12-30-2021

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Abstract

Background: With its rapid spread, the coronavirus disease 2019 (COVID-19) pandemic had a detrimental effect on students' psychological well-being, depression, and behavioral changes due to indefinite educational leaves, lockdowns, restricted outdoor activities, and excess use of social media. This study aims to assess the relationship of social media exposure with the psychological well-being, depression, and behavioral changes of Bangladeshi university students.

Methods: A web-based cross-sectional survey was carried out on 530 students from June 17 to July 10, 2020, to evaluate psychological well-being, depression, behavioral changes, and social media exposure via self-reported measures.

Results: The prevalence of factors were as follows: poor psychological well-being was 24.9%; moderate to severe depression was 56.6%; severe behavioral changes was 32.1%; and of moderate to severe addiction to social media exposure was 38.3%. All factors were positively associated with social media exposure. Multivariate logistic regression showed that the addiction of participants to social media was 7.488 times higher with severe behavioral changes (OR: 7.488; 95% CI 4.708–11.909), 2.299 times higher with poor psychological functioning (OR: 2.299; 95% CI 1.421–3.721), 30.54 times higher with severe depressed (OR: 30.54; 95% CI 15.0–62.177) than that of individuals without such symptoms.

Conclusions: The above findings imply that the government needs to pay greater attention to improve the overall situation of Bangladeshi university students.

Keywords: behavioral changes, COVID-19, depression, psychological well-being, social media

INTRODUCTION

The Hubei province of Wuhan, China, was the first to be affected by a pneumonia outbreak in December 2019. After lengthy scientific research procedures, Chinese scientists isolated the novel coronavirus (nCoV) from patients on January 7, 2020. Later, the virus was named severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2),[1] and the World Health Organization (WHO) named the disease as the coronavirus 2019 (COVID-19).[2] On January 30, 2020, WHO declared the COVID-19 outbreak as a public health emergency of international concern, particularly posing a high risk to countries with weak health systems.[3] With over 118,000 cases of worldwide

and further risk of global spread, WHO declared COVID-19 a pandemic on March 11, 2020.[4]

In Bangladesh, after confirming the first three cases of COVID-19 on March 8, 2020, the government declared a special leave called lockdown from March 26, 2020, to reduce the community transmission.[5, 6] Such sudden leave had negative effects on the daily activities and studies, creating pressure on Bangladeshi students as all educational institutions were closed. Home quarantine, social distancing, boredom, and disease risk are all associated with adverse effects.[7] Widespread outbreaks of COVID-19 cause public panic, psychological stress, and mental disorders, including anxiety, depression, and post-traumatic stress disorder.[8] According to WHO, distress, anxiety, loneliness, sleep problems, and fear of uncertain, wide-spreading infectious diseases are natural psychological responses because of the rapid and random changes in the environment.[9, 10] Students face physiological, psychological, and social adaptation

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problems due to immature psychological and emotional development.[11] Adverse psychological outcomes increase due to the pandemic itself and its easily available information and misinformation via social media.[12] As a result, people from all socioeconomic classes may suffer from a rapidly increasing COVID-19 panic, which may be more harmful than the virus itself.[13] A Chinese study identified that stable family income and living with parents had positive effects on anxiety, with the rates of severe, moderate, and mild anxiety symptoms among university students at 0.9%, 2.7%, and 21.3%, respectively.[14] During the COVID-19 pandemic, depressive symptoms increased in prevalence, and without early intervention, may become long-term.[15, 16]

In fear of the frequent disease transmission, avoidance behaviors were implemented, as such for public transport usage, social events, crowded places, and school closures.[17, 18] During the COVID-19 pandemic, the stage of the outbreak, disease perception, and government involvement are associated with behavioral changes.[19] Several studies suggest that within a population, many people maintaining social distancing behaviors can hamper daily lives, have detrimental social implications, and increase risks in the future.[17, 20]

The unpredicted and sudden lockdown forced people to stay home and spend more time on social media while searching for news or information about the pandemic.[21] Social media quickly spreads both rumors and useful information, but many delinquents are deliberately spreading fake information to cause psychological trauma, confusion, and anxiety.[22, 23] WHO has reported that due to a massive infodemic, correct and incorrect information during the COVID-19 pandemic increase the difficulties for people to find reliable and trustworthy guidance.[24] People's behavior is strongly influenced by fast-spreading information. WHO reported that rumor and misinformation through social media are the driving force of fear, anxiety, and stigma.[25] Social media exposure can also enhance post-traumatic stress disorder (PTSD) symptoms.[26] During this pandemic, social media helps by providing health information, telemedicine, and online psychological counseling, but may also harm by spreading negative emotions, rumors, and fake news that are associated with potential adverse effects such as the promotion of stress, loneliness, and depression.[21, 27]

