





# Prevalence and Associated Factors of Problematic Smartphone Use During the COVID-19 Pandemic: A Bangladeshi Study

Ismail Hosen <sup>1,2</sup>  
Firoj al Mamun <sup>1,2</sup>  
Md Tajuddin Sikder<sup>2</sup>  
Amir Zaib Abbasi<sup>3</sup>  
Liye Zou <sup>4</sup>  
Tianyou Guo<sup>4</sup>  
Mohammed A Mamun <sup>1,2</sup>

<sup>1</sup>CHINTA Research Bangladesh, Dhaka, Bangladesh; <sup>2</sup>Department of Public Health and Informatics, Jahangirnagar University, Dhaka, Bangladesh; <sup>3</sup>Department of Management Sciences, Shaheed Zulfiqar Ali Bhutto Institute of Science and Technology, Islamabad, Pakistan; <sup>4</sup>Exercise Psychophysiology Laboratory, Institute of KEEP Collaborative Innovation, School of Psychology, Shenzhen University, Shenzhen, People's Republic of China

**Background:** Problematic smartphone use (PSU) has been increasing hastily in recent decades, and it has become inseparable during the COVID-19 pandemic, especially among the students who are at risk of problematic smartphone use. Therefore, the present study aimed to investigate the prevalence and associated factors of PSU during the COVID-19 pandemic among the Bangladeshi students.

**Methods:** A total of 601 Bangladeshi students were recruited through an online-based cross-sectional survey that was conducted between October 7 and November 2, 2020. The survey collected information related to socio-demographics, behavioral health, internet use behaviors, depression, anxiety, and PSU. Independent samples *t*-test and one-way ANOVA were performed to present the relationship between the studied variables and PSU. Multiple linear regression analysis was also used for investigating the explanatory power of the predictive models for PSU.

**Results:** Surprisingly, about 86.9% of the students scored to be problematic smartphone users ( $\geq 21$  out of a total 36 based on the Smartphone Application-Based Addiction Scale). In addition, medical students, engaging in a relationship, performing less physical activity, longer duration of internet use, some sorts of internet use purpose (eg, messaging, watching videos, using social media), depression, and anxiety were significantly associated with higher scores of PSU. After adjusting all the studied variables, the final model explained a 31.3% variance predicting PSU.

**Conclusion:** The present study is one of the first approaches to assess the prevalence of PSU among the Bangladeshi students during the COVID-19 pandemic, whereas the addiction level was superfluous (and this may be due to more online engagement related to the pandemic). Thus, the study recommended strategies or policies related to the students' risk-reducing and healthy use of smartphones.

**Keywords:** Bangladeshi student, Bangladesh, smartphone, problematic smartphone use, smartphone addiction in Bangladesh, smartphone overuse, technological addiction

## Introduction

Nowadays, the impact of modern technology, smartphone use – for example, has been increased dramatically due to its advantages, such as easy setting up communication, learning opportunity, finding updated information, and accessing ideas for business plans. In addition, it has become one of the most indispensable commodities among young people, particularly students.<sup>1</sup> During the COVID-19 pandemic, the importance of smartphone use has aggravated as of its multifunctional capacity integrating several functions such as information, communication, online education,

Correspondence: Tianyou Guo;  
Mohammed A Mamun  
Email gtyou168@126.com;  
mamunphi46@gmail.com

Received: 17 June 2021  
Accepted: 26 August 2021  
Published: 13 September 2021



entertainment, and so forth.<sup>2</sup> However, excessive and uncontrolled use of smartphones can be deleterious to psychological health, which was explored in the prior studies conducted during the normal time [see Sohn et al<sup>3</sup> for a recent systematic review].

In response to the COVID-19 pandemic, the government of Bangladesh has taken some of the preventive measures introducing a countrywide lockdown like the previous outbreaks (eg, SARS in 2003, Ebola in 2014), along with social distancing, restriction on movement to curb the spread of the virus.<sup>4–6</sup> Under the circumstances, people's normal lives have been disrupted, especially for the students, as their educational institutions were also closed down mandatorily to alleviate its spread.<sup>6</sup> Consequently, a rise in mental health problems was observed in Bangladeshi students. That is, a recent systematic review of the cross-sectional studies reported mild to severe symptoms of depression, anxiety, and stress ranging from 46.92% to 82.4%, 26.6% to 96.82%, and 28.5% to 70.1%, respectively.<sup>6</sup> The educational process has been converted into online, reflecting more engagement with smartphones than the normal period.<sup>7</sup> In addition, students feel lonely as their social circle has been physically disrupted, which involves them using smartphones for a longer period of time to spend their free time,<sup>8</sup> which is one of the major factors that can lead to addictive smartphone use.<sup>9</sup> Prior to the COVID-19 pandemic, a systematic review suggested that the prevalence of problematic smartphone use (including smartphone addiction) ranged between 10% and 30% among children and young people,<sup>3</sup> whereas, this rate is reported as 78.8% among the Bangladeshi university students.<sup>10</sup> Under the COVID-19 circumstance, it is anticipated that many of the Bangladeshi students will be at risk of problematic smartphone use, and its magnitude will be higher than the prior rate reported during the normal time.

