the first-level administrative unit of Bangladesh (division) was calculated based on the identification of factors through map comparisons and regression analysis for mild, moderate, and severe levels. In the maps, the adjusted odds ratios (AOR) for each level was categorized into five quantiles and were presented using graduated colour symbols.

Results

Demographic Characteristics

From the 10,900 participants, data for 10,660 respondents (aged 18 years and over) deriving out of all 8 divisions in Bangladesh were included in the analysis. 5238 participants (49.1%) were males and mostly aged between 18-37years (8466, 79.4%). Of the total number of respondents, 6233 (58.5%) had a university degree or higher, and 5332 (50.3%) were married. About half of the participants (5260 participants [49.6%]) lived in Dhaka division, with the family (8533, 80.4%) or with up to 3 people (9328, 87.9%) and were working full time or part-time (5974 participants [56.0%]) during the pandemic. This survey included data from 343 individuals (3.2%) with confirmed cases of COVID-19 and 832 individuals (7.8%) with suspected cases of COVID-19.

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Of the total number of respondents, the majority enforced protective measures in their homes to protect their families (9705, 91.5%), had quarantine experience, 8454 (79.7%) but more than two-third (~78% each) did not comply with the public health measures of avoiding public transport, handshaking, large gatherings, wear of facemask when going out, which were put in place to contain the spread of the disease. More than two-thirds of the participants had at least one symptom of COVID-19 a couple of weeks before data collection, especially persistent fever and cough (9727, 91.7%) and difficulty breathing (9207, 86.8%). Additional demographic and epidemic-related characteristics are presented in Table 1.

Prevalence and 95% confidence intervals (CI) of Covid-19 depression, anxiety, and stress

The prevalence of symptoms for the 3 mental health conditions among the total sample is shown in Figures 1 (a-c) for depression, anxiety, and stress, respectively. The prevalence was 65.0% for depression (6822 participants total, including 1563 participants [14.7%, 95%CI, 14.0-15.4%] with mild depression and 1552 participants [14.6%, 95%CI, 13.9-15.3%] with severe depression), 86.9% for anxiety (9267 participants total, including 1440 participants [13.5%, 95%CI, 12.4-13.7%] with mild anxiety and 6310 participants [59.2%, 95%CI, 58.3-60.1%] with severe anxiety), 50.5% (95% CI, 28.8%-29.6%) for stress (5381 participants total, including 1339 participants [12.6%, 95%CI, 12.0-13.2%] with mild stress and 1684 participants [15.8%, 95% CI, 15.1-16.5%] with severe stress). Additional details on the prevalence of mental health symptoms in different populations are presented in Figure 1.

Factors Associated with Symptoms of Depression, Anxiety, and Stress

The results of the unadjusted analysis of demographic and COVID-19 related variables are presented in the supplementary Tables 1-3, for depression, anxiety, and stress, respectively. Table 2 presents the multivariate analysis of factors associated with depression in this cohort. In the multivariable analysis, being married, having lower than a postgraduate degree, living

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alone or living in shared accommodation, living in the Sylhet, Dhaka, Chittagong, Rajshahi, and, Rangpur divisions, having experienced any COVID-19 related health symptom couple of weeks before data collection, were found to be associated with symptoms of depression at all levels. Figure 2 presents the adjusted odds ratios for depression symptoms among the respondents by region. The map in Figure 2, indicates that significantly high odds of depression occurred in all 8 regions of Bangladesh with the highest odds of severe depression reported in Rangpur, Sylhet and Chittagong reported (darkest brown colour). Individuals who were tested for COVID-19 also had remarkably higher levels of mild-severe symptoms of depression compared to those that had not been tested. In addition, female participants, those who were divorced or separated, residents of Barisal or Mymensing divisions, and those who traveled by public transport displayed a higher risk of moderate-severe symptoms of depression. Additional details on the factors associated with depression are presented in Table 2. Individuals with confirmed COVID-19 had at least a 50 percent higher risk of moderate-severe depression symptoms compared to those who were not tested for the disease.

Table 3 presents the multivariate analysis of factors associated with anxiety among the participants. Their distribution by region is shown in Figure 3, revealing that the odds for feeling severely anxious increased by more than 3 folds among respondents from four of the eight regions (see Figure 3 for details). From the Table, females, those who were divorced or widowed, those who lived in shared accommodation during the lockdown, individuals who experienced self-quarantine, and those who experienced fever and cough a couple of weeks before data collection, were more likely to experience mild-severe symptoms of anxiety, while older participants experienced a lower risk of depression at all levels. Compared to those from Khulna division, participants who lived in other divisions particularly Chittagong [adjusted OR, 6.26, 95%CI, 4.40-8.90], Mymensing [adjusted OR, 5.26, 95%CI, 3.04-9.12]

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and Rangpur [adjusted OR, 5.86, 95%CI, 3.64-9.42] had a higher risk of severe symptoms of depression (see Figure 4) as well as those who lived alone [adjusted OR, 1.70, 95%CI, 1.35-2.16] during the lockdown. Those with confirmed or suspected cases of COVID-19 were more about two times more likely to experience severe symptoms of depression compared to those who were not tested. Other symptoms of COVID-19 were also significantly associated with some degree of depression in this study.

The factors associated with stress in the multivariate analysis are shown in Table 4. Females, those living outside of Khulna division, participants with lower than postgraduate education, older people (>27years), participants who were married, those who lived alone, and participants who had experienced self-quarantine and any of the health symptoms in this study (except for fever) were more likely to experience symptoms of stress at all levels. Participants who were divorced/widowed [adjusted OR, 1.54, 95%CI, 1.06-2.24], those who lived in shared accommodations [adjusted OR, 2.26, 95%CI, 1.69-3.02] as well as individuals who failed to comply with the precautionary measures advising people to avoid traveling by public transport and/or shake hands [adjusted OR, 1.63, 95%CI, 1.15-2.30] had a remarkably higher risk of moderate and severe stress symptoms [adjusted OR, 4.02, 95%CI, 2.74-5.91 and 1.63, 95%CI, 1.15-2.30, respectively for severe stress], while severe stress symptoms were also found among those who failed to wear face masks when going out [adjusted OR, 1.64, 95%CI, 1.19-2.25].

Table 1 Characteristics of the study population (n=10609)

Variables	n	Percent (%)
Demography		
Division of Living		
Khulna	1788	16.85
Chittagong	1198	11.29
Mymensing	288	2.71

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	Rajshahi	674	6.35
	Barisal	716	6.75
	Rangpur	464	4.37
	Sylhet	221	2.08
	Dhaka	5260	49.58
Gender			
	Male	5238	49.37
	Female	5371	50.63
Level of Education			
	Postgraduate/Post Doctorate	2291	21.59
	Graduate	3942	37.16
	HSC or Equivalent	2881	27.16
	SSC or Equivalent	969	9.13
	Under SSC	526	4.96
Age Category			
	18-27 years	6043	56.96
	28-37 years	2423	22.84
	38-47 years	1157	10.91
	48-57 years	709	6.68
	58+ years	277	2.61
Marital Status			
	Single	4833	45.56
	Married	5332	50.26
	Divorced/Widowed	444	4.19
Working Status			
	Working (Full time)	4754	44.81
	Working (Part-time)	1220	11.50
	No working/Student	4635	43.69
Household Factors			
Living Arrangement			
	Living with Family	8533	80.43
	Living Alone	1504	14.18
	Sharing/Living with Flatmates	572	5.39
Household Size			
	1-2 People	1281	12.07
	3-4 People	9328	87.93
Have you been tested for COVID-19?			

