BMJ Open

Impact of COVID-19 pandemic on mental health among general Bangladeshi population: a cross-sectional study

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ABSTRACT

Objectives Mental health problems significantly increased worldwide during the coronavirus (COVID-19) pandemic. At the early stage of the outbreak, the government of Bangladesh imposed lockdown and quarantine approaches to prevent the spread of the virus, which impacted people's daily life and health. The COVID-19 pandemic has also affected people's economic status, healthcare facilities and other lifestyle factors in Bangladesh. We aimed to assess the impact of the COVID-19 pandemic on mental health among the Bangladeshi population.

Methods We conducted an online cross-sectional survey among 672 Bangladeshi people aged between 15 and 65 years all over the country from 15 April to 10 May 2020. After obtaining electronic consent, we conducted a survey assessing people's sociodemographic profiles and psychometric measures. We used The University of California, Los Angeles (UCLA) Loneliness Scale-8, Patient Health Questionnaire-9, Generalized Anxiety Disorder 7-Item Scale and Pittsburgh Sleep Quality Index to assess loneliness, depression, anxiety and sleep disturbance, respectively.

Results The prevalence of loneliness, depression, anxiety and sleep disturbance was estimated at 71% (mild: 32%, moderate: 29%, severe: 10%), 38% (mild: 24%, moderate: 11%, severe: 3%), 64% (mild: 30%, moderate: 17%, severe: 17%) and 73% (mild: 50%, moderate: 18%, severe: 5%), respectively. In Bangladesh, the key factors associated with poor mental health during COVID-19 were female sex, unemployment, being a student, obesity and living without a family. The present study also identified statistically significant interrelationships among the measured mental health issues.

Conclusions A large portion of respondents reported mental health problems during the COVID-19 pandemic in Bangladesh. The present study suggests longitudinal assessments of mental health among Bangladeshi people to determine the gravity of this issue during and after the pandemic. Appropriate supportive programmes and interventional approaches would address mental health problems in Bangladesh during the COVID-19 pandemic.

Strengths and limitations of this study

► The study assessed the four major mental health issues among the general Bangladeshi population during the COVID-19 pandemic.
► The study ensured rapid data collection during public health emergencies and suitability to developing context-specific mental health programmes.
► Online self-reporting surveys might have multiple biases and are not representative of those without internet facilities.
► This cross-sectional study was not able to measure the impact of these mental illnesses over time.

uncontrolled spread worldwide.[1] As of 29 December 2020, over 79.2 million COVID-19 cases and over 1.7 million deaths have been reported worldwide since the start of the pandemic.[2] In December 2020, we observed the highest weekly average of 4.3 million confirmed new cases than any previous time.[3] This devastating condition has not yet improved due to lack of proper treatment and medications, although more than a hundred vaccine candidates are in different stages of development.[4] Most countries imposed lockdown to limit the spread of the virus, which eventually affected people's socioeconomic conditions and mental health regardless of age, sex, profession and so on.[5] COVID-19 is usually transmitted through breathing droplets or contact with infected individuals. This fear of coronavirus infection impacted the lifestyle, psychological health and relationship status of people.[6] About 52.1% of people felt worried during the COVID-19 pandemic, and among them 57.8%–77.9% needed mental support from their family and friends.[7]

Major epidemic and pandemic outbursts have several negative impacts on individual and collective mental health in the society.[5] The previous Middle East respiratory

INTRODUCTION

The novel coronavirus strain SARS-CoV-2 which causes COVID-19 originated from Wuhan, China. COVID-19 was declared a pandemic on 11 March 2020 due to the

syndrome (MERS) and severe acute respiratory syndrome (SARS) severely impacted the local people's mental health.[8] [9] Healthcare providers experienced long-term occupational and psychological effects during the SARS outbreak.[10] In the USA, a study was conducted among Capitol Hill staff workers to determine how they successfully responded to disaster-related mental health after the anthrax attacks in 2001. The study reported prevalence rates of post-traumatic stress disorder and postanthrax psychiatric disorder among respondents of 55% and 27%, respectively.[11]

The mental health of many individuals is potentially affected by COVID-19 in many ways. Family members and friends of patients with COVID-19, their close contacts, isolated or suspected population, healthcare providers, and the general population experience extra mental health burden during the COVID-19 pandemic.[12] Therefore, understanding the impact of the COVID-19 pandemic on an individual's mental health might reduce many current and future mental health issues.

Bangladesh is a densely populated country with a population size of about 164 million people. The population density is five times higher than any other mega country.[13] Several factors that affect mental health are population density, housing, economic status, employment, life experience, disease burden and so on.[14] The financial condition of the general population was affected after the implementation of lockdown from 26 March 2020. The Institute of Epidemiology, Disease Control and Research of Bangladesh reported the first COVID-19 cases on 8 March 2020.[15] Between 8 March and 27 December 2020, there were 509 148 confirmed cases with 7452 fatalities reported in Bangladesh. It ranks 27th among countries affected by COVID-19, contributing 0.64% COVID-19-related disease burden to the world.[16] At the initial stage of the pandemic, many hospitals were not ready to treat COVID-19 and testing facilities were limited. This situation impacted the mental health of many Bangladeshi people. A few people had suicidal ideations after failing to cope with this extra mental burden.[17–19] The infection has reached every corner of the country. The number of confirmed cases significantly increased, and as a result mental health-related disorders may increase, particularly among susceptible people. Therefore, more attention needs to be paid to mental health burden during and after the COVID-19 pandemic.[20–22] It is equally applicable to other low-income and middle-income countries, where resources are limited to tackle any pandemic situation and its associated mental health issues.[23–25] The present study aimed to assess the prevalence rates of loneliness, depression, anxiety and sleep disturbance among the general Bangladeshi population during the COVID-19 pandemic. We also expected to identify factors associated with mental health problems during the COVID-19 pandemic.