Students' excessive dependency on smartphone use adversely impacts daily life disturbances, such as interruption of concentration in work, disruption in daily meal, reduction of productivity, disruption of the social relationship, suffering from psychological problems along with physical difficulties, such as wrist pain, neck stiffness, blurred vision, and disturbances in sleeping patterns.<sup>3,11</sup> It also impacts their academic performance, where they pay less attention during class-time through using social media, messaging, browsing websites, etc.<sup>1,12</sup> In extreme conditions, addictive behavior related to smartphone use may lead them to suicidality.<sup>12–14</sup> More specifically,

suicidal ideation is found 35.1% among smartphone over-users, whereas it is only 17.9% among the normal users.<sup>15</sup>

In Bangladesh, a few studies assessed technological addictions (eg, internet addiction and Facebook addiction, more generally), but smartphone addiction is yet to be investigated [see Griffiths and Mamun<sup>16</sup> and Mamun and Griffiths<sup>17</sup> for technological addiction-related studies]. Smartphone dependency or problematic smartphone use (PSU) has increased among the students during the COVID-19 pandemic. Regrettably, only one study was conducted on PSU during the pandemic, but that study did not report the PSU prevalence rate.<sup>18</sup> Therefore, the present study observes the prevalence rate of PSU and predictive factors among the Bangladeshi students.

## Methods

### Study Design, Procedure, and Participants

An online-based cross-sectional survey was conducted among the Bangladeshi students. Data were collected through an online data collection tool (eg, Google form) between October 7 and November 2, 2020; through a structured questionnaire concerning socio-demographics, behavior and health related, internet use behaviors related, depression, anxiety, and smartphone addiction. The questionnaire was distributed on popular Bangladeshi social media sites (eg, Facebook, WhatsApp, etc.) to collect data. The inclusion criteria were being a Bangladeshi student, studying at least in high school, participating willingly in the study. However, initially, 617 students filled-up data were obtained using a convenience sampling method, whereas after omitting incomplete data, overall, 601 samples were kept for final analysis.

## Measures

### Sociodemographic Information

Basic sociodemographic information was collected based on gender, educational status (ie, university, medical college, and high school), residence area (ie, rural or urban), relationship status, monthly family income (ie, lower-class = less than 15,000 BDT; middle-class = 15,000–30,000 BDT; upper-class = more than 30,000 BDT), types of the family (eg, joint or nuclear), and also currently they are living with their family or not during this survey period.

### Behaviour and Health-Related Measures

Behaviour and health-related information were collected based on sleeping status (eg, normal sleeping was considered as 6–7 hours, which was deployed in the previous

Bangladeshi study<sup>19</sup>), physical exercise (eg, at least 30 minutes daily walking, cycling, swimming, or other activities regularly), smoking status and comorbidity status (eg, students who previously experience a number of illnesses, such as asthma, heart problems, kidney problems and diabetes, are denoted as “yes” and vice versa).

### Internet Use Behaviours

The internet uses behaviour-related information was collected concerning the duration of internet use as suggested by a prior Bangladeshi study.<sup>19</sup> Besides, the purpose of internet use was also included, such as educational activities, messaging, gaming, watching videos, social media browsing, online shopping, watching the news and others.<sup>19</sup> Students were able to provide multiple responses based on their daily uses.

### Depression

Depression was determined by using Patient Health Questionnaire (PHQ-2) scale,<sup>20,21</sup> whereas participants were asked how often they experienced the two core symptoms of depressive disorder (ie, “Little interest or pleasure in doing things”, and “Feeling down, depressed, or hopeless”) over the past two weeks. Besides, participants’ responses were recorded on a 4-point Likert scale (0= not at all to 3=nearly every day), including a score range of 0 to 6. A total score of  $\geq 3$  suggested the presence of depression among participants.<sup>20,21</sup> The Cronbach’s alpha of this study was 0.77.

### Anxiety

Anxiety was measured using the Generalized Anxiety Disorder (GAD-2) scale.<sup>21,22</sup> Participants were asked how often they experienced the two core symptoms of anxiety disorder (ie, “Feeling nervous, anxious or on edge”, and “Not being able to stop or control worrying”) over the past two weeks. Besides, participants’ responses were recorded on a 4-point Likert scale (0= not at all to 3=nearly every day), including a score range of 0 to 6.<sup>21,22</sup> A total score of  $\geq 3$  suggested the presence of anxiety among participants.<sup>21</sup> The Cronbach’s alpha of this study was 0.77.

### Problematic Smartphone Use

Problematic smartphone use was measured using the Smartphone Application-Based Addiction Scale.<sup>23</sup> The scale consisted of six items based on the component model of addiction (ie, salience, mood modification, tolerance, withdrawal symptoms, conflict, and relapse), where question items include “My smartphone is the most

important thing in my life” and “Over time, I fiddle around more and more with my smartphone”.<sup>23,24</sup> Participant responses were recorded on a 6-point Likert scale (1 = strongly disagree to 6 = strongly agree). The overall score is determined by adding each item’s individual scores 1 to 6, which provides a minimum score of 6, and a maximum score of 36.<sup>23</sup> The problematic smartphone use (PSU) was determined using 21 as a cut-off score out of 36 as followed in the previous Bangladeshi study.<sup>10</sup> Previously, good psychometric characteristics and internal scale consistency were observed for this scale.<sup>25</sup> Besides, the Cronbach’s alpha of this study was 0.70.