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	No	9434	88.92
	Yes, I Tested Negative	832	7.84
	Yes. I Tested Positive	343	3.23
<i>Compliance with Public health measures</i>			
Have You Enforced Protective Measures Inside Your Home to Protect Yourself and Your Family from COVID 19?			
	Yes	9705	91.48
	No	904	8.52
Are You Currently in Self-Quarantine Since Past Seven Days?			
	No	2155	20.31
	Yes	8454	79.69
What Sort of Protective Measures Have You Taken?			
Avoid Public Transport			
	Yes	2230	21.02
	No	8379	78.98
Avoid Shaking Hands			
	Yes	2313	21.80
	No	8296	78.20
Wearing Face Mask			
	Yes	2368	22.32
	No	8241	77.68
Avoid Large Gatherings			
	Yes	2352	22.17
	No	8257	77.83
Advocating People About the Health Risk Related to COVID-19			
	Yes	1792	16.89
	No	8817	83.11
Responses Regarding the Health Condition for the Last Couple of Weeks			
Fever For at least A Day			
	No	9179	86.52
	Yes	1430	13.48
Chills For at least a Day			
	No	9225	86.95
	Yes	1384	13.05
Headache For at least a day			
	No	7851	74.00
	Yes	2758	26.00

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Cough For at least a Day			
	No	8228	77.56
	Yes	2381	22.44
Breathing Difficulty			
	No	9207	86.78
	Yes	1402	13.22
Dizziness			
	No	8802	82.97
	Yes	1807	17.03
Sore Throat			
	No	8761	82.58
	Yes	1848	17.42
Persistent fever and cough or difficulty in breathing			
	No	9727	91.69
	Yes	882	8.31

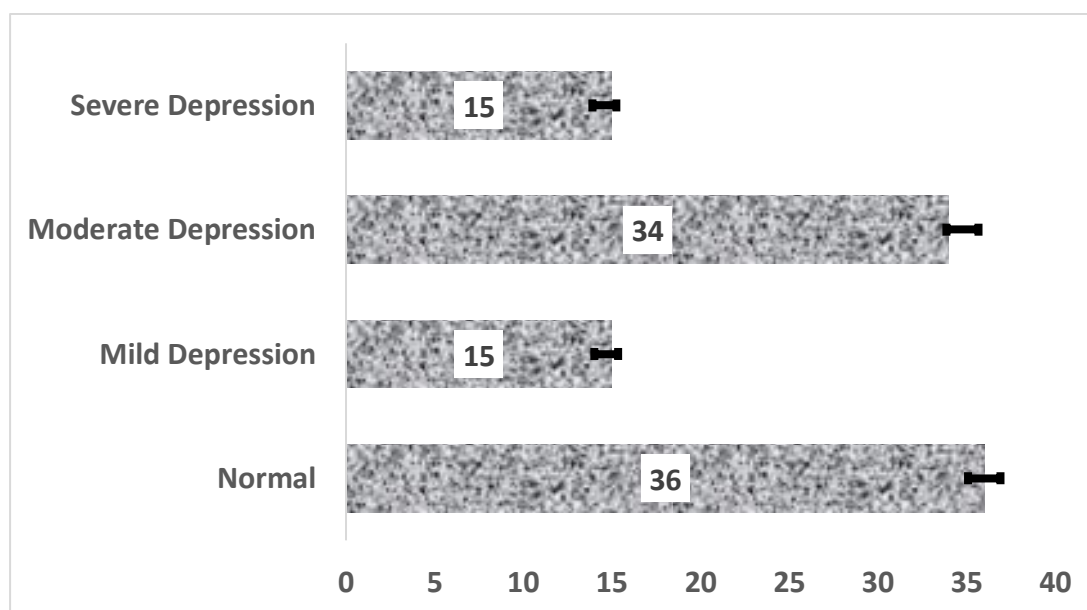


Figure 1 (a): Prevalence and 95% CI of Depression level during COVID-19

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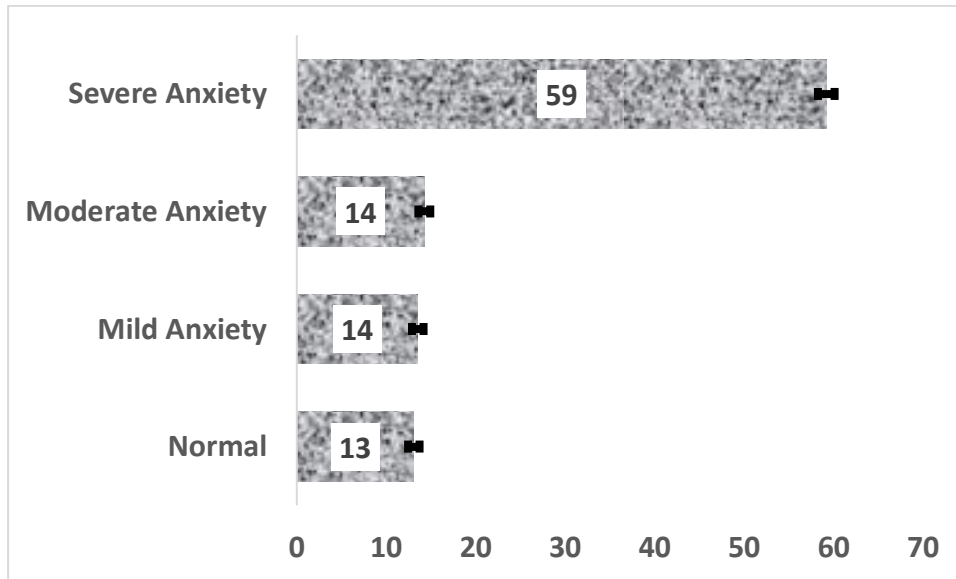


Figure 1 (b): Prevalence and 95% CI of Anxiety level during COVID-19

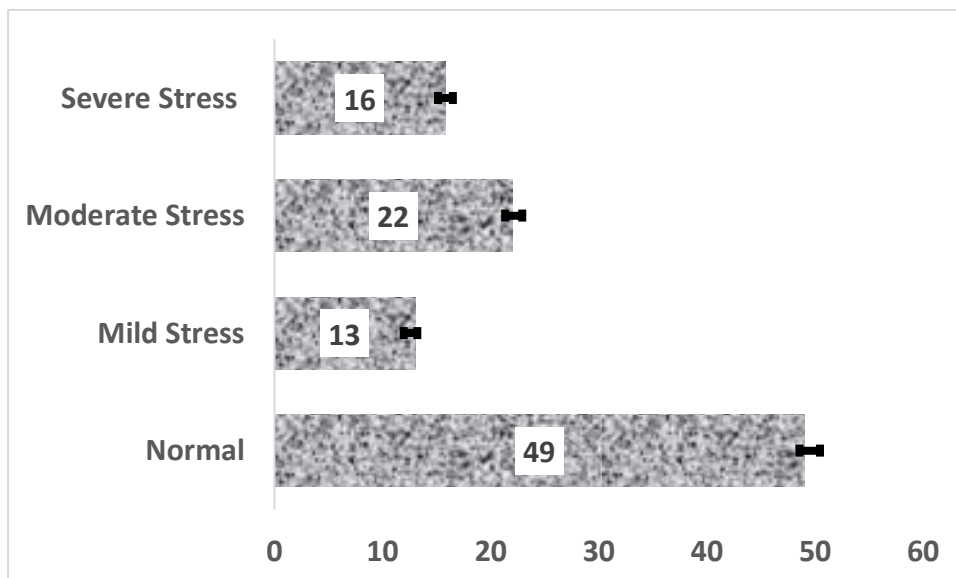


Figure 1 (c): Prevalence and 95% CI of Stress level during COVID-19

Table 2: Factors associated with mild, moderate, and severe depression during COVID-19 in Bangladesh.

