Suicidal ideation among Bangladeshi university students early during the COVID-19 pandemic: Prevalence estimates and correlates

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ABSTRACT

Lockdown, social isolation, and interruption of daily life during the COVID-19 period have impacted many lives. University students are particularly vulnerable to such disruptions and may be particularly disposed to suicidal ideation, potentially creating a new public health crisis. This study aimed to assess suicidal ideation and associated factors among university students in Bangladesh during the early stages of the COVID-19 pandemic. A cross-sectional online survey was conducted using the Google form (Google survey tool) from April to May 2020. Initially, 3366 respondents voluntarily completed the survey form. Finally, 3331 surveys were included in the final analyses after removing incomplete surveys. The data ware reviewed, rechecked, and analyzed with SPSS (25.0 version) software. A total of 1979 (59.4%) males and 1352 (40.6%) females participated. Respondents were between the ages of 18 to 28 years (mean age 21.4 years [SD = 1.9]). The prevalence estimate of suicidal ideation was 12.8%. Potential risk factors included less sleep, excess sleep, cigarette smoking, past suicidal thoughts, suicide attempt history, family history of suicidality, depression, anxiety, and stress. Potential protective factors included being male, having lower SES, living in rural areas, regular physical exercise, and satisfactory study. Suicidal ideation was prevalent among Bangladeshi university students during the onset of the COVID-19 pandemic. Understanding the correlates of suicidal ideation may aid to develop targeted strategies to support students during and after the COVID-19 pandemic.

1. Introduction

The world is facing a severe pandemic (COVID-19) with no reliable prediction of its duration. Bangladesh reported the first three cases of COVID-19 in March 08, 2020 (Islam, Emran, et al., 2020; Tasnim et al., 2020). To alleviate the spread of the potentially fatal disease, the government of Bangladesh declared a "lockdown" on March 26, 2020, with closures of educational institutions and enforced maintenance of strict social isolation (Bdnews24.com, 2020; Ferdous et al., 2020). Nonetheless, steep rises in COVID-19 cases were observed in April 2020 (Dhaka Tribune, 2020). The imposition of isolation and quarantine hindered

social activities, and the situation created psychological fears and the potential for vulnerable citizens to contemplate suicide (Thakur & Jain, 2020).

Pandemic issues, such as spatial or physical distancing, isolation, and quarantine, as well as occupational, educational, and economic impacts, may generate psychological distress including sadness, depression, anxiety, fear, anger, annoyance, frustration, guilt, hopelessness, boredom, and panic (Islam, Ferdous, et al., 2020; Islam, Potenza, et al., 2020; Mazza et al., 2020; Thakur & Jain, 2020). Many people experience these features of mental health problems during and after crises like the COVID-19 pandemic (Banerjee, 2020), and these may contribute to

suicidal ideation. People may experience on average 0.205 years of life lost due to psychosocial consequences of COVID-19-related mitigation measures (Moser et al., 2020). Strict spatial isolation and mass home quarantining may have long-lasting effects on student psychological well-being (Brooks et al., 2020), and isolation among prisoners in Italy has been associated with two- to four-fold elevated rates of suicide (Roma et al., 2013). Moreover, to obtain relief from negative mood states and experiences, individuals may initiate or increase participation in potentially addictive behaviors (e.g., tobacco use, heavy drinking, and illicit drug use) that are also associated with suicidal ideation (Kaloyanides, McCabe, Cranford, & Teter, 2007) and behavior among adolescents (Wilcox, 2004) and adults (Esang & Ahmed, 2018), with risk of death by suicide 10 to 14 fold higher in individuals using substances or with substance use disorders (Wilcox et al., 2004). Early adulthood (e. g. from 18 to 30 years) appears to be a particularly vulnerable developmental epoch for suicidal ideation (Arafat, 2019). Findings from a previous study suggested high levels of anxiety and depression among Bangladeshi students early in the COVID-19 pandemic (Islam, Sujan, et al., 2020), and these factors may lead to suicidal ideation (Czeisler et al., 2020). However, the extent to which students may experience suicidal ideation during the pandemic is not well understood.

Suicidal ideation is prevalent among university students, with estimates of 6.3% noted in American students and 13.8% among Bangladeshi students (Eisenberg et al., 2013; Rahman, Islam, Mamun, et al., 2020). The latter study also found associations between suicidal ideation and female gender, being a fifth-year student, being of lower socioeconomic status, having experienced traumatic events, having a family history of suicide, and depression (Rahman, Islam, Mamun, et al., 2020). Suicidal ideation, which is considered an identifiable and modifiable risk factor for suicidal behavior, is important to identify for suicide prevention (Mann et al., 2005; Zalsman et al., 2016). The elevated prevalence of suicidal ideation among university students has been associated with depression, drug use problems, sleep problems, and being overweight (Ashrafioun et al., 2016). Such factors (e.g., depression, stress, post-traumatic stress symptoms, mood alterations and irritability, emotional disturbances, emotional exhaustion, insomnia, anger) are prevalent among individuals who have been quarantined (Serafini et al., 2020). Potential risk factors for suicidal ideation in university students may include psychopathological symptoms such as depression and anxiety (Arria et al., 2009; Gulec Oyekcin et al., 2017; Mann et al., 2005; Sareen et al., 2005).