### Ethical Consideration

Before data collection, online informed consent was taken from the participants after describing the nature and purpose of the study. Participation was voluntary, and the security of their data was also ensured. Initially, the project was approved by the CHINTA Research Bangladesh for conducting. However, to oversee the project, external institute ethics approval was also granted by the ethical review committees of the Institute of Allergy and Clinical Immunology of Bangladesh. All the study procedures were followed by the Declaration of Helsinki.

### Statistical Analysis

Data analysis was conducted using IBM SPSS Statistics (version 22) and Microsoft Excel 2019. After data collection, the data were cleaned and prepared for final analysis by Microsoft Excel 2019. Descriptive statistics such as frequencies and percentages were carried out, whereas independent samples *t*-test and one-way ANOVA test determine the mean differences of the studied variables against PSU. Multiple linear regression was also performed, considering PSU as the dependent variable. The normality of the distribution and multicollinearity (eg, VIF and tolerance values) were also tested, and no issues were found. Finally, the value of  $p < 0.05$  was set as statistically significant with a 95% confidence interval for the tests.

## Results

### Characteristics of the Participants

More than half of the respondents were male (57.2%), whereas 65.6% of the students belonged to a university background; 75.2% and 44.6% were from urban areas and upper-class families, respectively. Most of them were from nuclear families, and being single based on relationship

**Table 1** Distribution of the Socio-Demographic Variables with Problematic Smartphone Use

Variables	n (%)	Mean and SD	p-value
<b>Gender</b>			
Male	344 (57.2)	24.78 ± 4.95	0.073
Female	257 (42.8)	25.52 ± 4.89	
<b>Educational status</b>			
University	394 (65.6)	24.75 ± 4.47	<0.001
Medical college	178 (29.6)	26.55 ± 4.76	
High school	29 (4.8)	21.07 ± 8.13	
<b>Current residence</b>			
Rural	149 (24.8)	24.68 ± 5.41	0.227
Urban	452 (75.2)	25.25 ± 4.76	
<b>Monthly family income (BDT)</b>			
<15,000	106 (17.6)	24.07 ± 4.91	0.011
15,000–30,000	227 (37.8)	25.77 ± 4.37	
>30,000	268 (44.6)	24.95 ± 5.31	
<b>Family type</b>			
Joint	132 (22.0)	24.57 ± 4.48	0.161
Nuclear	469 (78.0)	25.26 ± 5.04	
<b>Relationship status</b>			
Single	478 (79.5)	25.14 ± 4.43	<0.001
In a relationship	67 (11.1)	26.92 ± 5.37	
Married	56 (9.3)	22.64 ± 7.09	
<b>Currently living with family</b>			
No	78 (13.0)	24.46 ± 6.04	0.215
Yes	523 (87.0)	25.20 ± 4.74	

status along with currently living with the family was higher in the total sample (Table 1). In addition, about half of the respondents were involved in physical exercise, whereas 53.9% reported sleeping 6 to 7 hours daily. In contrast, 91.5% and 89.2% reported not being involved with smoking and comorbidity status, respectively (Table 2). More than half of the respondents reported using the internet for a longer duration (eg, more than 5 hours) (Table 3). Lastly, 43.3% and 32.6% of the participants had scored to be depressed and anxious (Table 4).

## Mean Differences of Problematic Smartphone Use

Surprisingly, 86.9% of the participants were reported to have PSU. The distribution of the variables across PSU was presented in Tables 1–4. Although females scored

**Table 2** Distribution of the Behavioral Health-Related Variables with Problematic Smartphone Use

Variables	n (%)	Mean and SD	p-value
<b>Daily sleeping hour</b>			
Less than 6 hours	69 (11.5)	25.84 ± 5.17	0.335
6 to 7 hours	324 (53.9)	24.89 ± 4.58	
More than 7 hours	208 (34.6)	25.19 ± 5.36	
<b>Physical exercise</b>			
No	306 (50.9)	26.33 ± 4.51	<0.001
Yes	295 (49.1)	23.84 ± 5.03	
<b>Smoking status</b>			
No	550 (91.5)	25.27 ± 4.69	0.008
Yes	51 (8.5)	23.35 ± 6.79	
<b>Comorbidity status</b>			
No	536 (89.2)	25.10 ± 4.76	0.937
Yes	65 (10.2)	25.15 ± 6.19	

higher in PSU, the significant gender difference was absent ( $25.52 \pm 4.89$  vs  $24.78 \pm 4.95$ ;  $p = 0.073$ ). Within educational status, medical students significantly reported having a higher PSU level than university or high-school students ( $p < 0.001$ ). Similarly, participants who were engaged in a relationship ( $p < 0.001$ ) and were physically inactive ( $p < 0.001$ ) had a greater likelihood of being addicted compared to others (Table 1). The more engagement with the internet, the more (PSU) behaviors were reported ( $p < 0.001$ ). Additionally, some of the purposes of internet use like messaging ( $p < 0.001$ ), video watching ( $p < 0.001$ ), and using social media ( $p < 0.001$ ) were strongly associated with a higher level of PSU (Table 3). Finally, participants suffering from psychological problems, such as depression and anxiety, were significantly more prone to being problematic smartphone users (Table 4).