Given the abovementioned discussions, Bangladesh may also need to determine the psychological status changes among university students, who are the nation's future driving force. Therefore, this study investigates the depression, psychological functioning, behavioral changes, and addiction to social media exposure among Bangladesh university students during the quarantine period of the COVID-19 outbreak. The relative factors that affect the depression level,

psychological functioning, and behavioral changes are examined to determine the influence of social media exposure. Thus, we can deepen our understanding of the depression level, psychological functioning, and behavioral adaptations of Bangladeshi university students during the COVID-19 pandemic and suggest enhancement initiatives to policymakers.

METHODS

Study design
A web-based cross-sectional study was carried out from June 17 to July 10, 2020, after the lockdown started. A total of 530 students from 55 Bangladeshi universities (public, private, and national) willingly participated in the study. Data were collected online, given that community-based sampling was not feasible due to the COVID-19 pandemic. The survey link was distributed among Bangladeshi university students via social media using a convenient sample.

Ethical approval
This study was approved by the ethical committee of Noakhali Science and Technology University, Noakhali, Bangladesh (Application no: 101).

Study procedures
The questionnaire was set both in Bangla (the native language of participants) and English to achieve better understanding. The online survey was carried out using Google survey tool (Google Forms). Participants were obtained using a convenience sampling technique, yielding 530 respondents (61.7% male, 38.3% female) who completed the entire survey. The inclusion criteria were status as a current Bangladeshi student, Internet access, and genuineness in response. The students who were unwilling to participate in the study were excluded.

Survey content
The survey contained a semi-structured and self-related questionnaire with an informed consent letter. The questionnaire included questions on socio-demographic data, behavioral changes, psychological well-being, depression, and social media exposure. Socio-demographic data such as age, gender, and educational status were also collected. Educational status was classified into two categories, namely, undergraduate and post-graduate.

Behavioral changes were measured by asking questions regarding engagement in negative beliefs about oneself, blaming oneself for a crisis experience, negative feelings, losing interest in enjoyable activities, feelings of loneliness, having problems with positive feelings, aggressive behavior, excessive risk-taking, excessive carefulness or attentiveness, excitement, trouble paying attention, and problems with falling or staying asleep.

Respondents rated their answer on each item as "not at all," "sometimes," and "most of the time."

Psychological function was measured by using 18 items from the psychological well-being multi-dimensional scale that was theoretically derived by Ryff. This scale originally included 20 items for six subscales, namely, autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, and self-acceptance.[28] The present study used a modified 18-item version, consisting of three items for each of the six subscales.[29] The items included positive and negative questions, and the answer was recorded on a 6-point Likert-type scale ranging from "strongly disagree" to "strongly agree." Negative questions were reverse-coded. Scores from all items are added, and a high total indicates greater well-being.

Depression level was measured using "Patient Health Questionnaire-9" (PHQ-9), a modified version of the original PRIME-MD, a 3-page questionnaire that can be entirely self-administered by the patient.[30] Nine items are scored from 0 ("not at all") to 3 ("nearly every day"). Scores from all items are added, and a high total indicates greater depression level. Levels of depression are diagnosed based on the presence of depressive symptoms for at least "more than half the days" in the past two weeks, namely, major depression for five or more of the nine depressive symptoms, and other depression levels for 2–4 depressive symptoms.

Addiction to social media was measured by questions on the duration of use, frequency of using apps, changes in feelings or efforts due to increase or reduction of Internet use, such as satisfaction or adverse emotional effects, respectively. Addiction level was categorized by using a Likert-type scale.

Statistical analysis

Microsoft Excel 2016 and IBM SPSS Statistics version 23.0 were used to carry out data analysis. Data editing, sorting, and coding were carried out using Microsoft Excel, and the file was subsequently imported into SPSS software for descriptive statistics (frequencies, percentages) and first-order analysis (i.e., chi-square tests). Logistic regression was performed with a 95% confidence interval to determine the significant associations between categorical variables. These associations were considered statistically significant if the p was less than 0.05.

RESULTS

Among the 530 participants, most were males (61.7%) and with the range 22–25 years of age (57.4%). This study included 1st–4th year M.Sc. students, although most of the participants were 4th-year students (28.8%). Responses show that participants had moderate behavioral changes than usual (46%), no changes (21.9%), and severe changes (32.1%). Psychological well-being was rated as mainly moderate (64.5) and otherwise poor (24.9). Depression was rated as moderately severe (14.5%) and severe (13.6%). Most of the respondents reported addiction to social media exposure as moderate (33.2%) and severe (5.1%). These outcomes of all the key variables are shown in Table 1.