Variables	Mild		Moderate		Severe	
	aOR	Pvalue	aOR	Pvalue	aOR	Pvalue
<i>Demography</i>						
Division of Living						
Khulna	1.00		1.00		1.00	
Chittagong	2.16 (1.65, 2.81)	<0.001	4.38 (3.47, 5.55)	<0.001	6.38 (4.77, 8.56)	<0.001
Mymensing	0.96 (0.59, 1.57)	0.875	2.68 (1.86, 3.85)	<0.001	2.51 (1.57, 4.01)	<0.001
Rajshahi	1.42 (1.01, 1.98)	0.042	3.56 (2.74, 4.62)	<0.001	3.77 (2.70, 5.27)	<0.001
Barisal	1.04 (0.77, 1.41)	0.782	1.76 (1.36, 2.27)	<0.001	2.09 (1.50, 2.93)	<0.001
Rangpur	1.91 (1.28, 2.86)	0.002	5.07 (3.65, 7.03)	<0.001	5.68 (3.82, 8.45)	<0.001
Sylhet	5.34 (2.93, 9.75)	<0.001	10.67 (6.05, 18.81)	<0.001	15.17 (8.07, 28.53)	<0.001
Dhaka	1.85 (1.54, 2.22)	<0.001	2.48 (2.11, 2.93)	<0.001	2.88 (2.30, 3.62)	<0.001
Gender						
Male	1.00		1.00		1.00	
Female	1.14 (0.99, 1.30)	0.060	1.63 (1.45, 1.83)	<0.001	1.71 (1.47, 1.98)	<0.001
Level of Education						
Postgraduate/Post Doctorate	1.00		1.00		1.00	
Graduate	1.47 (1.24, 1.75)	<0.001	1.64 (1.41, 1.90)	<0.001	1.55 (1.28, 1.88)	<0.001
HSC or Equivalent	1.25 (1.03, 1.52)	0.026	2.00 (1.70, 2.35)	<0.001	2.19 (1.79, 2.68)	<0.001
SSC or Equivalent	1.53 (1.14, 2.05)	0.005	3.57 (2.84, 4.48)	<0.001	3.22 (2.44, 4.24)	<0.001
Under SSC	1.61 (1.14, 2.28)	0.007	2.64 (1.97, 3.53)	<0.001	2.89 (2.04, 4.10)	<0.001
Age in category						
18-27 years	1.00		1.00		1.00	
28-37 years	1.16 (0.94, 1.44)	0.166	1.21 (1.02, 1.43)	0.032	1.49 (1.23, 1.82)	<0.001
38-47 years	0.84 (0.63, 1.13)	0.246	1.10 (0.89, 1.37)	0.367	0.80 (0.61, 1.04)	0.090

48-57 years	1.90 (1.40, 2.58)	<0.001	1.18 (0.91, 1.52)	0.206	1.03 (0.76, 1.39)	0.848
58+ years	0.35 (0.19, 0.65)	0.001	0.96 (0.68, 1.37)	0.828	0.80 (0.52, 1.25)	0.332
Marital Status						
Single	1.00		1.00		1.00	
Married	0.68 (0.56, 0.84)	<0.001	1.42 (1.20, 1.68)	<0.001	1.69 (1.36, 2.10)	<0.001
Divorced/Widowed	1.12 (0.71, 1.78)	0.626	1.71 (1.15, 2.53)	0.008	2.43 (1.56, 3.76)	<0.001
Working Status						
Working (Full time)	1.00		1.00		1.00	
Working (Part time)	1.23 (0.97, 1.56)	0.089	0.74 (0.61, 0.89)	0.002	0.88 (0.71, 1.10)	0.281
No working/Student	0.72 (0.59, 0.89)	0.002	0.40 (0.33, 0.47)	<0.001	0.27 (0.22, 0.34)	<0.001
Household factor						
Living Arrangement						
Living with Family	1.00		1.00		1.00	
Living Alone	1.27 (1.04, 1.54)	0.019	1.91 (1.61, 2.28)	<0.001	2.22 (1.80, 2.74)	<0.001
Shared accommodation/Living with Flatmates	1.34 (1.02, 1.77)	0.039	1.77 (1.37, 2.29)	<0.001	1.68 (1.20, 2.35)	0.002
Household Size						
1-2 People	1.00		1.00		1.00	
3-4 People	0.55 (0.45, 0.78)	<0.001	0.72 (0.59, 0.87)	0.001	0.60 (0.48, 0.75)	<0.001
Have you been tested for COVID-19?						
No	1.00		1.00		1.00	
Yes, I Tested Negative	1.85 (1.38, 2.49)	<0.001	2.52 (1.94, 3.26)	<0.001	2.24 (1.67, 3.02)	<0.001
Yes. I Tested Positive	1.48 (0.87, 2.54)	0.152	2.08 (1.31, 3.28)	0.002	1.92 (1.17, 3.16)	0.010
Compliance with Public health measures						
Are You Currently in Self-Quarantine Since Past Seven Days?						
No	1.00		1.00		1.00	
Yes	0.77 (0.66, 0.91)	0.002	1.41 (1.21, 1.64)	<0.001	1.89 (1.53, 2.33)	<0.001

Avoid Public Transport							
Yes	1.00		1.00		1.00		
No	0.91 (0.62, 1.33)	0.626	2.57 (1.86, 3.56)	<0.001	2.52 (1.70, 3.73)		<0.001
Avoid Shaking Hands							
Yes	1.00		1.00		1.00		
No	0.69 (0.48, 1.00)	0.051	1.08 (0.78, 1.48)	0.651	1.76 (1.20, 2.56)		0.003
Wearing Face Mask when going out							
Yes	1.00		1.00		1.00		
No	0.92 (0.66, 1.28)	0.634	1.28 (0.97, 1.71)	0.081	1.39 (0.99, 1.96)		0.057
Avoid Large Gatherings							
Yes	1.00		1.00		1.00		
No	1.53 (1.10, 2.12)	0.011	0.62 (0.46, 0.82)	0.001	0.67 (0.48, 0.95)		0.023
Advocating People About the Health Risk Related to COVID-19							
Yes	1.00		1.00		1.00		
No	0.76 (0.61, 0.95)	0.017	0.50 (0.41, 0.62)	<0.001	0.56 (0.43, 0.73)		<0.001
Health Condition experienced in the Last Week							
Fever							
No	1.00		1.00		1.00		
Yes	1.25 (0.99, 1.57)	0.051	0.90 (0.74, 1.10)	0.290	1.37 (1.09, 1.72)		0.006
Chills							
No	1.00		1.00		1.00		
Yes	1.32 (1.01, 1.72)	0.041	2.05 (1.65, 2.56)	<0.001	2.19 (1.72, 2.78)		<0.001
Headache							
No	1.00		1.00		1.00		
Yes	1.15 (0.98, 1.36)	0.089	1.43 (1.25, 1.64)	<0.001	1.13 (0.96, 1.35)		0.144
Cough							

No	1.00		1.00		1.00	
Yes	2.55 (2.14, 3.03)	<0.001	2.45 (2.10, 2.86)	<0.001	1.68 (1.39, 2.02)	<0.001
Breathing Difficulty						
No	1.00		1.00		1.00	
Yes	3.29 (2.48, 4.35)	<0.001	3.15 (2.47, 4.03)	<0.001	4.43 (3.41, 5.76)	<0.001
Dizziness						
No	1.00		1.00		1.00	
Yes	1.92 (1.53, 2.40)	<0.001	2.42 (1.99, 2.93)	<0.001	1.86 (1.49, 2.32)	0.001
Sore Throat						
No	1.00		1.00		1.00	
Yes	1.84 (1.48, 2.27)	<0.001	2.26 (1.89, 2.70)	<0.001	2.15 (1.75, 2.65)	<0.001

Adjusted odd ratios (aOR); 95% confidence intervals (CI)

Table 3. Factors associated with mild, moderate, and severe anxiety during COVID-19 in Bangladesh

Variables	Mild		Moderate		Severe	
	aOR	P-value	aOR	P-value	aOR	P-value
<i>Demography</i>						
Division of Living						
Khulna	1.00		1.00		1.00	
Chittagong	1.38 (0.91, 2.09)	0.124	3.28 (2.23, 4.83)	<0.001	6.26 (4.40, 8.90)	<0.001
Mymensing	1.57 (0.84, 2.92)	0.159	2.30 (1.24, 4.26)	0.008	5.26 (3.04, 9.12)	<0.001
Rajshahi	0.65 (0.44, 0.95)	0.026	1.11 (0.77, 1.60)	0.582	2.26 (1.68, 3.04)	<0.001
Barisal	1.25 (0.92, 1.69)	0.149	1.07 (0.76, 1.50)	0.697	1.60 (1.21, 2.11)	0.001
Rangpur	1.19 (0.67, 2.11)	0.561	2.17 (1.26, 3.75)	0.005	5.86 (3.64, 9.42)	<0.001
Sylhet	3.32 (0.38, 28.84)	0.277	20.25 (2.71, 151.42)	<0.001	38.54 (5.30, 280.02)	<0.001