## Predictive Models for Problematic Smartphone Use

Table 5 represents a multiple linear regression analysis that was conducted to predict the variance of problematic smartphone use. A total of four models were included in the regression analysis, whereas except for model 1 (which consisted of only sociodemographic information), all the models were statistically significant ( $p < 0.001$ ) with PSU. In addition, the final model predicted a total of 31.3% of

**Table 3** Distribution of the Online Use Behaviors Related Variable with Problematic Smartphone Use

Variables	n (%)	Mean and SD	p-value
<b>Daily internet use time</b>			
Less than 2 hours	23 (3.8)	20.87 ± 3.61	<0.001
2 to 3 hours	114 (19.0)	23.38 ± 3.38	
4 to 5 hours	144 (24.0)	24.37 ± 4.01	
More than 5 hours	320 (53.2)	26.356 ± 5.424	
<b>Purpose of online use</b>			
Educational	506 (84.2)	25.17 ± 4.59 vs 24.79 ± 6.46	0.493
Messaging	581 (96.7)	25.38 ± 4.53 vs 17.25 ± 8.61	<0.001
Gaming	148 (24.6)	25.47 ± 4.67 vs 24.99 ± 5.01	0.300
Video	556 (92.5)	25.32 ± 4.52 vs 22.47 ± 8.16	<0.001
Social media	574 (95.5)	25.39 ± 4.55 vs 19.18 ± 8.19	<0.001
Shopping	128 (21.3)	25.07 ± 4.02 vs 25.12 ± 5.15	0.922
News	379 (63.1)	24.90 ± 4.53 vs 25.45 ± 5.54	0.193
Others	405 (67.4)	25.39 ± 4.47 vs 24.52 ± 5.74	0.044

**Table 4** Distribution of the Psychopathological Factors with Problematic Smartphone Use

Variables	n (%)	Mean and SD	p-value
<b>Depression</b>			
Probable depression	260 (43.3)	26.60 ± 4.69	<0.001
Normal	341 (56.7)	23.96 ± 4.80	
<b>Anxiety</b>			
Probable anxiety	196 (32.6)	27.25 ± 4.65	<0.001
Normal	405 (67.4)	24.07 ± 4.73	

the variance for PSU with a value of  $p < 0.001$  along with a 95% confidence interval (Table 5).

## Discussion

As mentioned, there is no study investigating the prevalence of problematic smartphone use (PSU) in the country, which was studied herein. Therefore, providing the first insight into PSU during the COVID-19 pandemic can be regarded as another major strength of this study, which can be helpful for other countries sharing similar socio-economic statuses.

The finding indicates that about 86.9% of the Bangladeshi students scored as problematic smartphone users (based on the Smartphone Application-Based Addiction Scale with  $\geq 21$  out of 36 as the cutoff point). The rate is unquestionably higher than any other studies reported in the literature prior to the COVID-19 pandemic;

for example, only the Bangladeshi study reported 78.8% of the university students scored this rate assessing by the same instrument.<sup>10</sup> The high rate of smartphone addiction among the Bangladeshi students during the COVID-19 pandemic is concerning, as the prior studies have reported substantial consequences related to excessive smartphone use among students.<sup>26–28</sup> However, some of the reasons can explain such a higher PSU prevalence rate in the present study. For example, the participants who mandatorily attend online schooling might be responsible, as the previous study reported. That is, some students face difficulties in understanding study materials during their online classes,<sup>29</sup> which may lead them more engagement with smartphones to clarify their doubt about a specific topic. In addition, participants were unable to go outside due to lockdown. Having more confinement time during the lockdown may also lead them to use smartphones to cope with their psychological distress.<sup>30</sup> The prevalence rate of PSU reported herein has less face validity, but the ongoing pandemic situation reflects the rate to be somewhat reasonable.

In particular, this study does not suggest any gender-based differences in relation to PSU, which is in contrast with some of the studies conducted during the normal period<sup>8,31,32</sup> and COVID-19 pandemic situation.<sup>18</sup> It has been found that medical students are experiencing a higher level of addictive behavior compared to high school or university students, which is not previously explored in any other studies to the best of authors' knowledge. In addition, a Saudi Arabian study assessing medical