METHODS
Participants and procedures
We carried out a nationwide cross-sectional online survey between 15 April and 10 May 2020 using the Google survey tool (Google Forms). Here we used the purposive sampling technique to collect primary data from the participants. We assumed the CI, margin of error and expected prevalence at 95%, 5% and 30%, respectively. According to our assumption, the required sample size was 323. We initially thought the response rate might be 20% and invited 1615 people to participate in the survey. However, the actual response rate was 46%, with 736 responses received. After screening, we excluded 64 responses due to partial or incomplete information. Finally, we included 672 respondents (381 men, 291 women) aged between 15 and 65 years in the analysis. Before participation in the survey, the participants reviewed and acknowledged a brief description of the survey, eligibility requirements, procedures and electronic consent form. We obtained electronic consent from all participants. All the respondents of this survey were of Bangladeshi ethnicity and living in Bangladesh at that time. People aged between 15 and 65 years who understood the questions were included in this survey. Exclusion criteria included history of other psychiatric disorders such as delusions, mental retardation, bipolar disorder, schizophrenia, personality disorder, mood-congruent or mood-incongruent psychotic features, comorbid psychiatric illness, neurological disease, or clinical evidence of dementia. Additional exclusion criteria were acute medical conditions, chronic diseases and history of addiction. We did not pay for participation.

Estimations
We used two sets of questionnaires for this survey. The first one was a structured questionnaire designed by the researchers which contained the informed consent and sociodemographic information. The second set was a self-reported structured questionnaire from different psychometric assessment scales. We prepared both sets of questionnaire in English and then translated them to Bangla. First, all questionnaires were translated to Bangla by a medical graduate and a general person who were native speakers of Bangla and were fluent in English. An independent researcher compiled and addressed discrepancies to make a single Bangla forward version. A professional translator with expertise in medical translation and a medical graduate who was not involved in forward translation translated this Bangla version back to English. Again, an independent researcher compiled these back-translated versions in the same way.[26] We piloted the questionnaire in a randomly selected small group to confirm clarity and understanding. We circulated the questionnaire in both English and Bengali versions for proper understanding of the questions. We sent the link of the designed Google Forms to participants through emails and social networking sites. The educated family

members of illiterate or older respondents helped to collect their responses.

Sociodemographic and biophysical measures

We collected the most relevant sociodemographic information of the respondents. Collected data were regarding age, sex, body mass index (BMI), marital status, education level, occupation, economic status, residence, living status (with or without family) and smoking habit.

Loneliness Scale

The University of California, Los Angeles Loneliness Scale-8 (UCLA-8) is a short form of the UCLA Loneliness Scale which contains eight questions.[27] Each question is scored from 1 to 4, depending on the respondent's answer: 1 (never), 2 (rarely), 3 (sometimes) and 4 (often). We followed reverse scoring for two positive questions from other negative questions ('I am an outgoing person' and 'I can find companionship when I want it'). The total score ranges from 8 to 32. Higher score indicates higher degree of loneliness. We divided the cumulative score into four groups: 8–16, no loneliness; 7–21, mild loneliness; 22–16, moderate loneliness; and 27 or above, severe loneliness.

Patient Health Questionnaire

The Patient Health Questionnaire-9 (PHQ-9) has nine different questions that assess respondents' depressive symptoms. The total score ranges from 0 to 27 points, where each question is scored from 0 to 3 depending on the answer: 0 (not at all), 1 (several days), 2 (half of the days), and 3 (nearly every day). A score below 10 indicates no depressive symptoms, while a score of 10 or higher indicates the presence of depressive symptoms.[28] To determine the gravity of depression, we divided the total score into four levels: cumulative scores <10, 10–15, 16–21 and 22–27 for no depression, mild depression, moderate depression and severe depression, respectively.

Generalized Anxiety Disorder Scale

The Generalised Anxiety Disorder 7-Item Scale (GAD-7) consists of seven basic questions that evaluate respondents' anxiety disorder. The total score ranges from 0 to 21. Each question has four different scores depending on the response: 0 (not at all), 1 (several days), 2 (more than half the days) and 3 (nearly every day). Higher score indicates high degree of anxiety, divided into four different segments, where <5, 5–9, 10–14 and 15–21 indicate no, mild, moderate and severe anxiety, respectively.[29]

Pittsburgh Sleep Quality Index

We used the Pittsburgh Sleep Quality Index (PSQI) to determine the sleep quality of respondents over 1 month. This questionnaire consists of 19 specific questions in 7 different domains: (1) sleep quality (one question), (2) sleep latency (two questions), (3) sleep duration (one question), (4) sleep efficiency (three questions), (5) sleep disturbance (nine questions), (6) sleep medication (one question) and (7) daily dysfunction (two questions).

Each domain score ranges from 0 to 3. The cumulative score of the seven domains ranges from 0 to 21. A higher total score indicates poor sleep quality, which determines severity. A total PSQI score below 5 indicates no sleep disturbance. A cumulative score of 5 or more indicates poor sleep. Respondents with PSQI scores greater than 10 are considered bad sleepers.[30]

Statistical analysis

We performed statistical analysis using Microsoft Excel 2016 and Statistical Packages for Social Sciences V.25.0. We used Microsoft Excel for data editing, sorting, coding, classification and tabulation. We then imported the Excel file into IBM SPSS software. We used descriptive statistics to analyse the characteristics of the respondents. We applied χ^2 test to observe the differences in loneliness status (yes or no) with or without depression, anxiety or sleep disturbance among the respondents. We assessed the correlations between risk factors and psychometric measures (loneliness, depression, anxiety and sleep quality) using binary logistic regression analysis with a 95% CI. Statistically significant results were considered at p<0.05.

Patient and public involvement

Patients and the public were not involved in this study.

RESULTS

The descriptive statistics for all variables of the respondents are presented in table 1. Of the 672 respondents, 57% and 43% were men and women, respectively. Half of the respondents were above 30 years of age. Of the respondents, 65% had normal BMI and about two-thirds completed higher secondary education. Of the respondents, 57%, 74% and 46% were married, non-smokers and of middle economic class, respectively. We observed two-thirds of the total respondents were living with their family (64%) in a rural area (62%).