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Dhaka	1.13 (0.93, 1.38)	0.233	1.70 (1.38, 2.09)	<0.001	2.91 (2.44, 3.47)	<0.001
Gender						
Male	1.00		1.00		1.00	
Female	1.20 (1.01, 1.43)	0.039	1.53 (1.29, 1.82)	<0.001	1.91 (1.65, 2.21)	<0.001
Level of Education						
Postgraduate/Post Doctorate	1.00		1.00		1.00	
Graduate	1.10 (0.89, 1.36)	0.363	1.19 (0.97, 1.47)	<0.001	1.51 (1.26, 1.81)	<0.001
HSC or Equivalent	0.75 (0.59, 0.95)	0.016	1.06 (0.84, 1.34)	0.608	1.78 (1.46, 2.16)	<0.001
SSC or Equivalent	0.96 (0.69, 1.34)	0.811	0.88 (0.62, 1.25)	0.465	2.34 (1.78, 3.07)	<0.001
Under SSC	2.13 (1.38, 3.28)	0.001	1.45 (0.90, 2.33)	0.124	3.37 (2.30, 4.94)	<0.001
Age in category						
18-27 years	1.00		1.00		1.00	
28-37 years	0.46 (0.35, 0.60)	<0.001	0.60 (0.46, 0.78)	<0.001	0.45 (0.36, 0.56)	<0.001
38-47 years	0.39 (0.28, 0.54)	<0.001	0.30 (0.21, 0.42)	<0.001	0.27 (0.21, 0.36)	<0.001
48-57 years	0.19 (0.12, 0.28)	<0.001	0.30 (0.20, 0.44)	<0.001	0.31 (0.23, 0.42)	<0.001
58+ years	0.10 (0.056, 0.18)	<0.001	0.17 (0.10, 0.29)	<0.001	0.18 (0.12, 0.26)	<0.001
Marital Status						
Single	1.00		1.00		1.00	
Married	0.76 (0.58, 0.98)	0.037	0.80 (0.62, 1.03)	0.088	1.09 (0.88, 1.35)	0.433
Divorced/Widowed	4.98 (2.22, 11.13)	<0.001	6.38 (2.94, 13.89)	<0.001	6.00 (2.88, 12.50)	<0.001
Working Status						
Working (Full time)	1.00		1.00		1.00	
Working (Part time)	0.90 (0.66, 1.23)	0.505	0.90 (0.67, 1.23)	0.520	0.79 (0.61, 1.01)	0.058
No working/Student	0.78 (0.61, 1.01)	0.060	0.96 (0.74, 1.24)	0.761	0.51 (0.41, 0.63)	<0.001
Household factor						
Living Arrangement						

Living with Family	1.00		1.00		1.00	
Living Alone	0.83 (0.62, 1.12)	0.227	1.13 (0.86, 1.45)	0.366	1.70 (1.35, 2.16)	<0.001
Shared accommodation/Living with Flatmates	1.87 (1.19, 2.92)	0.006	2.10 (1.34, 3.29)	0.001	2.42 (1.60, 3.64)	<0.001
Household Size						
1-2 People	1.00		1.00		1.00	
3-4 People	0.61 (0.42, 0.88)	0.008	0.63 (0.45, 0.90)	0.011	0.37 (0.27, 0.50)	<0.001
Have you been tested for COVID-19?						
No	1.00		1.00		1.00	
Yes, I Tested Negative	1.02 (0.65, 1.61)	0.932	1.38 (0.92, 2.07)	0.120	1.85 (1.31, 2.63)	0.001
Yes, I Tested Positive	1.45 (0.56, 3.74)	0.439	2.44 (1.05, 5.68)	0.038	2.31 (1.05, 5.09)	0.038
Compliance with Public health measures						
Are You Currently in Self-Quarantine Since Past Seven Days?						
No	1.00		1.00		1.00	
Yes	2.27 (1.81, 2.86)	<0.001	1.53 (1.23, 1.89)	<0.001	1.44 (1.20, 1.73)	<0.001
Avoid Public Transport						
Yes	1.00		1.00		1.00	
No	0.40 (0.21, 0.74)	0.004	0.74 (0.42, 1.32)	0.306	1.49 (0.88, 2.52)	0.135
Avoid Shaking Hands						
Yes	1.00		1.00		1.00	
No	0.52 (0.28, 0.94)	0.030	0.48 (0.28, 0.85)	0.011	0.81 (0.49, 1.34)	0.411
Wearing Face Mask when going out						
Yes	1.00		1.00		1.00	
No	2.34 (1.40, 3.94)	0.001	1.15 (0.71, 1.87)	0.574	1.82 (1.17, 2.81)	0.007
Avoid Large Gatherings						
Yes	1.00		1.00		1.00	
No	1.20 (0.70, 2.05)	0.500	0.94 (0.57, 1.56)	0.819	0.48 (0.30, 0.76)	0.002

Advocating People About the Health Risk Related to COVID-19						
Yes	1.00		1.00		1.00	
No	0.62 (0.43, 0.89)	0.009	0.58 (0.42, 0.83)	0.003	0.36 (0.26, 0.50)	<0.001
Health Condition experienced in the Last Week						
Fever						
No	1.00		1.00		1.00	
Yes	2.07 (1.35, 3.17)	0.001	1.92 (1.27, 2.89)	0.002	2.80 (1.92, 4.08)	<0.001
Chills						
No	1.00		1.00		1.00	
Yes	1.32 (0.78, 2.25)	0.299	2.75 (1.74, 4.35)	<0.001	4.63 (3.05, 7.02)	<0.001
Headache						
No	1.00		1.00		1.00	
Yes	2.54 (1.98, 3.27)	<0.001	2.43 (1.90, 3.10)	<0.001	2.17 (1.74, 2.69)	0.144
Cough						
No	1.00		1.00		1.00	
Yes	2.17 (1.62, 2.90)	<0.001	2.51 (1.90, 3.31)	<0.001	2.81 (2.18, 3.63)	<0.001
Breathing Difficulty						
No	1.00		1.00		1.00	
Yes	0.63 (0.41, 0.97)	0.038	1.03 (0.71, 1.50)	0.878	1.67 (1.21, 3.30)	0.002
Dizziness						
No	1.00		1.00		1.00	
Yes	0.88 (0.63, 1.23)	0.458	1.21 (0.89, 1.65)	0.215	1.21 (0.92, 1.59)	0.170
Sore Throat						
No	1.00		1.00		1.00	
Yes	0.86 (0.60, 1.22)	0.390	2.13 (1.57, 2.91)	<0.001	1.88 (1.42, 2.49)	<0.001

Adjusted odd ratios (aOR); 95% confidence intervals (CI)

Table 4: Factors associated with mild, moderate, and severe Stress during COVID-19 in Bangladesh