**Table 5** Predictive Models for Problematic Smartphone Use Based on Multiple Linear Regression Analysis

Variables	Model 1			Model 2			Model 3			Model 4		
	[R <sup>2</sup> =0.019, F=1.609, Adjusted R <sup>2</sup> =0.007, p=0.130]			[R <sup>2</sup> =0.083, F=4.848, Adjusted R <sup>2</sup> =0.066, p<0.001]			[R <sup>2</sup> =0.255, F=9.924, Adjusted R <sup>2</sup> =0.229, p<0.001]			[R <sup>2</sup> =0.313, F=11.948, Adjusted R <sup>2</sup> =0.286, p<0.001]		
	B	S.E.	β	B	S.E.	β	B	S.E.	β	B	S.E.	β
Constant	22.585	1.477		26.878	1.671		10.950	2.166		10.923	2.085	
Gender <sup>a</sup>	0.643	0.418	0.065	0.046	0.420	0.005	0.504	0.402	0.051	0.276	0.388	0.028
Educational status <sup>b</sup>	0.014	0.354	0.002	0.030	0.346	0.004	0.545	0.325	0.064	0.427	0.313	0.050
Current residence <sup>c</sup>	0.467	0.485	0.041	0.182	0.476	0.016	0.203	0.437	0.018	0.196	0.421	0.017
MFI <sup>d</sup>	0.164	0.282	0.025	0.149	0.276	0.022	-0.010	0.253	-0.002	0.036	0.244	0.005
Family type <sup>e</sup>	0.466	0.492	0.039	0.273	0.478	0.023	0.303	0.438	0.025	0.377	0.422	0.032
Relationship status <sup>f</sup>	-0.673	0.323	-0.086	-0.684	0.316	-0.087	-0.297	0.290	-0.038	-0.280	0.280	-0.036
CLWF <sup>g</sup>	0.506	0.619	0.034	-0.018	0.607	-0.001	-0.727	0.570	-0.050	-0.698	0.548	-0.048
DSH <sup>h</sup>				-0.356	0.311	-0.046	-0.181	0.288	-0.023	-0.050	0.278	-0.006
Physical exercise <sup>g</sup>				-2.453	0.406	-0.249	-1.675	0.380	-0.170	-1.472	0.368	-0.149
Smoking status <sup>g</sup>				-1.476	0.720	-0.083	-0.912	0.671	-0.052	-1.099	0.647	-0.062
Comorbidity status <sup>g</sup>				0.047	0.636	0.003	-0.218	0.581	-0.014	-0.378	0.559	-0.024
DIUT <sup>i</sup>							1.256	0.208	0.228	1.052	0.203	5.189
Educational <sup>g</sup>							-0.577	0.521	-0.043	-0.328	0.503	-0.653
Messaging <sup>g</sup>							6.533	1.119	0.238	6.072	1.080	5.623
Gaming <sup>g</sup>							0.346	0.451	0.030	0.158	0.435	0.364
Video watching <sup>g</sup>							0.800	0.392	0.078	0.939	0.378	2.488
Social media <sup>g</sup>							4.073	0.935	0.171	3.843	0.900	4.269
Shopping <sup>g</sup>							-0.206	0.456	-0.017	-0.002	0.439	-0.005
News <sup>g</sup>							-0.532	0.399	-0.052	-0.484	0.384	-1.260
Others <sup>g</sup>							0.161	0.401	0.015	-0.062	0.388	-0.159
Depression										0.865	0.407	0.087
Anxiety										2.049	0.425	0.195

**Notes:** <sup>a</sup>1, male; 2, female. <sup>b</sup>1, university; 2, medical college; 3, high school. <sup>c</sup>1, rural; 2, urban. <sup>d</sup>1, less than 15,000 BDT; 2, 15,000 to 30,000 BDT; 3, more than 30,000 BDT. <sup>e</sup>1, joint; 2, nuclear. <sup>f</sup>1, single; 2, in a relationship; 3, married. <sup>g</sup>1, yes; 0, no. <sup>h</sup>1, less than 6 hours; 2, 6 to 7 hours; 3, more than 7 hours. <sup>i</sup>1, less than 2 hours; 2, 2 to 3 hours; 3, 4 to 5 hours; 4, more than 5 hours.

**Abbreviations:** MFI, monthly family income; CLWF, currently living with the family; DSH, daily sleeping hour; DIUT, daily internet use time.

students’ smartphone addiction reported no significant association between smoking status and smartphone addiction, which is in contrast with the present finding; that is, students with the habit of smoking are at higher risk of PSU.<sup>9</sup> Likewise, physical inactivity was associated with PSU, a finding that is also reported in the present

study.<sup>18,33,34</sup> Physical inactivities may arise due to the restrictive measures (ie, quarantine, social distancing, closure of sports centers, parks, and gyms) implemented by the government of Bangladesh to curb the COVID-19 outbreak, which may engage them with the smartphone to spend their free times leading to addictive behavior.

This study also suggests that students engaged in a relationship have higher levels of problematic smartphone use; such an association was not observed in the previous Bangladeshi study conducted during the pandemic.<sup>18</sup> However, this may be due to feelings of loneliness, physical distancing as their educational institutions were closed down, and maybe fear of being infected by their loved one by the COVID-19. The recent suicide of youth students as of missing their beloved person also supports the situation.<sup>35</sup> As a result, they continuously communicate with each other by using different smartphone applications, which may intensify the risk of PSU. In addition, a longer duration of internet use (more than 5 hours) also significantly influenced smartphone addictive behavior in the present study, consistent with the previous study.<sup>33</sup>

During the pandemic situation, students are getting involved in using smartphones excessively for various purposes like education, messaging, watching videos, playing games, social media use, online shopping, etc. This disruption from normal life may propagate mental health problems, such as depression, anxiety, stress, and so on.<sup>36</sup> However, more exposure to social media is reportedly identified as a suicidal ideation risk factor.<sup>37</sup> The relationship between PSU and psychological suffering is not something unexpected. There is a huge evidence suggesting strong associations between psychological problems and PSU. For instance, a recent systematic review observes that participants with PSU to be 3.17-time, 3.05-time, 1.86-time and 2.60-time higher risk of depression, anxiety, perceived stress and sleep problem, respectively.<sup>3</sup> However, along with depression and anxiety, the purposes of internet use (using social media, watching videos, and messaging) are significantly associated with PSU in this study, as reported in the previous studies during both COVID and non-COVID periods.<sup>18,38–40</sup> This could be due to the lack of physical relationships and contact with relatives or friends due to restrictive social distancing and also to reduce their boredom.