During the COVID-19 pandemic and with isolation and quarantine, there may be increases in suicidal ideation and behaviors among at-risk populations (Mamun & Griffiths, 2020). The first suicide case (male; age 36 years) reported in Bangladesh related to the fear of COVID-19 occurred on March 25, 2020 (Mamun & Griffiths, 2020). Later, another case report identified eight apparent suicides in Bangladesh during the COVID-19 pandemic in April 2020 (Bhuiyan et al., 2020).

Students' psychological well-being may be disrupted by not only having strict spatial isolation imposed, but also by future career uncertainty. Hence, university students may be at particular risk of contemplating suicide during the outbreak. Here, we sought to examine the prevalence and correlates of suicidal ideation among Bangladeshi university students in a nationwide survey early during the COVID-19 pandemic. We hypothesized that suicidal ideation would be prevalent and would exceed the 13.8% estimate previously observed in Bangladeshi students (Rahman, Islam, Mamun, et al., 2020), and would be more prevalent among females as compared with males. Further, we hypothesized positive correlations between suicidal ideation and mental health concerns (e.g., depression and anxiety) and negative correlations with measures of positive health (good sleep, regular exercise, and self-reported satisfaction with studies).

2. Materials and methods

2.1. Study design and participants

The present survey was cross-sectional and conducted from April to May 2020. The study included 3331 respondents from different universities (including public, private, and national universities located in different administrative units of Bangladesh). This study's target population was university students who were enrolled in various subject areas at different universities in Bangladesh. Inclusion criteria were being (i) a university student, (ii) aged 18 years or older, and (iii) able to read and understand Bangla. Exclusion criteria included (i) students who were under 18 years of age, and (ii) those who did not complete the entire survey.

2.2. Data collection procedure

A self-reported questionnaire written in Bangla (participants' native language) was employed to collect data during the survey. After depositing all questions in Google form, a shareable link was generated. An internet-based survey was conducted using the Google survey link shared across different online platforms available to university students (e.g., university students' Facebook groups, online students' forums, and university blogs). In informed consent, a specific indication was made of our interest to assess suicidal ideation in relation to the COVID-19 pandemic among university students. Moreover, the name of participants' universities was queried during the survey. A pilot test was conducted on 50 samples before inaugurating final data collection. These pilot data were excluded in subsequent analyses. Initially, 3366 individuals submitted survey responses after providing informed consent. Of these, 3331 respondents (97.5%) completed the entire survey voluntarily and anonymously. Duplicate respondents were controlled using google survey tools' default system that allowed a participant in a single time to fill up the survey form after signing in using his/her google account.

2.3. Measures

A self-reported virtual questionnaire containing informed consent along with four sections assessing socio-demographic, behavioral, suicidal, and psychological factors, was employed to conduct the survey. In the informed consent, a specific indication was made of COVID-19 and our interest in assessing suicidal ideation and mental states in relation to the COVID-19 outbreak and the ensuing public health measures.

2.3.1. Socio-demographic measures
Socio-demographic data were collected during the survey including age, gender, marital status, family type (nuclear/joint, with joint families being extended and often including multiple generations), monthly family income, and living area (urban/rural). Socio-economic status (SES) was categorized into three classes: lower, middle, and upper based on monthly family income of<15,000 Bangladeshi Taka (BDT) $\approx$ 177 US $, 15,000–30,000 BDT $\approx$ 177–354 US$, and more than 30,000 BDT $\approx$354 US$, respectively (Rahman, Islam, Bishwas, et al., 2020, Rahman, Islam, Mamun, et al., 2020). The intra-class correlation coefficient (ICC) of socio-demographic measures was 0.24.

2.3.2. Behavioral measures
Behavioral measures were collected during the survey by asking questions concerning physical exercising (yes/no), average sleeping hours, satisfaction regarding academic studies (yes/no), and cigarette smoking (yes/no) in relation to the COVID-19 outbreak. Sleeping hours were classified into three categories on the basis of average daily sleeping hours and classed as normal (7–9 h), less than average (<7h), or more than average (>9h) based on (Hirshkowitz et al., 2015; Islam, Akter, et al., 2020). The overall ICC of behavioral measures was −0.02.