Social media exposure had a statistically significant correlation with behavioral changes, psychological well-being, and depression as p (0.001, 0.001, and 0.001, respectively) were less than 0.05 (Table 2). Approximately 2.9% of respondents have moderate changes in behavior and 10.6% had severe changes, particularly for respondents with severe addiction to social media. For those who can control their addiction (mild) to social media, the majority (66%) of respondents have normal or no changes in behavior. Approximately 21% of respondents who are severely addicted to social media face severe depression.

Table 3 shows the regression analysis of participants' social media exposure and their behavioral changes, psychological well-being, and depression. Among the participants, addiction to social media is 7.488 times higher with severe behavioral changes (OR: 7.488; 95% CI 4.708–11.909) and 2.734 times higher with moderate behavioral changes (OR: 2.734; 95% CI 1.812–4.123) than those with no behavioral changes. In terms of

TABLE 1. Outcomes of key variables

Variables	Total
Gender	
Male	327 (61.7%)
Female	203 (38.3%)
Educational Status	
Undergraduate	388 (73.2%)
Post-graduate	142 (26.8%)
Behavioral Changes	
Normal/No changes	116 (21.9%)
Moderate changes	244 (46.0%)
Severe changes	170 (32.1%)
Psychological well-being	
Good psychological functioning	56 (10.6%)
Moderate psychological functioning	342 (64.5%)
Poor psychological functioning	132 (24.9%)
Depression level	
Minimal	77 (14.5%)
Mild depression	153 (28.9%)
Moderate depression	151 (28.5%)
Moderately severe depression	77 (14.5%)
Severe depression	72 (13.6%)
Social media exposure	
Normal/No addiction	37 (7.0%)
Mild addiction	290 (54.7%)
Moderate addiction	176 (33.2%)
Severe addiction	27 (5.1%)

psychological well-being, the social media exposure is 2.299 times higher with poor psychological functioning (OR: 2.299; 95% CI 1.421–3.721) and 1.381 times higher with moderate psychological functioning (OR: 1.381: 95% CI 0.893–2.137) than those with good psychological functioning. Social media exposure is 3.589, 11.698, 14.826, and 30.54 times higher with mild (OR: 3.589; 95% CI 2.02–6.376), moderate (OR: 11.698; 95% CI 6.231–21.961), moderately severe (OR: 14.826; 95% CI 7.492–29.340) and severe (OR: 30.540; 95% CI 15.0–62.177) depression compared with those with no depressive symptoms.

The results in Table 4 show no significant gender differences in overall psychological well-being given that $p > 0.05$. Male and female participants responded similarly to the six psychological well-being dimensions.

However, significant gender variations were observed in the depression scale with $p < 0.001$. Compared with males (M male = 6.152, SD male = 5.718), female respondents scored higher for depression (M female = 8.039, SD female = 6.205, $p = 0.000$).

The effect of lockdown on one's behavioral changes was evaluated with the following options "Most of the time," "Sometimes," and "Not at all" (Table 5). In most areas, the majority of participants reported the option "Sometimes." However, several participants reported slight negative changes in behavior such as negative feelings (20.2%), losing interest in enjoyable activities (20.6%), feeling alone or isolated (23.0%), annoying or angry or aggressive behavior (17.2%), becoming too attentive (22.8%), having trouble paying attention (24.9%), and problem in sleeping (19.8%).

TABLE 2. Correlation of social media exposure with behavioral changes, psychological well-being, and depression

Variables	Normal or no addiction (%)	Mild addiction (%)	Moderate addiction (%)	Severe addiction (%)	p
Behavioral changes					
Normal or no changes	23 (19.8)	77 (66.4)	14 (12.1)	2 (1.7)	
Moderate changes	12 (4.9)	153 (62.7)	72 (29.5)	7 (2.9)	0.000***
Severe changes	2 (1.2)	60 (35.3)	90 (52.9)	18 (10.6)	
Psychological well-being					
Good psychological functioning	7 (12.5)	34 (60.7)	13 (23.2)	2 (3.6)	
Moderate psychological functioning	22 (6.4)	200 (58.5)	109 (31.9)	11 (3.2)	0.001**
Poor psychological functioning	8 (6.1)	56 (42.4)	54 (40.9)	14 (10.6)	
Depression					
Minimal	24 (31.2)	46 (59.7)	7 (9.1)	0 (0)	
Mild depression	10 (6.5)	114 (74.5)	29 (19)	0 (0)	
Moderate depression	3 (2)	75 (49.7)	65 (43)	8 (5.3)	0.000***
Moderately Severe depression	0 (0)	34 (44.2)	39 (50.6)	4 (5.2)	
Severe depression	0 (0)	21 (29.2)	36 (50)	15 (20.8)	

The header "Social media exposure" spans the four addiction columns.