A total of 31.3% variance of PSU are predicted by socio-demographics, behavioral health-related variables, online use behaviors, and psychopathological factors in the present study. However, the prior Bangladeshi study that was also conducted during the pandemic predicted almost the same variance (30%) of PSU by considering the sociodemographic factors (age, gender, educational level, family type, monthly family income, and residence), lifestyle factors (physical exercise, sleeping hours,

smoking cigarettes, and alcohol consumption), home quarantine activities (study, social media use, watching television, household chores, and earning activities), and psychological factors (anxiety and depression).<sup>18</sup>

The present study has some limitations, including cross-sectional study in nature and selection bias occurring as data was collected through online, which likely overestimates the extent of the problematic use. Besides, social desirability or memory biases can arise due to participants' self-reported approach. Furthermore, increased reliance on distant learning during the mandatory quarantine period could be linked to smartphone abuse. In addition, although the duration of smartphone use, age group, consuming alcohol, etc., are significantly associated with its addictive behavior previously,<sup>8,9,31</sup> these variables were not included in this present study. Future studies can examine the role of personality traits as potential predictors of problematic smartphone use and its further effect on users' subjective well-being.<sup>41,42</sup> Considering these limitations, additional studies are required to explore the PSU more rigorously, whereas this study may help.

## Concluding Remarks

The present study provides the first insight into the prevalence of problematic smartphone use among the Bangladeshi students during the COVID-19 pandemic, whereas an unexpected PSU prevalence rate is found. Although smartphones play a significant role during the COVID-19 pandemic by providing necessary information, their overuse makes it concerning for the students. The present study also suggests that PSU is linked to the medical students, students engaging in a relationship, physical inactivity, longer duration of internet use, and some sort of internet use purpose (eg, messaging, watching videos, social media using) along with depression and anxiety. Therefore, to alleviate PSU, parental control is a must. In this case, psychiatric professionals, social workers, and activists can raise awareness and encourage guardians to pay attention. Restricting negotiable smartphone use can be achieved by spending guardians' more time with their children. Furthermore, mind-body exercise and cognitive behavior therapy may also be operative in alleviating PSU among the students in Bangladesh and reducing the states of loneliness, stress, and anxiety by organizing readily available intervention training programs including gentle movement, deep breathing, and meditative state of mind focusing on the issue.<sup>43</sup>

## Acknowledgments

Tianyou Guo acknowledges the funding support they received as: Attentional Bias Characteristics and Eye

Movement Desensitization Intervention of PTSD (No: 31871115). Besides, it should be noted that a paper has been published from this project.<sup>44</sup>

## Funding

The present study did not receive any financial support.

## Disclosure

The authors reported no conflicts of interest in this work.