The prevalence of loneliness, depression, anxiety and sleep disturbance was estimated at 71%, 38%, 64% and 73%, respectively (figure 1). The proportion of respondents experiencing loneliness was higher in (1) people living without family members versus with family members (77% vs 68%, p=0.009) and (2) people with versus without much depression (89% vs 60%, p<0.001), anxiety (85% vs 46%, p<0.001) and sleep disturbance (79% vs 49%, p<0.001), respectively. The proportion of respondents with depression was higher in (1) women versus men (48% vs 31%, p<0.001), (2) unemployed versus service (44% vs 30%, p=0.006), (3) non-smoker versus smoker (42% vs 28%, p=0.002), (4) people of lower economic status versus middle (43% vs 33%, p=0.047), (5) respondents living with family members versus without family members (42% vs 33%, p=0.020), and (6) people with versus without much loneliness (48% vs 14%, p<0.001), anxiety (57% vs 5%, p<0.001) and sleep disturbance (45% vs 19%, p<0.001), respectively. The proportion of

Table 1 Distribution of variables and their association with different mental health problems among the respondents

	Total N=672		Loneliness n=478					Depression n=256					Generalised anxiety n=429					Sleep disturbance n=494				
			Yes					Yes					Yes					Yes				
	n	%	n	%	χ^2	df	P value	n	%	χ^2	df	P value	n	%	χ^2	df	P value	n	%	χ^2	df	P value
Age (years)																						
15–30	344	51	236	69	2.19	1	0.139	119	35	3.67	1	0.056	213	62	1.12	1	0.289	242	70	3.62	1	0.051
Above 30	328	49	242	74				137	42				216	66				252	77			
Sex																						
Male	381	57	278	73	1.44	1	0.23	117	31	20.35	1	<0.001	223	59	10.74	1	**0.001**	271	71	2.57	1	0.109
Female	291	43	200	69				139	48				206	71				233	80			
Body mass index (kg/m²)																						
Below 18.5	32	5	24	75	0.25	2	0.88	18	56	4.74	2	0.093	28	88	8.16	2	**0.017**	26	81	1.08	2	0.584
18.5–25	435	65	308	71				163	37				272	63				317	73			
Above 25	205	31	146	71				75	37				129	63				151	74			
Marital status																						
Unmarried	289	43	210	73	0.58	1	0.446	107	37	0.25	1	0.619	187	65	0.16	1	0.685	207	72	0.93	1	0.336
Married	383	57	268	70				149	39				242	63				287	75			
Education																						
Illiterate	26	4	21	81	7.53	4	0.11	15	58	6	4	0.199	18	69	7.39	4	0.117	19	73	0.71	4	0.849
Primary	85	13	59	69				35	41				61	72				65	76			
Secondary	61	9	48	79				23	38				44	72				44	72			
Higher secondary	410	61	279	68				146	36				246	60				302	74			
Graduate/above	90	13	71	79				37	41				60	67				64	71			
Occupation																						
Service	219	33	153	70	3.75	3	0.29	66	30	12.45	3	**0.006**	125	57	9.28	3	**0.026**	158	72	0.56	3	0.906
Business	28	4	20	71				7	25				17	61				20	71			
Student	208	31	158	76				88	42				148	71				153	74			
Unemployed	217	32	147	68				95	44				139	64				163	75			
Economic status																						
Low	245	36	179	73	0.75	2	0.688	106	43	6.11	2	**0.047**	163	67	1.39	2	0.499	177	72	2.6	2	0.273
Middle	310	46	218	70				103	33				195	63				224	72			
High	117	17	81	69				47	40				71	61				93	79			
Residence																						
Urban	255	38	184	72	0.21	1	0.646	109	43	3.79	1	0.052	164	64	0.04	1	0.841	192	75	0.67	1	0.413
Rural	417	62	194	47				147	35				265	64				302	72			
Living status																						
With family	430	64	291	68	11.62	3	**0.009**	179	42	9.86	3	**0.02**	274	64	1.56	3	0.665	323	75	4.82	3	0.185

Continued

Table 1 Continued

	Total N=672		Loneliness n=478					Depression n=256					Generalised anxiety n=429					Sleep disturbance n=494				
			Yes					Yes					Yes					Yes				
	n	%	n	%	χ^2	df	P value	n	%	χ^2	df	P value	n	%	χ^2	df	P value	n	%	χ^2	df	P value
Without family	242	36	187	77				77	32				155	64				171	71			
Smoking habit																						
Smoker	177	26	135	76	3.09	1	0.079	50	28	9.88	1	**0.002**	105	59	2.12	1	0.145	129	73	0.05	1	0.825
Non-smoker	495	74	343	69				206	42				324	65				365	74			
Loneliness																						
Yes	478	71	478	100	–	–	–	228	48	64.75	1	**<0.001**	366	77	116.23	1	**<0.001**	391	82	58.4	1	**<0.001**
No	194	29	0	0				28	14				63	32				103	53			
Depression																						
Yes	256	38	228	89	64.75	1	**<0.001**	256	100	–	–	–	244	95	177.45	1	**<0.001**	222	87	37.04	1	**<0.001**
No	416	62	250	60				0	0				185	44				272	65			
Generalised anxiety																						
Yes	429	64	366	85	116.23	1	**<0.001**	244	57	177.45	1	**<0.001**	429	100	–	–	–	366	85	84.86	1	**<0.001**
No	243	36	112	46				12	5				0	0				128	53			
Sleep disturbance																						
Yes	494	75	391	79	58.4	1	**<0.001**	222	45	37.04	1	**<0.001**	366	75	84.88	1	**<0.001**	494	100	–	–	–
No	178	25	87	49				34	19				63	35				0	0			