Variables	Mild		Moderate		Severe	
	aOR	Pvalue	aOR	Pvalue	aOR	Pvalue
Demography						
Division of Living						
Khulna	1.00		1.00		1.00	
Chittagong	2.10 (1.61, 2.74)	<0.001	3.70 (2.92, 4.68)	<0.001	2.87 (2.17, 3.78)	<0.001
Mymensing	2.18 (1.44, 3.29)	<0.001	2.10 (1.44, 3.08)	<0.001	1.85 (1.18, 2.89)	0.007
Rajshahi	3.16 (2.36, 4.23)	<0.001	2.72 (2.05, 3.60)	<0.001	2.98 (2.18, 4.06)	<0.001
Barisal	1.25 (0.91, 1.71)	0.168	1.82 (1.38, 2.39)	<0.001	1.36 (0.97, 1.89)	0.074
Rangpur	2.51 (1.76, 3.58)	<0.001	3.73 (2.723, 5.11)	<0.001	3.21 (2.23, 4.61)	<0.001
Sylhet	2.86 (1.81, 4.52)	<0.001	2.71 (1.72, 4.37)	<0.001	3.77 (2.32, 6.13)	<0.001
Dhaka	1.82 (1.49, 2.23)	<0.001	2.42 (2.00, 2.91)	<0.001	3.07 (2.48, 3.80)	<0.001
Gender						
Male	1.00		1.00		1.00	
Female	1.62 (1.42, 1.87)	<0.001	1.54 (1.37, 1.74)	<0.001	1.82 (1.58, 2.09)	<0.001
Level of Education						
Post Graduate/Post Doctorate	1.00		1.00		1.00	
Graduate	1.85 (1.54, 2.22)	<0.001	2.11 (1.80, 2.47)	<0.001	1.89 (1.58, 2.27)	<0.001
HSC or Equivalent	1.69 (1.38, 2.06)	<0.001	1.92 (1.62, 2.28)	<0.001	1.98 (1.64, 2.39)	<0.001
SSC or Equivalent	2.61 (2.02, 3.37)	<0.001	2.56 (2.03, 3.22)	<0.001	3.09 (2.41, 3.94)	<0.001
Under SSC	1.72 (1.24, 2.40)	0.001	1.61 (1.20, 2.17)	0.002	2.43 (1.79, 3.30)	<0.001
Age in category						
18-27 years	1.00		1.00		1.00	
28-37 years	1.72 (1.42, 2.09)	<0.001	1.49 (1.27, 1.76)	<0.001	1.61 (1.35, 1.92)	<0.001
38-47 years	1.96 (1.54, 2.50)	<0.001	1.49 (1.21, 1.84)	<0.001	1.42 (1.13, 1.80)	0.003

48-57 years	1.16 (0.85, 1.60)	0.345	1.15 (0.89, 1.49)	0.275	1.95 (1.51, 2.51)	<0.001
58+ years	5.31 (3.63, 7.76)	<0.001	2.25 (1.53, 3.33)	<0.001	2.83 (1.87, 4.28)	<0.001
Marital Status						
Single	1.00		1.00		1.00	
Married	1.72 (1.41, 2.11)	<0.001	1.43 (1.20, 1.71)	<0.001	2.05 (1.67, 2.51)	<0.001
Divorced/Widowed	1.97 (1.38, 2.82)	<0.001	1.31 (0.94, 1.83)	0.106	1.54 (1.06, 2.24)	0.024
Working Status						
Working (Full time)	1.00		1.00		1.00	
Working (Part time)	1.11 (0.90, 1.38)	0.329	0.91 (0.76, 1.10)	0.324	0.68 (0.56, 0.84)	<0.001
No working/Student	0.96 (0.79, 1.17)	0.714	0.36 (0.31, 0.43)	<0.001	0.27 (0.22, 0.34)	<0.001
Household factor						
Living Arrangement						
Living with Family	1.00		1.00		1.00	
Living Alone	1.60 (1.33, 1.93)	<0.001	1.67 (1.41, 1.98)	<0.001	1.71 (1.40, 2.08)	<0.001
Shared accommodation/Living with Flatmates	1.02 (0.75, 1.40)	0.883	1.59 (1.23, 2.06)	<0.001	2.26 (1.69, 3.02)	<0.001
Household Size						
1-2 People	1.00		1.00		1.00	
3-4 People	0.76 (0.62, 0.93)	0.007	0.74 (0.61, 0.88)	0.001	0.58 (0.47, 0.70)	<0.001
Have you been tested for COVID-19?						
No	1.00		1.00		1.00	
Yes, I Tested Negative	1.57 (1.23, 2.01)	<0.001	1.77 (1.42, 2.21)	<0.001	1.22 (0.94, 1.57)	0.136
Yes. I Tested Positive	1.38 (0.95, 2.01)	0.095	1.42 (1.01, 1.99)	0.046	1.10 (0.75, 1.60)	0.636
Compliance with Public health measures						
Have You Enforced Protective Measures Inside Your Home to Protect Yourself and Your Family from COVID 19?						
Yes	1.00		1.00		1.00	

<i>No</i>	1.08 (0.85, 1.38)	0.540	1.18 (0.94, 1.47)	0.148	1.28 (1.00, 1.65)	0.049
Are You Currently in Self-Quarantine Since Past Seven Days?						
No	<i>1.00</i>		<i>1.00</i>		<i>1.00</i>	
Yes	1.28 (1.07, 1.53)	0.007	2.09 (1.75, 2.49)	<0.001	1.92 (1.55, 2.38)	<0.001
Avoid Public Transport						
Yes	<i>1.00</i>		<i>1.00</i>		<i>1.00</i>	
No	1.08 (0.80, 1.47)	0.601	1.60 (1.20, 2.13)	0.001	4.02 (2.74, 5.91)	<0.001
Avoid Shaking Hands						
Yes	<i>1.00</i>		<i>1.00</i>		<i>1.00</i>	
No	0.94 (0.70, 1.27)	0.700	0.68 (0.52, 0.90)	0.007	1.63 (1.15, 2.30)	0.006
Wearing Face Mask when going out						
Yes	<i>1.00</i>		<i>1.00</i>		<i>1.00</i>	
No	1.25 (0.95, 1.64)	0.107	1.15 (0.89, 1.48)	0.291	1.64 (1.19, 2.25)	0.002
Avoid Large Gatherings						
Yes	<i>1.00</i>		<i>1.00</i>		<i>1.00</i>	
No	1.12 (0.86, 1.47)	0.398	1.72 (1.35, 2.19)	<0.001	1.18 (0.88, 1.58)	0.257
Advocating People About the Health Risk Related to COVID-19						
Yes	<i>1.00</i>		<i>1.00</i>		<i>1.00</i>	
No	0.55 (0.45, 0.68)	<0.001	0.99 (0.81, 1.21)	0.916	0.66 (0.51, 0.84)	0.001
Health Condition experienced in previous before the survey						
Fever						
No	<i>1.00</i>		<i>1.00</i>		<i>1.00</i>	
Yes	0.96 (0.78, 1.17)	0.663	1.11 (0.93, 1.32)	0.252	1.07 (0.88, 1.31)	0.509
Chills						
No	<i>1.00</i>		<i>1.00</i>		<i>1.00</i>	
Yes	1.99 (1.62, 2.44)	<0.001	2.07 (1.72, 2.49)	<0.001	2.01 (1.65, 2.46)	<0.001

Headache							
No	1.00			1.00		1.00	
Yes	1.26 (1.08, 1.48)	0.004	1.63 (1.42, 1.86)	<0.001	1.50 (1.29, 1.75)	<0.001	
Cough							
No	1.00		1.00		1.00		
Yes	1.27 (1.08, 1.50)	0.004	1.79 (1.56, 2.07)	<0.001	1.32 (1.12, 1.55)	0.001	
Breathing Difficulty							
No	1.00		1.00		1.00		
Yes	2.14 (1.74, 2.62)	<0.001	1.73 (1.44, 2.08)	<0.001	2.18 (1.79, 2.66)	<0.001	
Dizziness							
No	1.00		1.00		1.00		
Yes	1.45 (1.20, 1.76)	<0.001	1.91 (1.63, 2.25)	<0.001	1.50 (1.25, 1.80)	<0.001	
Sore Throat							
No	1.00		1.00		1.00		
Yes	1.33 (1.11, 1.60)	0.002	1.38 (1.18, 1.61)	<0.001	1.39 (1.16, 1.66)	<0.001	

Adjusted odd ratios (aOR); 95% confidence intervals (CI)