## References

- Arefin S, Islam R, Mustafi MA, Afrin S, Islam N. Impact of smartphone addiction on business students' academic performance: a case study. *Independ J Manage Prod*. 2017;8(3):955–975. doi:10.14807/ijmp.v8i3.629
- Kamaruddin PSNM, Nawati AM. Smartphone usage and pattern on self-reported symptoms among medical students in Universiti Kebangsaan Malaysia during the COVID-19 lockdown. *Res Sq*. 2020. doi:10.21203/rs.3.rs-67820/v1
- Sohn S, Rees P, Wildridge B, Kalk NJ, Carter B. Prevalence of problematic smartphone usage and associated mental health outcomes amongst children and young people: a systematic review, meta-analysis and GRADE of the evidence. *BMC Psychiatr*. 2019;19:356. doi:10.1186/s12888-019-2350-x
- Gualano MR, Lo Moro G, Voglino G, Bert F, Siliquini R. Effects of Covid-19 lockdown on mental health and sleep disturbances in Italy. *Int J Environ Res Public Health*. 2020;17(13):4779. doi:10.3390/ijerph17134779
- Islam SMDU, Bodrud-Doza M, Khan RM, Haque MA, Mamun MA. Exploring COVID-19 stress and its factors in Bangladesh: a perception-based study. *Heliyon*. 2020;6(7):e04399. doi:10.1016/j.heliyon.2020.e04399
- al mamun F, Hosen I, Misti JM, Kaggwa MM, Mamun MA. Mental disorders of Bangladeshi students during the COVID-19 pandemic: a systematic review. *Psychol Res Behav Manag*. 2021;14:645–654. doi:10.2147/PRBM.S315961
- Alawamleh M, Al-Twait LM, Al-Saht GR. The effect of online learning on communication between instructors and students during Covid-19 pandemic. *Asian Educ Dev Stud*. 2020;ahead-of-print. doi:10.1108/AEDS-06-2020-0131
- Sama HR, Kalvakolanu S. Novel hybrid approaches to measure smartphone addiction—application of statistical and triangular fuzzy techniques. *J Public Aff*. 2020;e2425. doi:10.1002/pa.2425
- Alhazmi AA, Alzahrani SH, Baig M, Salawati EM. Prevalence and factors associated with smartphone addiction among medical students at King Abdulaziz University, Jeddah. *Pak J Med Sci*. 2018;34(4):984–988. doi:10.12669/pjms.344.15294
- Mamun MA, Rayhan I, Akter K, Griffiths M. Prevalence and predisposing factors of suicidal ideation among the university students in Bangladesh: a single-site survey. *Int J Ment Health Addict*. 2020;1–4. doi:10.1007/s11469-020-00403-z
- Elhai JD, Levine JC, Hall BJ. The relationship between anxiety symptom severity and problematic smartphone use: a review of the literature and conceptual frameworks. *J Anxiety Disord*. 2019;62:45–52. doi:10.1016/j.janxdis.2018.11.005
- Kim M-H, Min S, Ahn J-S, An C, Lee J. Association between high adolescent smartphone use and academic impairment, conflicts with family members or friends, and suicide attempts. *PLoS One*. 2019;14(7):e0219831. doi:10.1371/journal.pone.0219831
- Mamun MA, Griffiths MD. The psychosocial impact of extreme gaming on Indian PUBG gamers: the case of PUBG (PlayerUnknown's Battlegrounds). *Int J Ment Health Addict*. 2019;1–5. doi:10.1007/s11469-019-00102-4
- Mamun MA, Griffiths MD. A rare case of Bangladeshi student suicide by gunshot due to unusual multiple causalities. *Asian J Psychiatr*. 2020;49:101951. doi:10.1016/j.ajp.2020.101951
- Kim H-J, Min J-Y, Kim H-J, Min K-B. Association between psychological and self-assessed health status and smartphone overuse among Korean college students. *J Ment Health*. 2019;28(1):11–16. doi:10.1080/09638237.2017.1370641
- Griffiths MD, Mamun MA. Internet addiction among young Bangladeshi adults: critical commentary on Hassan et al (2020). *J Egypt Public Health Assoc*. 2020;95:26. doi:10.1186/s42506-020-00054-x
- Mamun MA, Griffiths MD. The assessment of internet addiction in Bangladesh: why are prevalence rates so different? *Asian J Psychiatr*. 2019;40:46–47. doi:10.1016/j.ajp.2019.01.017
- Islam MS, Sujan MSH, Tasnim R, et al. Problematic smartphone and social media use among Bangladeshi college and university students amid COVID-19: the role of psychological well-being and pandemic related factors. *Front Psychiatry*. 2021;12:647386. doi:10.3389/fpsy.2021.647386
- Mamun MA, Hossain MS, Siddique AB, Sikder MT, Kuss DJ, Griffiths MD. Problematic internet use in Bangladeshi students: the role of socio-demographic factors, depression, anxiety, and stress. *Asian J Psychiatr*. 2019;44:48–54. doi:10.1016/j.ajp.2019.07.005
- Kroenke K, Spitzer RL, Williams JBW. The Patient Health Questionnaire-2: validity of a two-item depression screener. *Med Care*. 2003;41(11):1284–1292. doi:10.1097/01.MLR.000003487.78664.3C
- Löwe B, Wahl I, Rose M, et al. A 4-item measure of depression and anxiety: validation and standardization of the Patient Health Questionnaire-4 (PHQ-4) in the general population. *J Affect Disord*. 2010;122(1–2):86–95. doi:10.1016/j.jad.2009.06.019
- Kroenke K, Spitzer RL, Williams JBW, Monahan PO, Löwe B. Anxiety disorders in primary care: prevalence, impairment, comorbidity, and detection. *Ann Intern Med*. 2007;146(5):317–325. doi:10.7326/0003-4819-146-5-200703060-00004
- Csibi S, Griffiths MD, Cook B, Demetrovics Z, Szabo A. The psychometric properties of the smartphone application-based addiction scale (SABAS). *Int J Ment Health Addict*. 2018;16(2):393–403. doi:10.1007/s11469-017-9787-2
- Griffiths MD. A 'components' model of addiction within a biopsychosocial framework. *J Subst Use*. 2005;10(4):191–197. doi:10.1080/14659890500114359
- Lin C-Y, Imani V, Broström A, et al. Smartphone application-based addiction among Iranian adolescents: a psychometric study. *Int J Ment Health Addict*. 2019;17(4):765–780. doi:10.1007/s11469-018-0026-2
- Hu T, Wang Y, Lin L, Tang W. The mediating role of daytime sleepiness between problematic smartphone use and post-traumatic symptoms in COVID-19 home-refined adolescents. *Child Youth Serv Rev*. 2021;126:106012. doi:10.1016/j.childyouth.2021.106012
- Chen C-Y, Chen I-H, Pakpour AH, Lin C-Y, Griffiths MD. Internet-related behaviors and psychological distress among schoolchildren during the COVID-19 school hiatus. *Cyberpsychol Behav Soc Netw*. 2021. doi:10.1089/cyber.2020.0497
- Zhang MX, Chen JH, Tong KK, Yu EW, Wu AMS. Problematic smartphone use during the COVID-19 pandemic: its association with pandemic-related and generalized beliefs. *Int J Environ Res Public Health*. 2021;18(11):5724. doi:10.3390/ijerph18115724
- Nambiar D. The impact of online learning during COVID-19: students' and teachers' perspective. *Int J Indian Psychol*. 2020;8(2):783–793. doi:10.25215/0802.094