P values are significant at 95% CI (p<0.05). Significant p values are shown in bold.
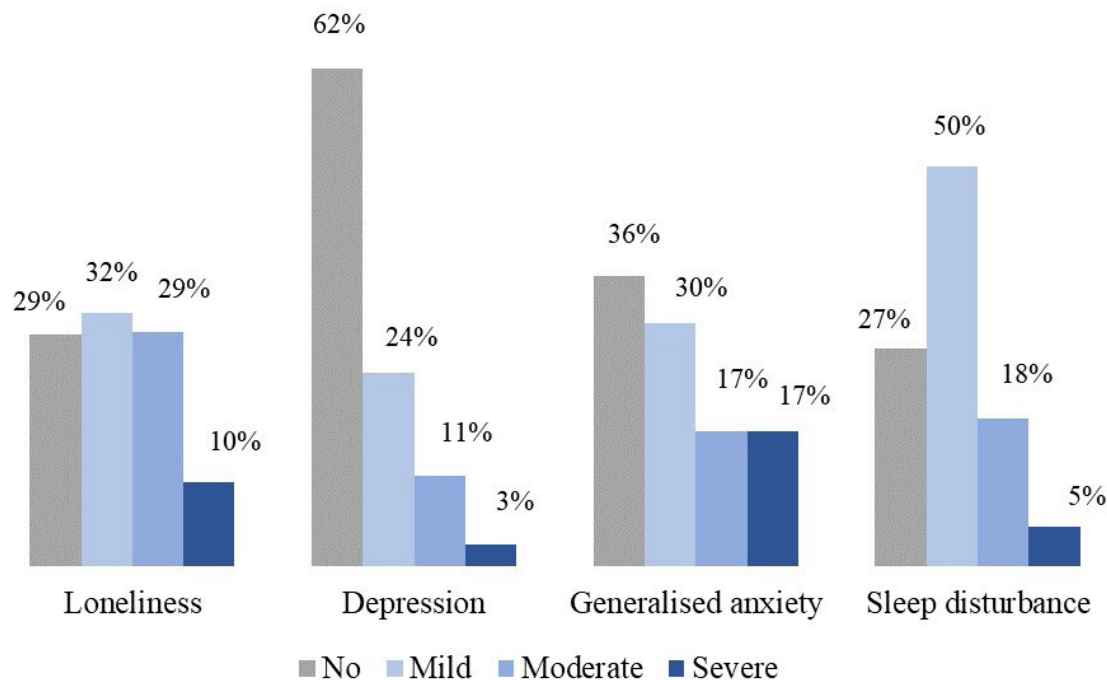df, degrees of freedom; n, Number.

Figure 1 Mental health problems among the respondents based on their distribution and gravity.

respondents with anxiety was higher in (1) women versus men (71% vs 69%, p=0.001), (2) students versus service (71% vs 57%, p=0.026), (3) people with BMI below 18.5 kg/m^2 versus above 25 kg/m^2 (88% vs 63%, p=0.017), and (4) people with versus without much loneliness (77% vs 32%, p<0.001), depression (95% vs 44%, p<0.001) and sleep disturbance (75% vs 35%, p<0.001), respectively. Finally the proportion of respondents with sleep disturbance was higher in people with versus without much loneliness (82% vs 53%, p<0.001), depression (87% vs 65%, p<0.001) and anxiety (85% vs 53%, p<0.001), respectively.

We performed binary logistic regression analysis to measure the correlations between dependent and independent variables (table 2). Respondents living with family members were 0.46 times less likely than respondents living away from family members to suffer from loneliness (OR=0.46, 95% CI 0.28 to 0.75, p=0.002). Respondents on business occupations were 1.76 times more likely than the unemployed group to have depression (OR=1.76, 95% CI 1.04 to 2.99, p=0.036). Respondents from the middle economic class were 1.62 times more likely than those from high economic class to have depression (OR=1.62, 95% CI 1.04 to 2.25, p=0.033). Urban respondents were 0.66 times less likely to have depression than rural respondents (OR=0.66, 95% CI 0.43 to 0.99, p=0.044). Respondents living with family members were 1.80 times more likely to have depression than respondents living away from family members (OR=1.80, 95% CI 1.13 to 2.87, p=0.014). The probability of suffering from loneliness was 2.96 times higher in respondents who already have depression (OR=2.96, 95% CI 1.73 to 5.05, p<0.001), 3.95 times higher in respondents with anxiety (OR=3.95, 95% CI 2.51 to 6.21, p<0.001) and 2.64 times

higher in respondents suffering from sleep disturbance (OR=2.64, 95% CI 1.72 to 4.05, p<0.001), respectively. The probability of having depression was 18.51 times higher in respondents with anxiety (OR=18.51, 95% CI 9.52 to 35.71, p<0.001) and 1.36 times higher in respondents suffering from sleep disturbance (OR=1.36, 95% CI 0.81 to 2.35, p<0.001), respectively. The likelihood of having anxiety was 3.60 times higher in respondents suffering from sleep disturbance (OR=3.60, 95% CI 2.24 to 5.65, p<0.001).

DISCUSSION

This study examines the impact of the COVID-19 pandemic on the mental health of the general Bangladeshi population. We observed the prevalence rates of loneliness, depression, anxiety and sleep disturbance among the general population were 71%, 38%, 64% and 73%, respectively (figure 1). We observed the associated factors behind the mental health issues are female sex, low economic status, being a student or unemployed, and living without a family. The findings showed a much higher rate of loneliness, depression, anxiety and sleep disturbance among Bangladeshi people during the COVID-19 pandemic. Consistent with our study findings, a cross-sectional epidemiological study reported a higher prevalence of stress (73.4%), depression (50.7%), anxiety (44.7%) and sleep disturbance (36.1%) among Chinese people at the early stage of the outbreak.[31] The higher rates of mental health problems in the present study are consistent with the previous SARS and MERS outbreaks.[8 9] During the early stage of the pandemic, people had little knowledge about the virus, preventive measures and treatment procedures, fatality rate, and so on. The little

Table 2 Regression analysis of variables by mental health problems among the respondents