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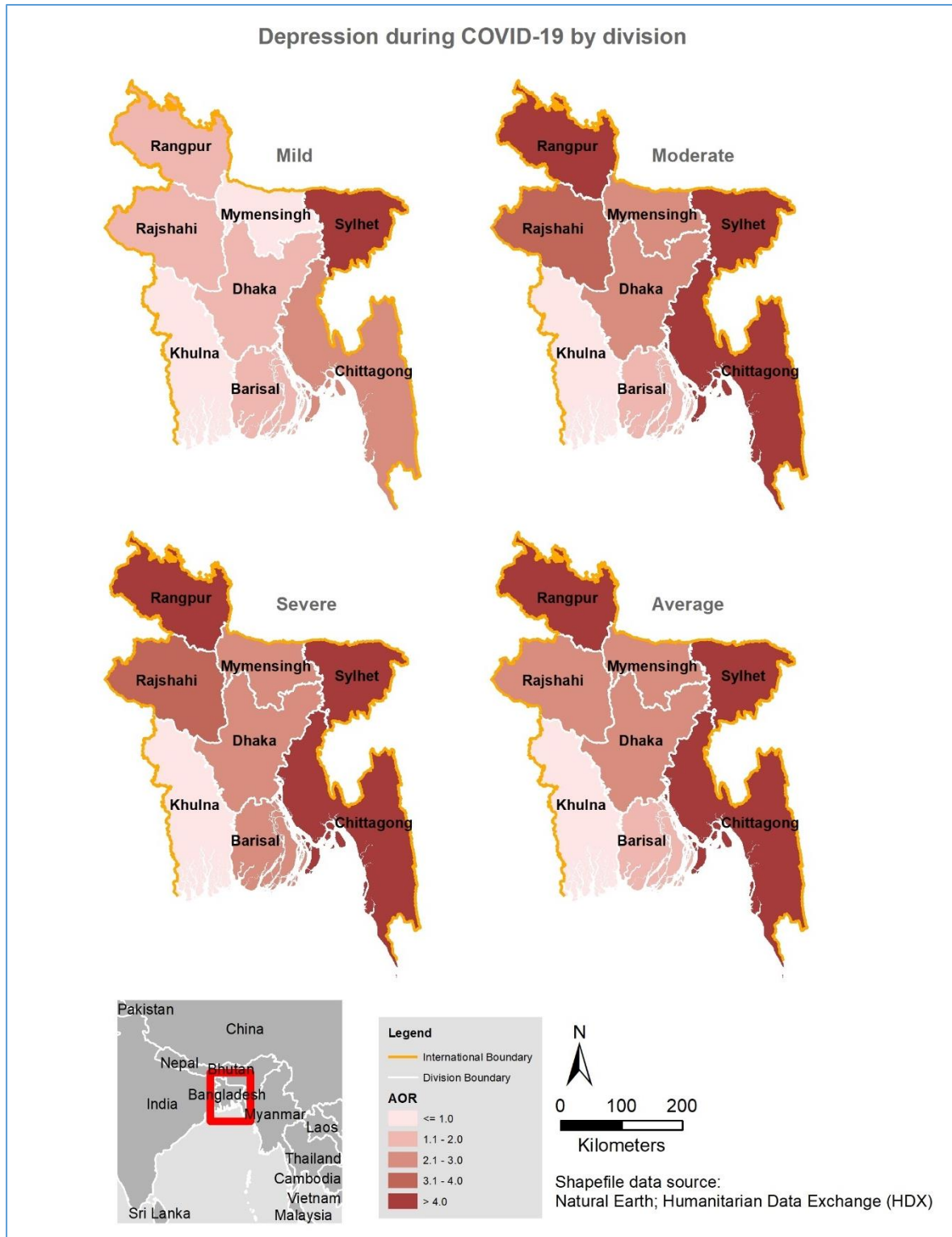


Figure 2 Spatial distribution of depression during COVID-19 in Bangladesh by division

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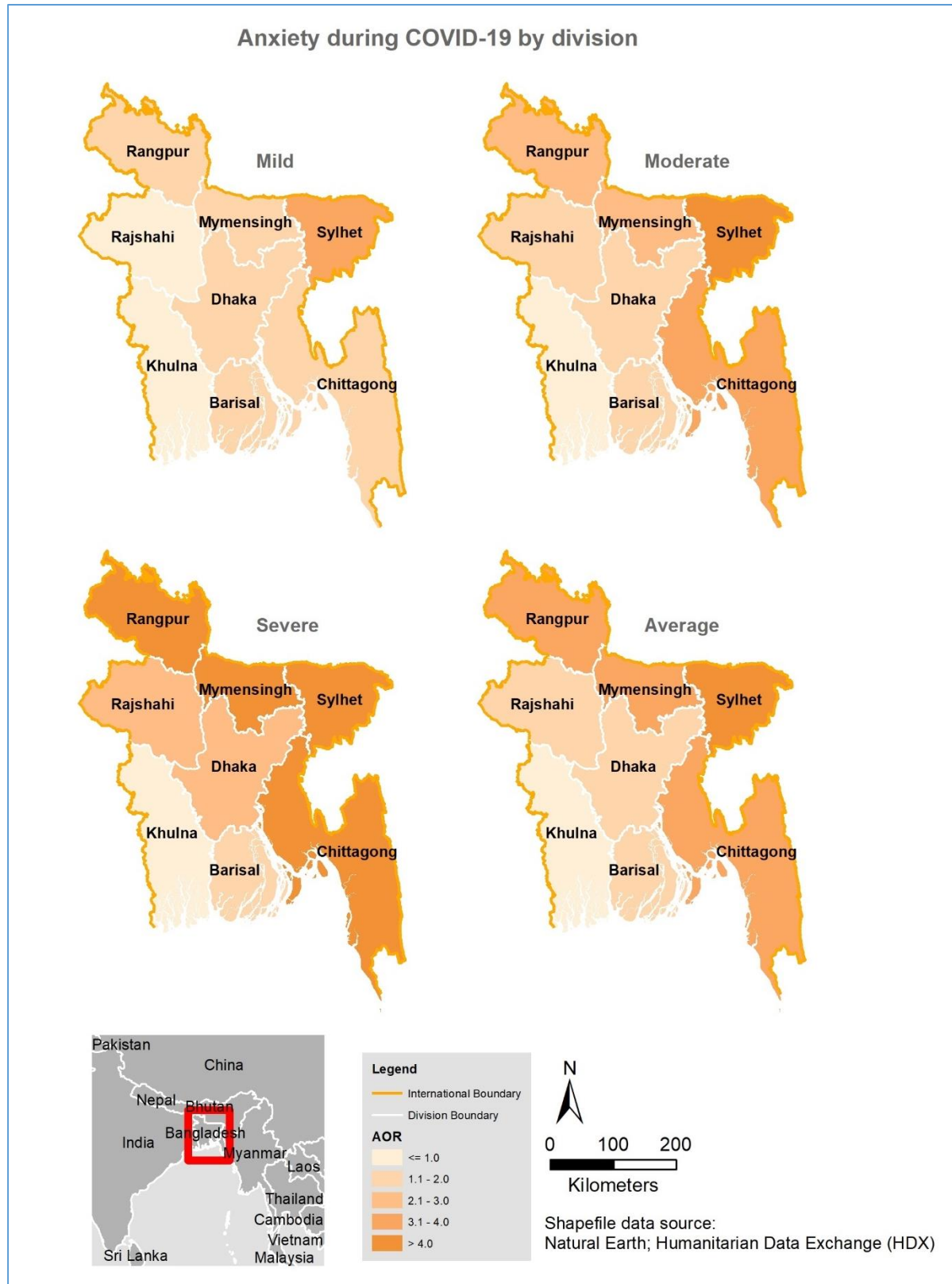


Figure 3 Spatial distribution of anxiety during COVID-19 in Bangladesh by division