30. Lei LY-C, Ismail M-A-A, Mohammad JA-M, Yusoff MSB. The relationship of smartphone addiction with psychological distress and neuroticism among university medical students. *BMC Psychol*. 2020;8(1):97. doi:10.1186/s40359-020-00466-6
31. Choi S-W, Kim D-J, Choi J-S, et al. Comparison of risk and protective factors associated with smartphone addiction and Internet addiction. *J Behav Addict*. 2015;4(4):308–314. doi:10.1556/2006.4.2015.043
32. Hawi NS, Samaha M. To excel or not to excel: strong evidence on the adverse effect of smartphone addiction on academic performance. *Comput Educ*. 2016;98:81–89. doi:10.1016/j.compedu.2016.03.007
33. Haug S, Castro RP, Kwon M, Filler A, Kowatsch T, Schaub MP. Smartphone use and smartphone addiction among young people in Switzerland. *J Behav Addict*. 2015;4(4):299–307. doi:10.1556/2006.4.2015.037
34. Kim S-E, Kim J-W, Jee Y-S. Relationship between smartphone addiction and physical activity in Chinese international students in Korea. *J Behav Addict*. 2015;4(3):200–205. doi:10.1556/2006.4.2015.028
35. Manzar MD, Albugami A, Usman N, Mamun MA. Suicide among adolescents and youths during the COVID-19 pandemic lockdowns: a press media reports-based exploratory study. *J Child Adolesc Psychiatr Nurs*. 2021;34:139–146. doi:10.1111/jcap.12313
36. HelpGuide. Smartphone addiction; 2020. Available from: <https://www.helpguide.org/articles/addictions/smartphone-addiction.htm>. Accessed March 13, 2021.
37. Mamun MA. Suicide and suicidal behaviors in the context of COVID-19 pandemic in Bangladesh: a systematic review. *Psychol Res Behav Manag*. 2021;14:695–704. doi:10.2147/PRBM.S315760
38. Alhassan AA, Alqadhib EM, Taha NW, Alahmari RA, Salam M, Almutairi AF. The relationship between addiction to smartphone usage and depression among adults: a cross sectional study. *BMC Psychiatr*. 2018;18(1):148. doi:10.1186/s12888-018-1745-4
39. Boumosleh JM, Jaalouk D, Hayashi N. Depression, anxiety, and smartphone addiction in university students-A cross sectional study. *PLoS One*. 2017;12(8):e0182239. doi:10.1371/journal.pone.0182239
40. Tastan S, Tastan B, Ayhan H, Iyigun E, Kose G, Tekaut A. Relationship between nursing students' smartphone addiction and interaction anxiety: a descriptive relation-seeker type study. *Perspect Psychiatr Care*. 2021. doi:10.1111/ppc.12767
41. Abbasi AZ, Nisar S, Rehman U, Ting DH. Impact of HEXACO personality factors on consumer video game engagement: a study on eSports. *Front Psychol*. 2020;11:1831. doi:10.3389/fpsyg.2020.01831
42. Abbasi AZ, Shamim A, Ting DH, Hlavacs H, Rehman U. Playful-consumption experiences and subjective well-being: children's smartphone usage. *Entertain Comput*. 2021;36:100390. doi:10.1016/j.entcom.2020.100390
43. Lu C, Zou L, Becker B, et al. Comparative effectiveness of mind-body exercise versus cognitive behavioral therapy for college students with problematic smartphone use: a randomized controlled trial. *Int J Ment Health Promot*. 2020;22(4):271–282. doi:10.32604/IJMHP.2020.014419
44. Jahan I, Hosen I, al mamun F, Kaggwa MM, Griffiths MD, Mamun MA. How has the COVID-19 pandemic impacted internet use behaviors and facilitated problematic internet use? A Bangladeshi study. *Psychol Res Behav Manag*. 2021;14:1127–1138. doi:10.2147/PRBM.S323570

## Risk Management and Healthcare Policy

Dovepress

### Publish your work in this journal

Risk Management and Healthcare Policy is an international, peer-reviewed, open access journal focusing on all aspects of public health, policy, and preventative measures to promote good health and improve morbidity and mortality in the population. The journal welcomes submitted papers covering original research, basic science, clinical & epidemiological studies, reviews and evaluations,

guidelines, expert opinion and commentary, case reports and extended reports. The manuscript management system is completely online and includes a very quick and fair peer-review system, which is all easy to use. Visit <http://www.dovepress.com/testimonials.php> to read real quotes from published authors.

Submit your manuscript here: <https://www.dovepress.com/risk-management-and-healthcare-policy-journal>