	Loneliness n=478			Depression n=256			Generalised anxiety n=429			Sleep disturbance n=494		
	OR	95% CI	P value	OR	95% CI	P value	OR	95% CI	P value	OR	95% CI	P value
Age (years)												
15–30	0.606	0.359 to 1.023	0.061	0.653	0.386 to 1.105	0.112	0.857	0.490 to 1.501	0.59	0.834	0.499 to 1.394	0.489
Above 30	1			1			1			1		
Sex												
Male	0.666	0.411 to 1.080	0.099	1.624	1.000 to 2.637	**0.05**	1.453	0.869 to 2.431	0.154	1.036	0.648 to 1.658	0.882
Female	1			1			1			1		
Body mass index (kg/m²)												
Below 18.5	1.574	0.557 to 4.443	0.392	0.889	0.346 to 2.282	0.806	0.27	0.072 to 1.011	0.052	0.818	0.289 to 2.319	0.706
18.5–25	1.244	0.399 to 3.877	0.706	0.832	0.287 to 2.410	0.735	0.347	0.085 to 1.411	0.139	0.877	0.281 to 2.737	0.821
Above 25	1			1			1			1		
Marital status												
Unmarried	0.902	0.508 to 1.600	0.723	0.845	0.463 to 1.542	0.584	1.097	0.599 to 2.011	0.763	1.009	0.578 to 1.764	0.974
Married	1			1			1			1		
Education												
Illiterate	0.498	0.211 to 1.172	0.111	1.076	0.476 to 2.430	0.861	0.511	0.215 to 1.211	0.127	1.346	0.617 to 2.935	0.455
Primary	1.365	0.491 to 3.794	0.551	1.545	0.620 to 3.851	0.351	0.566	0.210 to 1.525	0.26	0.855	0.350 to 2.090	0.732
Secondary	1.123	0.293 to 4.309	0.866	1.813	0.507 to 6.485	0.36	0.244	0.059 to 1.006	0.051	0.829	0.249 to 2.763	0.761
Higher secondary	0.518	0.204 to 1.314	0.166	1.006	0.430 to 2.351	0.989	0.788	0.311 to 2.000	0.616	1.396	0.589 to 3.310	0.449
Graduate/above	1			1			1			1		
Occupation												
Service	0.889	0.292 to 2.711	0.836	0.315	0.099 to 1.009	0.052	0.855	0.296 to 2.481	0.774	0.894	0.318 to 2.515	0.831
Business	1.476	0.895 to 2.434	0.127	1.76	1.037 to 2.994	0.036	1.3	0.754 to 2.237	0.344	1.161	0.702 to 1.923	0.559
Student	0.628	0.264 to 1.962	0.253	0.752	0.363 to 1.052	0.093	0.548	0.362 to 0.952	0.452	0.524	0.241 to 1.183	0.263
Unemployed	1			1			1			1		
Economic status												
Low	1.111	0.636 to 1.941	0.712	1.478	0.832 to 2.624	0.183	0.562	0.312 to 1.011	0.054	1.588	0.893 to 2.824	0.115
Middle	1.133	0.725 to 1.771	0.583	1.618	1.038 to 2.252	**0.033**	0.981	0.613 to 1.572	0.938	0.852	0.558 to 1.300	0.458
High	1			1			1			1		
Residence												
Urban	1.06	0.697 to 1.611	0.785	0.655	0.434 to 0.988	**0.044**	1.146	0.737 to 1.781	0.545	0.929	0.618 to 1.397	0.724

Continued

Table 2 Continued

	Loneliness n=478			Depression n=256			Generalised anxiety n=429			Sleep disturbance n=494		
	OR	95% CI	P value	OR	95% CI	P value	OR	95% CI	P value	OR	95% CI	P value
Rural	1			1			1			1		
Living status												
With family	0.457	0.278 to 0.751	**0.002**	1.797	1.126 to 2.867	**0.014**	0.842	0.511 to 1.388	0.501	1.344	0.844 to 2.140	0.213
Without family	1			1			1			1		
Smoking habit												
Smoker	0.637	0.376 to 1.078	0.093	1.441	0.849 to 2.447	0.176	1.032	0.611 to 1.743	0.906	0.925	0.567 to 1.509	0.755
Non-smoker	1			1			1			1		
Loneliness												
Yes	–	–	–	2.89	1.669 to 5.000	**<0.001**	3.952	2.500 to 6.211	**<0.001**	2.525	1.647 to 3.875	**<0.001**
No	–			1			1			1		
Depression												
Yes	2.958	1.733 to 5.050	**<0.001**	–	–	–	18.518	9.615 to 35.714	**<0.001**	1.344	0.800 to 2.257	0.263
No	1			–			1			1		
Generalised anxiety												
Yes	3.952	2.506 to 6.211	**<0.001**	18.518	9.523 to 35.714	**<0.001**	–	–	–	3.367	2.127 to 3.519	**<0.001**
No	1			1			–			1		
Sleep disturbance												
Yes	2.638	1.718 to 4.048	**<0.001**	1.385	0.814 to 2.352	0.229	3.558	2.237 to 5.649	**<0.001**	–	–	–
No	1			1			1			–	–	

P values are significant at 95% CI ($p<0.05$). Significant p values are shown in bold.

n, Number.

information and uncertainty about COVID-19 might contribute to the higher rate of mental health problems.