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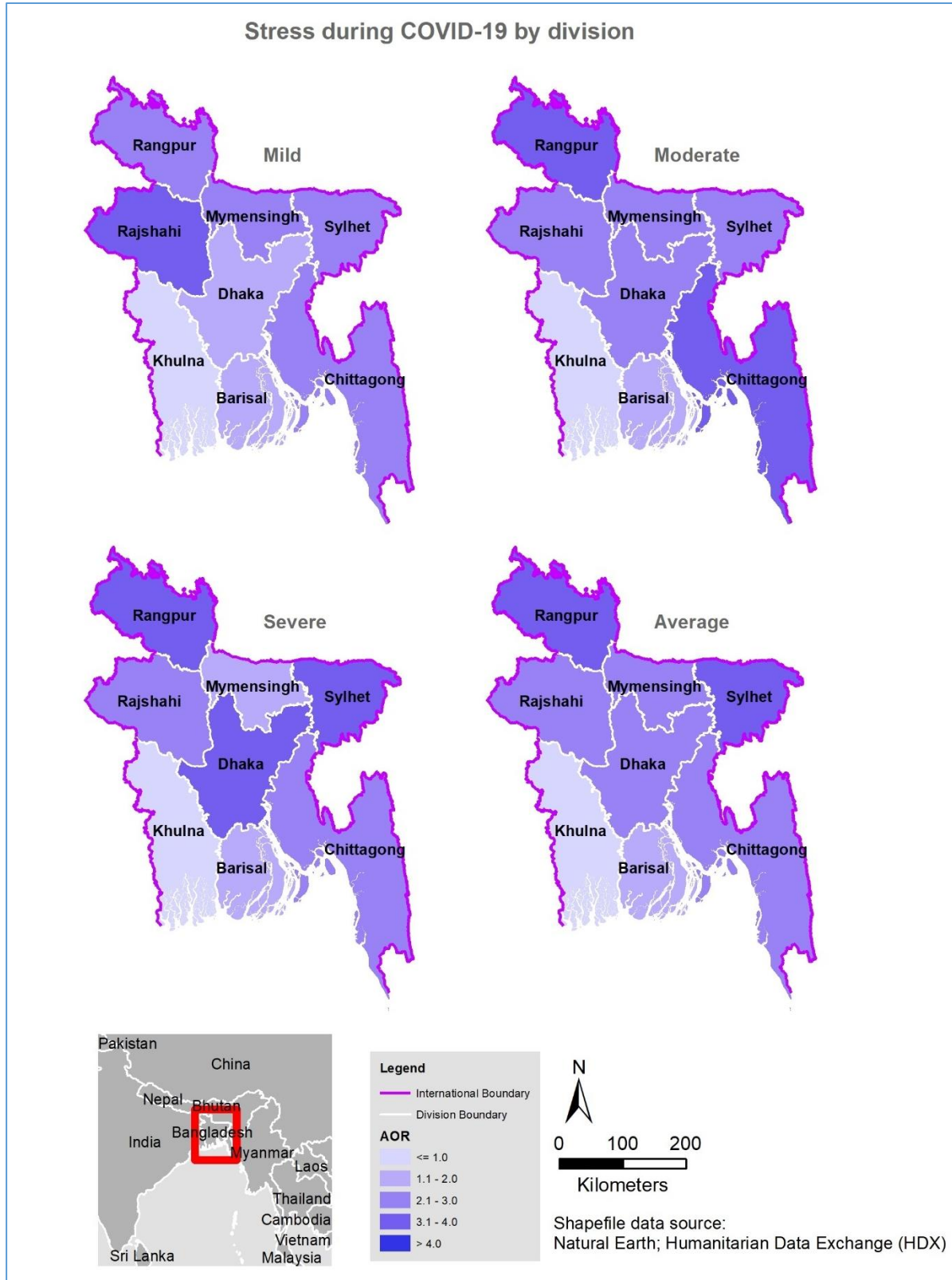


Figure 4 Spatial distribution of stress during COVID-19 in Bangladesh by division

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Discussion

This cross-sectional survey assessed the prevalence and associated factors of mental health symptoms related to the COVID-19 pandemic in Bangladesh using an online survey. The study found a high prevalence of mental health symptoms during the pandemic, particularly feeling anxious and depressed while about half of the respondents experienced stress. Respondents who reported these mental health symptoms during the pandemic were more likely to be females, married, have lower education, faced by various factors related to accommodation and living arrangements, and those who experienced COVID-19 related health symptoms. In addition, respondents who were tested for COVID-19, those who traveled via public transport, and people who practiced self-quarantine self-reported a higher prevalence of depression, anxiety, and stress in this study.

The prevalence of mental health symptoms found in this study was higher than previous studies conducted elsewhere during the COVID-19 pandemic including those from the United Kingdom [20] and Iran [21] where two in five respondents reported some form of depression. Similarly, studies in Asia have shown that people experienced substantial psychological problems during the pandemic [22, 23]. The authors attributed factors such as the recommended self-quarantine and isolation measures, employment uncertainty, and the rapid spread of COVID-19 related misinformation [24]. A similar high prevalence of depression and anxiety was reported among those with chronic medical problems in Ethiopia during the COVID-19 pandemic [25], and in Australia, a high prevalence of psychological distress was reported during the highly infectious equine influenza in 2007 [26]. The higher prevalence of mental health symptoms found in this study compared to previous studies may be due to the difference in the study population between studies as well as the socio-cultural differences and the methods used in assessing the mental health symptoms.

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Previous epidemiological studies found that women had a higher risk of depression [27] than men and were more vulnerable to stress and post-traumatic stress disorder [28]. These findings were corroborated in recent studies where the prevalence of anxiety, depression, and stress during the COVID-19 pandemic was significantly higher among women than men [29, 30, 31]. Compared with the previous studies the present study used a larger sample size to confirm that women in Bangladesh experienced significantly higher mental health symptoms than men and this could be due to the higher representation of women in various industries like retail, manufacturing, healthcare, and service industries, affected by the current pandemic. These findings are also in agreement with the suggestion that, with the uneven effects in the employment sector, women were more likely to experience psychological and mental health problems when faced with depression, anxiety, and stress [32].

Older people had a higher risk of COVID-19 infection and mortality [33]., however, the results of existing studies found higher levels of anxiety, depression, and stress among the younger population particularly those aged 21-40years [11, 34]. In the present study, age had a significant effect on the participants' report of mental health symptoms of depression, anxiety, and stress. This may be attributed to the fact that people in this age group are more concerned over the future consequences and economic challenges caused by the pandemic, as they are the key actors working force in society and are, therefore, mostly affected by fear of joblessness and business closures [35]. Some researchers have argued that greater anxiety among young people may be related to their greater access to information through social media, which can also cause severe stress [22, 36]. It has also been suggested that people become stressed and feel anxious when the information from public health experts are unreliable or was delivered incorrectly and as such could create confusion regarding the practice of self-quarantine or other public health measures put in place to control the spread of a pandemic [37].

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This study found a significant association between level of education and the mental health symptoms during the pandemic which was consistent with a study from China that was conducted at the initial stage of the COVID-19 outbreak [38]. In that study, those with no formal education were more likely to report depression during the epidemic. Other studies have also reported significant associations between the lower level of education, and anxiety and depression levels [20, 25]. In contrast to these studies, we found that during the COVID-19 pandemic, respondents in Bangladesh who had a higher level of education reported higher levels of anxiety, depression, and stress [31, 39]. It was because 59.75% of respondents of our study had the university level of education in comparison to respondents of the previous studies. Even some recent studies also revealed similar findings as our study did [40]

Similar to the findings of this study, some authors in China [38, 41] reported higher levels of anxiety among participants who had at least one family member, relative, or friend with COVID-19. Also, those who were separated or widowed/divorced were more likely to experience depression during the pandemic than other respondents which was consistent with a previous study in the USA [42] during the pandemic. Before the pandemic, a study in Pakistan revealed that among the older population, those who lived in a nuclear family system were more likely to report depression compared to those who lived in a joint family system [43].