*** ($p < 0.001$); ** ($p < 0.01$); *($p < 0.05$)

TABLE 3. Association between social media exposure and related covariates

Determinants	Coefficient	SE	Odd ratio	95% Confidence Interval [CI] Lower	95% Confidence Interval [CI] Upper
Behavioral changes					
Normal or no changes			1 Reference		
Severe changes	-4.283	0.546	7.488***	4.708	11.909
Moderate changes	-1.394	0.448	2.734**	1.812	4.123
Psychological well - being					
Good psychological functioning			1 Reference		
Poor psychological functioning	-8.133	0.584	2.299	1.421	3.721
Moderate psychological functioning	-0.857	0.510	1.381*	0.893	2.137
Depression					
Minimal Condition			1 Reference		
Mild depression	-1.806	0.577	3.589**	2.020	6.376
Moderate depression	-4.549	0.668	11.698***	6.231	21.961
Moderately severe depression	-5.830	0.761	14.826***	7.492	29.340
Severe depression	-7.893	0.839	30.540***	15.000	62.177

*** ($p < 0.001$); ** ($p < 0.01$); *($p < 0.05$)

TABLE 4. Summary of gender differences in psychological well-being and depression

Psychological well-being	Mean	SD	*p*
Autonomy			
Male	6.685	2.036	0.146
Female	6.428	1.866	
Environmental mastery			
Male	6.443	2.246	0.980
Female	6.438	2.207	
Personal growth			
Male	7.587	1.691	0.073
Female	7.315	1.691	
Positive relations with others			
Male	7.195	2.348	0.736
Female	7.123	2.507	
Purpose in life			
Male	7.134	2.155	0.742
Female	7.073	1.903	
Self-acceptance			
Male	6.889	2.110	0.157
Female	6.620	2.150	
Depression			
Male	6.152	5.718	0.000***
Female	8.039	6.205	

***(p <0.001); **(p <0.01); *(p <0.05)

TABLE 5. Effect on COVID-19 on behavioral changes

Effects on COVID-19 on behavioral changes	Frequency (%)		
	Most of the time	Sometimes	Not at all
Negative beliefs about yourself, about other people or the world (for example, thinking: I am bad, I have something wrong, I cannot trust anyone and this world is all bad)?	46 (8.7)	287 (54.2)	197 (37.2)
Blaming yourself or someone else for a crisis experience or what happened next?	58 (10.9)	261 (49.2)	211 (39.8)
Do you have any negative feelings such as fear, dread, anger, guilt or shame?	107 (20.2)	300 (56.6)	123 (23.2)
Are you losing interest in the activities you used to enjoy?	109 (20.6)	222 (41.9)	199 (37.5)
Feeling alone or isolated from others?	122 (23.0)	223 (42.1)	185 (34.9)
Having problems with positive feelings (for example, being unable to feel happy or feeling loving for the people around you)?	55 (10.4)	177 (33.4)	298 (56.2)
Behaving annoyingly, getting angry or aggressive?	91 (17.2)	248 (46.8)	191 (36.0)
Taking too much risk or doing something that could hurt you?	28 (5.3)	153 (28.9)	349 (65.8)
Becoming too careful or attentive?	121 (22.8)	260 (49.1)	149 (28.1)
Excited or easily startled?	57 (10.8)	261 (49.8)	134 (25.3)
Having trouble paying attention?	132 (24.9)	264 (49.8)	134 (25.3)
Problems falling asleep or staying asleep?	105 (19.8)	209 (39.4)	216 (40.8)

DISCUSSION

COVID-19 is a global pandemic that became the most devastating and challenging public health crisis with a rapidly increasing mortality rate. As such, people of all ages have suffered from psychological outcomes. Due to the unpredictable vacation and uncertain future of educational institutions, university students are more vulnerable to psychological consequences and increase their addiction to social media. This study investigated the behavioral changes, psychological well-functioning, depression, and social media exposure of Bangladeshi university students during the COVID-19 pandemic. Psychological suffering results from mental health problems, which are considered a public health concern.[31] In this study, among university students,

10.6% had good psychological functioning, while 64.5% and 24.9% had moderate and poor psychological functioning, respectively. A Chinese study reported that approximately two weeks after the outbreak of COVID-19, 40.4% of youth had psychological problems. This number is less than half of ours and indicates that the pandemic duration is also an essential factor.[32] A Spanish study found that 50.43% of participants showed moderate or severe psychological effects of outbreak and lockdown, which was lower compared with our findings.[33]