The present study found that about three in every four people in Bangladesh suffered from loneliness at any level of gravity during the lockdown period. Among them, 39% were suffering from moderate to severe loneliness. People living without family during lockdown are more prone to developing loneliness than people living with family. A previous report suggested that social isolation during the COVID-19 pandemic was a risk factor for loneliness.[32] People with considerable loneliness are prone to developing other mental health problems, low well-being and suicidal behaviours.[33 34] Following the current findings, one study conducted in the UK observed 36% of the respondents felt lonely during the COVID-19 pandemic, which is higher than any previous time.[35] Another two studies also reported higher loneliness scores among the general population during COVID-19 than the past times.[36 37] We observed a high prevalence of loneliness among people living without their family members. In agreement with the present findings, a recent study reported increased levels of loneliness among women, young people, single, unemployed and those who have other psychiatric illnesses.[38] Public communication regarding social distancing and mental well-being involving psychologists, social scientists and mental health specialists can reduce the burden of loneliness.[39]

Among the respondents, 38% experienced depressive symptoms, including mild (24%), moderate (11%) and severe (3%) symptoms. We also observed a higher prevalence of depressive symptoms among women, people of low economic class, unemployed people, students and people living without a family. Several previous studies also reported a higher rate of depressive symptoms among women than men during the COVID-19 pandemic.[40–43] Similar to the results of the present study, an increased rate of depression was reported in several recent studies in Spain, China and Hong Kong due to the COVID-19 pandemic.[44–46] However, some previous studies reported depression symptoms among the general Chinese population were 16.5% and among Japanese people 11.4%.[47 48] These inconsistencies might be the result of developed socioeconomic status and healthcare facilities. Among the study participants, 64% reported anxiety symptoms, where 30%, 17% and 17% were mild, moderate and severe cases, respectively. Similar to our findings, a study reported the prevalence rate of anxiety disorder in China was 28.8%, ranging from moderate to severe symptoms.[49] Also, a high prevalence of anxiety disorder was observed among respondents from many countries during the COVID-19 pandemic compared with previous times.[4 40] The prevalence rate of anxiety among Bangladeshi students was 71% in the present study. Final-year students of different education levels might contribute to this high rate due to uncertainty in examinations and the job market. We observed 73% of the general population were suffering from sleep disturbance during the COVID-19 pandemic. Among them, 50%, 18% and 5%

reported mild, moderate and severe sleep disturbance. The present study also demonstrated that respondents suffering from loneliness, depression or anxiety are more likely to have sleep disturbance than healthy individuals. Many recent studies reported similar findings. A previous study in China observed that among the general population 29.2% had insomnia, 27.9% had depressive symptoms and 31.6% had anxiety disorder during the COVID-19 pandemic.[50] Similarly, another study among Italian people observed 42.2% sleep disturbance, 17.4% moderate or severe insomnia, 24.7% depressive symptoms and 23.2% anxiety symptoms.[51]

To prevent the rapid spread of COVID-19 infection, the Bangladesh government has closed all educational institutions since 18 March 2020. A country-wide lockdown has been imposed to limit public movement since 26 March 2020 and ordered people to stay at home.[17] The country-wide movement restrictions and stay at home orders greatly impacted the market economy, offices, business organisations and transport systems.[52 53] Most of the Bangladeshi population depend on regular income, and due to the indefinite lockdown they were uncertain about returning to their workplace. This situation created a confounding impact on their mental health status.[54] In Bangladesh, we observed several reported suicide cases during the COVID-19 pandemic as a result of getting infected, economic loss, social security, job security and emotional breakdown among marginalised wage earners.[55 56] An Indian case study suggested that COVID-19 may significantly impact the mental health status and influence suicidal ideation and suicide attempts among the affected people; other comorbid diseases may aggravate the situation.[57] We found that 44% of unemployed and 30% of service holders were suffering from depression. About 43% of people belonging to the lower economic class faced depression during the lockdown period.

The prevalence rates of mental health problems before the COVID-19 period varied from 6.5% to 31.0% among adults in Bangladesh.[58] The significant increase in prevalence rates of mental health issues during the COVID-19 pandemic (ranging from 38% to 73%) in the present study is a concern. Therefore, the National Institute of Mental Health of Bangladesh has announced some recommendations. Recommendations regarding the management of mental health during the COVID-19 pandemic include using psychotropics, avoiding COVID-19 news or scrolling the news several times a day, authenticating sources of information, less use of social media, employing simple relaxation techniques such as breathing exercises, and so on.[59] In agreement with these suggestions, several studies also recommended online responses, counselling, social support, and training on mental health for patients, healthcare professionals, public service holders, youth, students and elderly populations to manage mental health problems.[24 60 61] Worldwide, the COVID-19 pandemic has revealed how unprepared the healthcare systems are, as well as the scarcity of resources (personal

protective equipment, testing kits and so on) to combat the situation.[62]

Strengths and limitations of this study

The present study has some limitations. First, online self-reporting surveys might have multiple biases and are not representative of those without internet facilities. Second, this cross-sectional study was not able to measure the impact of these mental illnesses over time. Third, we did not assess the altered lifestyle of the respondents during the COVID-19 pandemic. The present study also has some advantages. First, this is the first ever study in Bangladesh to assess the four major mental health issues during the COVID-19 pandemic. This study provides an idea about the mental health of the Bangladeshi population during the COVID-19 pandemic.

Future research

This study highlights the need for mental health assessment and proper management of these issues during the COVID-19 pandemic and future research among healthcare professionals to explore their actual mental health status in this pandemic situation.

CONCLUSION

In summary, our findings reflect the gravity of mental health problems during the COVID-19 pandemic. A large portion of the general population in Bangladesh were affected mentally with different levels of severity. We suggest intensive mental healthcare services for the Bangladeshi people. Therefore, integrated government, non-government and community activities can ensure individual and collective mental health. Mental health support, social security and economic stability should also be top priorities to grow confidence among the general population.