During the early outbreak of COVID-19 in Bangladesh, people who had potentially come into contact with the infection were asked to isolate themselves at home or in a dedicated quarantine facility [1]. The findings of negative psychological effects of these measures in this study have consisted with other studies which found that lockdown and self-quarantine during the pandemic like SARS, MARS, and COVID-19 had higher levels of post-traumatic stress symptoms, confusion, and anger [29, 36]. In our study, more than two-thirds of those who practiced self-quarantine reported mental health issues. Due to the self-quarantine

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measures and fear related to the spread of COVID-19, other persistent mental health disorders like anxiety, emotional disruption, and exhaustion, depression, anger, irritability, insomnia, and stress can be developed among the population [44]. Moreover, the longer the quarantine or self-isolation, the more detrimental these outcomes can become [45].

This study had some limitations. First, it was limited in scope. Many of the participants (50%) were from the capital city of Dhaka division, limiting the generalization of our findings to rural regions. Second, the study was carried out during the COVID-19 lockdown period and lacked longitudinal follow-up. The analysis of the periodic state of individuals may not reflect the psychological state, which changes with time and with the alterations in one's surrounding environment. Because of the increasingly arduous situation and the fear of the second wave, the mental health symptoms of residents could become more severe. Thus, the long-term psychological implications of this population are worth further investigation. Third, due to ethical requirements on anonymity and confidentiality, we were not allowed to collect contact details and personal information from the respondents. As a result, we could not conduct a prospective study that would provide a concrete finding to support the need for a focused public health initiative. Fourth, the study was not able to distinguish between pre-existing mental health symptoms and new symptoms. Fifth, there was an oversampling of a particular network of peers (e.g., students), which may lead to selection bias. However, a large percentage of respondents who were within 40 years old consisted of students. They were exposed to higher mental health symptoms due to the temporary shutdown of educational institutions, disbandment of social gatherings, and the pressure from having to attend classes online [46]. Sixth, the self-reported levels of psychological impact, anxiety, depression, and stress may not always align with assessment by mental health professionals. Despite these limitations, this study has several strengths. Further, then providing insight on the actual existing pandemic situation, this study sheds added light on the impact of COVID-

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19 on the mental health conditions of the educated people in Bangladesh who are the potential future workforce as well.

Conclusions

In this survey study conducted in Bangladesh, respondents reported high rates of symptoms of depression, anxiety, and distress while non-compliance with public health measures increased the risk of mental health outcomes. Protecting the Bangladesh population is an important component of public health measures for addressing the COVID-19 epidemic. Special interventions to promote mental wellbeing in Bangladesh communities exposed to COVID-19 need to be immediately implemented, with women, married people, the less educated people, and those that were tested for COVID-19 requiring particular attention. To further close the gap in the relationship and improve the mental health wellbeing of the Bangladeshi people, alternative ways of communication such as the use of internet video calls [47] should be promoted during similar situations.

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Supplementary Table 1: Sample of survey items and their test of reliability

Did not apply to me at all (0)	Applied to me to some degree or some of the time (1)	Applied to me to a considerable degree or most of the time (2)	Applied to me very much or most of the time (3)
Depression subscale			Cronbach's Alpha
3. I couldn't seem to experience any positive feeling at all			0.7618
5. I found it difficult to work up the initiative to do things			0.7661
10. I felt that I had nothing to look forward to			0.7594
13. I felt downhearted and blue			0.7690
16. I was unable to become enthusiastic about anything			0.7650
17. I felt I wasn't worth much as a person			0.7330
21. I felt that life was meaningless			0.7633
Anxiety subscale			Cronbach's Alpha
2. I was aware of dryness of my mouth			0.6644
4. I experienced breathing difficulty (e.g. excessively rapid breathing, breathlessness in the absence of physical exertion)			0.6768
7. I experienced trembling (e.g. in the hands)			0.7720
9. I was worried about situations in which I might panic and make a fool of myself			0.6668
15. I felt I was close to panic			0.6648
19. I was aware of the action of my heart in the absence of physical exertion (e.g. sense of heart rate increase, heart missing a beat)			0.6513
20. I felt scared without any good reason			0.6511
Stress subscale			Cronbach's Alpha
1. I found it hard to wind down			0.8100
6. I tended to over-react to situations			0.7894
8. I felt that I was using a lot of nervous energy			0.7776
11. I found myself getting agitated			0.7877
12. I found it difficult to relax			0.7775
14. I was intolerant of anything that kept me from getting on with what I was doing			0.7822
18. I felt that I was rather touchy			0.7823

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Supplementary Table 2

A survey questionnaire on Mental health and psychological impact of the coronavirus disease 2019 (COVID-19) outbreak: A cross-sectional study on Bangladeshi People

Socio-Demographic Profile of the Respondent:

Name		
What is your gender	Male	1
	Female	2
	Other	88
Level of study (year)	Under SSC	1
	SSC or Equivalent	2
	HSC or Equivalent	3
	Graduate	4
	Post Graduate	5
	Doctorate	6
	Post Doctorate	7
	Other	88
Your Mother's Schooling	Under SSC	1
	SSC or Equivalent	2
	HSC or Equivalent	3
	Graduate	4
	Post Graduate	5
	Doctorate	6
	Post Doctorate	7
	Other	88
Your Father's Schooling	Under SSC	1
	SSC or Equivalent	2
	HSC or Equivalent	3
	Graduate	4
	Post Graduate	5
	Doctorate	6
	Post Doctorate	7
	Other	88
What is your age?		##
Marital Status	Single	1
	Married	2
	Divorced	3

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	Widowed	4
What is your professional status?	Student	1
	Working (Full Time)	2
	Working (Part-Time)	3
	None	4
Living Arrangement	Living Alone	1
	Living with Family	2
	Living with flatmates	3
	Others	88
Which district are you currently living in		##
Which district you originally belong to		##
Have you been tested for COVID-19?	Yes, I tested positive	1
	Yes, I tested negative	2
	No	3
Have you enforced protective measures inside your home to protect yourself and your family from COVID 19?	Yes	1
	No	2
Are you currently in Self-Quarantine since past seven days?	Yes	1
	No	2
What sort of protective measures have you taken?	Avoid public transportation	1
	Avoid shaking hands	2
	Wearing face mask	3
	Avoid large gatherings	4
	Advocating people about the health risk related to COVID-19	5
	All of the above	6
	None of the above	7
What is your household size?	One person	1
	Two people	2
	Three to five people	3
	Six people or more	4

Physical Health Status (Please respond on your physical health since the past two weeks)

	Yes (1)	No (2)
Persistent fever >98 ° 'F' for at least one day		
Chills		
Headache		
Cough		

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Breathing Difficulty		
Dizziness		
Sore Throat		
Persistent fever and cough or difficulty breathing		

Mental Health Impact of COVID 19:

Please read each statement and circle a number 1, 2, 3 or 4 which shows how much the statement has applied in the past week to you. There are no correct answers or incorrect answers.

	Did not apply to me at all (1)	Applied to me to some degree or some of the time (2)	Applied to me to a considerable degree or most of the time (3)	Applied to me very much or most of the time (4)
I found it hard to wind down				
I was aware of dryness of my mouth				
I couldn't seem to experience any positive feeling at all				
I experienced breathing difficulty (e.g. excessively rapid breathing, breathlessness in the absence of physical exertion)				
I found it difficult to work up the initiative to do things				
I tended to over-react to situations				
I experienced trembling (e.g. in the hands)				
I felt that I was using a lot of nervous energy				
I was worried about situations in which I might panic and make a fool of myself				
I felt that I had nothing to look forward to				
I found myself getting agitated				
I found it difficult to relax				
I felt down-hearted and blue				
I was intolerant of anything that kept me from getting on with what I was doing				
I felt I was close to panic				
I was unable to become enthusiastic about anything				
I felt I wasn't worth much as a person				

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I felt that I was rather touchy				
I was aware of the action of my heart in the absence of physical exertion (e.g. sense of heart rate increase, heart missing a beat)				
I felt scared without any good reason				
I felt that life was meaningless				

Thank you for your participation

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