The current findings from the web-based cross-sectional survey indicated that over two-thirds of students experienced moderate to poor psychological functioning (89.4%) and mild to severe depression (84.5%). This prevalence rate was almost similar to another Bangladeshi study, which reported 82.4% mild to severe depression.[34] Previous Bangladeshi studies also reported the prevalence of depression among students in higher academic levels, such as 54.3% of medical and 52.2% of university students suffering from moderate to extremely severe depression.[31,35] In addition, 62.9% of university students experienced moderate to extreme depression, which was higher than the current findings (56.6%).[36] A Chinese study reported that after one month of home quarantine, 9% of university students were depressed, a number very much lower than our result.[37] In Spain, as study of the students, administrative staff, faculty members, and academic staff of the University of Valladolid found 48.1% exhibited signs of psychological symptoms and depression.[33] University students in Greece reported a 74.3% increase of depression during the lockdown[38] while those in Albania reported a 25.2% difference in the prevalence of moderate to severe depression compared with our result.[39] In Bangladesh, numerous university students work in part-time jobs, such as private tutoring, to cover their educational expenses and at times provide financial support to their families. Their dependence on part-time jobs is gradually increasing.[40] Under the lockdown, prolonged unemployment and insecure economic conditions are the most significant contributor to depression among university students.[34] Unemployment, which is associated with mental health, limits the feelings of achievement, accomplishment, and satisfaction, leading to possible impairment of psychological well-being and self-esteem.[41]

The uncertain situation, prolonged unemployment, and risk of mental health problems cause behavioral changes. The increased prevalence of negative feelings, losing interest, feeling alone, annoying or angry or aggressive behavior, becoming too attentive, and sleeping problems, also lead to the possible increase in the prevalence of depression during this pandemic. In the present sample, 46% had moderate behavioral changes than those with normal or no changes (21.9%)

and severe changes (32.1%) in behavior. By comparison with a Spanish study in behavioral changes, our results showed similarities and differences, such as problems in paying attention (24.9% vs. 33.8%), sleeping problems (19.8% vs. 36.4%), annoying or angry or aggressive behavior (17.2% vs. 16.8%), feelings of loneliness (23.0% vs. 19.6%), hopelessness (8.7% vs. 33.5%), excited or restlessness (10.8% vs. 29.1%).[42] In our study, almost half of the participants reported that sometimes they had negative changes in their behavior such as negatives beliefs about themselves (54.7%), blaming themselves (49.2%), negative feelings (56.6%), losing interest in enjoyable activities (41.9%), feeling alone or isolated (42.2%), problems with positive feelings (33.4%), annoying or angry or aggressive behavior (46.8%), taking too much risk (28.9%), becoming too attentive (49.1%), excited (49.1%), having trouble paying attention (49.8%), and sleeping problems (39.4%). The findings lead to great concern and reflect the effect of COVID-19 on normal behavior.

Social distancing and isolation due to the pandemic and lockdowns affected mental health and increased reliance on social media. On the one hand, social media is an excellent source of information and entertainment, but on the other hand, can also adversely affect mental health by providing misinformation. In late January 2020, people of Wuhan and Hubei province experienced direct trauma via the media.[22] A Chinese study reported "less" (8.8%), "sometimes" (9.2%), and "frequently" (82.0%) for social media exposure.[43] In our study, most of respondents reported their addiction to social media exposure as mild (54.7%), moderate (33.2%), and severe (5.1%). Thus, social media exposure is significantly associated with the psychological well-being, depression, and behavioral changes of Bangladeshi university students.

During the COVID-19 pandemic, exposure to social media considerably increased and had detrimental effects on students' mental health and normal behavior due to restrictions in normal daily activities. Negative changes in mental health and behavior are a matter of concern to the family, society, and the country, and it requires proper attention from every level. The findings can help to realize and address the current situation before more devastating conditions occur. These negative impacts can be minimized by spending quality time with family, making homestead gardens, and using technology for learning and developing skills.

CONCLUSIONS

The findings show a high prevalence of poor psychological well-being, depression, and behavioral changes, which are positively associated with social media exposure during the COVID-19 outbreak. The government needs to pay greater attention to improving

such conditions while fighting COVID-19. Current quarantines limit the space and restrict outdoor activities, directly affecting physical activity and quality of life. Safe, effective, and low-cost means to gain physical fitness, such as home exercise under proper guidance, positively influence the overall quality of life. Therefore, this study suggests increasing physical movement, limiting social media use, and spending quality time with family.

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