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REFERENCES

1 Talevi D, Socci V, Carai M, *et al*. Mental health outcomes of the CoViD-19 pandemic. *Riv Psichiatr* 2020;55:137–44.
2 WHO. COVID-19 Weekly Epidemiological Update - 29 December, 2020. Available: https://www.who.int/publications/m/item/weekly-epidemiological-update-29-december-2020 [Accessed 06 Feb 2021].
3 WHO. Who coronavirus disease (COVID-19) Dashboard. Available: https://covid19.who.int/?gclid=Cj0KCQiAmfmABhCHARIsACwPRADLrk2VaTyZeSFy6kf8pjyrLYNDLGHR0c8z4nYnqSyLggvDD63O9eAaAiK0EALw_wcB [Accessed 06 Feb 2021].
4 Chen Y, Zhou H, Zhou Y, *et al*. Prevalence of self-reported depression and anxiety among pediatric medical staff members during the COVID-19 outbreak in Guiyang, China. *Psychiatry Res* 2020;288:113005.
5 Duan L, Zhu G. Psychological interventions for people affected by the COVID-19 epidemic. *Lancet Psychiatry* 2020;7:300–2.
6 Madabhavi I, Sarkar M, Kadakol N. COVID-19: a review. *Monaldi Arch Chest Dis* 2020;90. doi:10.4081/monaldi.2020.1298. [Epub ahead of print: 14 May 2020].
7 Zhang Y, Ma ZF. Impact of the COVID-19 pandemic on mental health and quality of life among local residents in Liaoning Province, China: a cross-sectional study. *Int J Environ Res Public Health* 2020;17:2381.
8 Lau JTF, Griffiths S, Choi KC, *et al*. Avoidance behaviors and negative psychological responses in the general population in the initial stage of the H1N1 pandemic in Hong Kong. *BMC Infect Dis* 2010;10:139.
9 Jeong H, Yim HW, Song Y-J, *et al*. Mental health status of people isolated due to middle East respiratory syndrome. *Epidemiol Health* 2016;38:e2016048.
10 Maunder RG, Lancee WJ, Balderson KE, *et al*. Long-Term psychological and occupational effects of providing Hospital healthcare during SARS outbreak. *Emerg Infect Dis* 2006;12:1924–32.
11 North CS, Pfefferbaum B, Vythilingam M, *et al*. Exposure to bioterrorism and mental health response among staff on capitol Hill. *Biosecur Bioterror* 2009;7:379–88.
12 Xiang Y-T, Yang Y, Li W, *et al*. Timely mental health care for the 2019 novel coronavirus outbreak is urgently needed. *Lancet Psychiatry* 2020;7:228–9.
13 Central Intelligence Agency. The world factbook, 2020. Available: https://www.cia.gov/library/publications/resources/the-world-factbook/geos/print_bg.html [Accessed 01 Sep 2020].
14 Streatfield PK, Karar ZA. Population challenges for Bangladesh in the coming decades. *J Health Popul Nutr* 2008;26:261–72.
15 Paul R. Bangladesh confirms its first three cases of coronavirus, 2020. Available: https://www.reuters.com/article/us-healthcoronavirus-bangladesh-idUSKBN20V0FS [Accessed 14 Apr 2020].
16 WHO. WHO Bangladesh COVID-19 Morbidity and Mortality Weekly Update - 27 - December 2020 (MMWU). Available: https://cdn.who.int/media/docs/default-source/searo/bangladesh/covid-19-who-bangladesh-situation-reports/who_covid-19-update_44_20201227.pdf?sfvrsn=bffee8db_7 [Accessed 06 Feb 2021].
17 The Daily Star. Man left out of relief net dies by suicide in Chattogram, 2020. Available: https://www.thedailystar.net/coronavirus-deadly-new-threat/news/man-left-out-relief-net-dies-suicide-chattogram-1893409 [Accessed 16 Apr 2020].
18 The Kaler Kantho. Day labourer commits suicide in Naldanga (in Bangla), 2020. Available: https://www.kalerkantho.com/home/printnews/898402/2020-04-13 [Accessed 13 Apr 2020].
19 The Jugantor. The young woman committed suicide after losing her job in corona left Posting on Facebook (in Bangla), 2020. Available: https://rb.gy/pmssav [Accessed 11 Jul 2020].
20 Silva Junior FJGda, Sales JCES, Monteiro CFdeS, *et al*. Impact of COVID-19 pandemic on mental health of young people and adults: a systematic review protocol of observational studies. *BMJ Open* 2020;10:e039426.
21 Lopes-Júnior LC, Bomfim E, Silveira DSCda, *et al*. Effectiveness of mass testing for control of COVID-19: a systematic review protocol. *BMJ Open* 2020;10:e040413.
22 Every-Palmer S, Jenkins M, Gendall P, *et al*. Psychological distress, anxiety, family violence, suicidality, and wellbeing in New Zealand during the COVID-19 lockdown: a cross-sectional study. *PLoS One* 2020;15:e0241658.

23 Chen Q, Liang M, Li Y, *et al*. Mental health care for medical staff in China during the COVID-19 outbreak. *Lancet Psychiatry* 2020;7:e15–16.

24 Yang Y, Li W, Zhang Q, *et al*. Mental health services for older adults in China during the COVID-19 outbreak. *Lancet Psychiatry* 2020;7:e19.

25 Brooks SK, Webster RK, Smith LE, *et al*. The psychological impact of quarantine and how to reduce it: rapid review of the evidence. *Lancet* 2020;395:912–20.

26 Beaton DE, Bombardier C, Guillemin F, *et al*. Guidelines for the process of cross-cultural adaptation of self-report measures. *Spine* 2000;25:3186–91.

27 Hays RD, DiMatteo MR. A short-form measure of loneliness. *J Pers Assess* 1987;51:69–81.

28 Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. *J Gen Intern Med* 2001;16:606–13.

29 Spitzer RL, Kroenke K, Williams JBW, *et al*. A brief measure for assessing generalized anxiety disorder: the GAD-7. *Arch Intern Med* 2006;166:1092–7.

30 Zigmond AS, Snaith RP. The hospital anxiety and depression scale. *Acta Psychiatr Scand* 1983;67:361–70.

31 Liu S, Yang L, Zhang C, *et al*. Online mental health services in China during the COVID-19 outbreak. *Lancet Psychiatry* 2020;7:e17–18.

32 Dahlberg L. Loneliness during the COVID-19 pandemic. *Aging Ment Health* 2021;25:1–4.

33 Leigh-Hunt N, Bagguley D, Bash K, *et al*. An overview of systematic reviews on the public health consequences of social isolation and loneliness. *Public Health* 2017;152:157–71.

34 Rico-Uribe LA, Caballero FF, Martín-María N, *et al*. Association of loneliness with all-cause mortality: a meta-analysis. *PLoS One* 2018;13:e0190033.

35 Li LZ, Wang S. Prevalence and predictors of general psychiatric disorders and loneliness during COVID-19 in the United Kingdom. *Psychiatry Res* 2020;291:113267.

36 Luchetti M, Lee JH, Aschwanden D, *et al*. The trajectory of loneliness in response to COVID-19. *Am Psychol* 2020;75:897–908.

37 Killgore WDS, Cloonan SA, Taylor EC, *et al*. Loneliness: a signature mental health concern in the era of COVID-19. *Psychiatry Res* 2020;290:113117.

38 Hoffart A, Johnson SU, Ebrahimi OV. Loneliness and social distancing during the COVID-19 pandemic: risk factors and associations with psychopathology. *Front Psychiatry* 2020;11:589127.

39 Popa E. Loneliness and negative effects on mental health as trade-offs of the policy response to COVID-19. *Hist Philos Life Sci* 2021;43:15.

40 Zhou S-J, Zhang L-G, Wang L-L, *et al*. Prevalence and socio-demographic correlates of psychological health problems in Chinese adolescents during the outbreak of COVID-19. *Eur Child Adolesc Psychiatry* 2020;29:749–58.

41 Islam MR, Ali S, Karmoker JR, *et al*. Evaluation of serum amino acids and non-enzymatic antioxidants in drug-naïve first-episode major depressive disorder. *BMC Psychiatry* 2020;20:333.

42 Li G, Miao J, Wang H, *et al*. Psychological impact on women health workers involved in COVID-19 outbreak in Wuhan: a cross-sectional study. *J Neurol Neurosurg Psychiatry* 2020;91:895–7.

43 Kang L, Ma S, Chen M, *et al*. Impact on mental health and perceptions of psychological care among medical and nursing staff in Wuhan during the 2019 novel coronavirus disease outbreak: a cross-sectional study. *Brain Behav Immun* 2020;87:11–17.

44 González-Sanguino C, Ausín B, Castellanos Miguel Ángel, *et al*. Mental health consequences during the initial stage of the 2020 coronavirus pandemic (COVID-19) in Spain. *Brain Behav Immun* 2020;87:172–6.

45 Huang Y, Zhao N. Generalized anxiety disorder, depressive symptoms and sleep quality during COVID-19 outbreak in China: a web-based cross-sectional survey. *Psychiatry Res* 2020;288:112954.

46 Choi EPH, Hui BPH, Wan EYF. Depression and anxiety in Hong Kong during COVID-19. *Int J Environ Res Public Health* 2020;17:3740.

47 Wang C, Pan R, Wan X, *et al*. A longitudinal study on the mental health of general population during the COVID-19 epidemic in China. *Brain Behav Immun* 2020;87:40–8.

48 Ueda M, Stickley A, Sue H, *et al*. Mental health status of the general population during the COVID-19 pandemic: a cross-sectional national survey in Japan. *medRxiv* 2020. doi:10.1101/2020.04.28.20082453

49 Liu X, Luo W-T, Li Y, *et al*. Psychological status and behavior changes of the public during the COVID-19 epidemic in China. *Infect Dis Poverty* 2020;9:58.

50 Shi L, Lu Z-A, Que J-Y, *et al*. Prevalence of and risk factors associated with mental health symptoms among the general population in China during the coronavirus disease 2019 pandemic. *JAMA Netw Open* 2020;3:e2014053.

51 Gualano MR, Lo Moro G, Voglino G, *et al*. Effects of Covid-19 Lockdown on mental health and sleep disturbances in Italy. *Int J Environ Res Public Health* 2020;17:4779.

52 The Bangla Tribune. The patient committed suicide by jumping from the roof as He was infected with corona (in Bangla), 2020. Available: https://rb.gy/jfogjx [Accessed 11 Jun 2020].

53 The Somoy News. Patient commits suicide without getting treatment in hospital (in Bangla), 2020. Available: https://www.somoynews.tv/pages/details/214750 [Accessed 20 May 2020].

54 Hossain KA, Roy S, Ullah MM. COVID-19 and mental health challenges in Bangladesh. *AMDHS* 2020;2:31–3. doi:10.5530/amdhs.2020.2.8

55 The BBC News. Corona virus: COVID-19 patient committed suicide after escaping from the hospital (in Bangla), 2020. Available: https://www.bbc.com/bengali/news-53125017 [Accessed 21 Jun 2020].

56 The Desh Rupantor. Corona-infected businessman commits suicide (in Bangla), 2020. Available: https://www.deshrupantor.com/mofossol/2020/07/07/230368 [Accessed 07 Jul 2020].

57 Hossain MM, Tasnim S, Sultana A. COVID-19 and suicide of an army soldier in India: perspectives on psychosocial epidemiology of suicidal behavior. *SocArXiv* 2020.

58 Hossain MD, Ahmed HU, Chowdhury WA, *et al*. Mental disorders in Bangladesh: a systematic review. *BMC Psychiatry* 2014;14:216.

59 National Institute of Mental Health (MIMH). Recommendations from sub Committee for mental health, 2020. Available: https://mofa.portal.gov.bd/sites/default/files/files/mofa.portal.gov.bd/page/ad1f289c_47cf_4f6c_8dee_887957be3176/Guideline%20for%20Mental%20Health%20Issue-COVID-19-%20DGHS.pdf [Accessed 01 Sep 2020].

60 Wang C, Pan R, Wan X, *et al*. Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. *Int J Environ Res Public Health* 2020;17:1729.

61 Armitage R, Nellums LB. The COVID-19 response must be disability inclusive. *Lancet Public Health* 2020;5:e257.

62 Pfefferbaum B, North CS. Mental health and the Covid-19 pandemic. *N Engl J Med* 2020;383:510–2.