2.3.3. Suicidal measures

Suicidal measures were recorded during the survey by asking 'yes/ no' questions concerning suicidal ideation, past suicidal thoughts, history of suicide attempts, and family members' suicidal history. With regard to assessing suicidal ideation, respondents were asked the following: *"During the COVID-19 outbreak, have you ever seriously thought about killing yourself?"*. The construction of this question was based on previous studies that assessed suicidal ideation: *"During the past 12 months, have you ever seriously thought about killing yourself?"* (Begum et al., 2017; Pandey et al., 2019; Santos et al., 2017). Family history of suicide was assessed using the question, *"Has anyone in your family committed suicide?"*. In addition, *"Have you ever seriously thought about killing yourself?"*, and *"Have you ever attempted to kill yourself?"* were asked during the survey to assess lifetime suicidal thoughts and suicide attempt history, respectively; these have been recently used in a study of university students (Abdu et al., 2020). The overall ICC of suicidal measures was −0.11.

2.3.4. Psychometric measures

The present study used the Depression, Anxiety and Stress Scale (DASS-21: Lovibond & Lovibond, 1995; Bangla version: Alim et al., 2017) to assess depression, anxiety, and stress. The DASS-21 is widely in epidemiological surveys. This scale consists of 21 questions including three subscales: 7 items each for depression, anxiety, and stress, with each question scored along a four-point Likert scale ranging from 0 ("never") to 3 ("always") (Lovibond & Lovibond, 1995). In the present study, moderate to severe or extremely severe scores were used to categorize levels of depression, anxiety, and stress, using the following cutoffs: depression ≥ 14, anxiety ≥ 10, and stress ≥ 19 (Alim et al., 2017). In the present study, the overall Cronbach's alpha of the DASS-21 was 0.94 (for depression, anxiety, and stress subscales were 0.86, 0.86, and 0.86, respectively). The overall ICC of the DASS-21 was 0.94.

2.4. Statistical analysis

Data were analyzed using Microsoft Excel 2019 and SPSS software version 25.0. Microsoft Excel was used for editing, sorting, and coding. The excel file was then imported into SPSS software. Descriptive statistics (frequencies, percentages, means, standard deviation) and some analyses (i.e., chi-square tests, reliability tests) were performed using SPSS software. Logistic regression (both unadjusted and adjusted models) was performed with a 95% confidence interval to determine significant associations between categorical dependent and independent variables. Analyses were univariate, yielding crude odds ratios (*CORs*), followed by multivariable analyses with predictors (only significant variables from unadjusted model) combined in the models, and yielding adjusted odds ratios (*AORs*). The association of variables was considered statistically significant if the two-sided *p*-value was<0.05.

2.5. Ethics

All procedures of the present study were performed in accordance with the Institutional Research Ethics and the Declaration of Helsinki. The study was approved by the Biosafety, Biosecurity, and Ethical Clearance Committee, the ethical review board of the Faculty of Biological Sciences, Jahangirnagar University, Savar, Dhaka-1342, Bangladesh (Ref No: BBEC, JU/ M 2020/COVID-19/(8)6). After providing digital consent, respondents completed the survey form. The consent form specifically outlined the aims, objectives, nature, and procedure of the study and stated clearly the right to withdraw data from the survey at any time.

3. Results

A total of 3,331 respondents was recruited into the final analyses; 59.4% were male, the mean age was 21.4 years (*SD* = 1.9) and ages ranged between 18 and 28 years, and almost all respondents were unmarried (82.1%). Most were from nuclear families (81.8%), and the majority were from the higher SES group (50.3%) and came from urban areas (68.0%) (Table 1). More than half of respondents (55.6%) did not engage in physical exercise, and most (73.0%) slept in a normal range (7–9 h). Additionally, most did not smoke cigarettes (81.1%), and did not have satisfactory feelings regarding their studies (62.4%) during the COVID-19 outbreak.

A sizable minority of respondents (12.8%) had suicidal ideation during the COVID-19 outbreak, and 18.0% of respondents reported past suicidal thoughts during pre-COVID-19 times. Additionally, a sizable minority reported prior suicidal attempts (6.6%), and 3.2% reported a family history of suicide. Based on the psychometric scale, the findings revealed that the majority (63.0%, 63.9%, and 58.9%) of respondents experienced depression, anxiety, and stress, respectively.

Proportions of respondents with suicidal ideation during the COVID-19 were higher in (i) females versus males, (ii) respondents aged 21–23 years versus 18–20 years, (iii) respondents from higher SES versus lower SES families, (iv) respondents living in urban versus rural areas, (v) respondents not regularly versus regularly exercising, (vi) respondents sleeping less than normal (<6 h) versus a normal range (7–9 h), (vii) respondents sleeping more than normal (>9 h) versus a normal range (7–9 h), (viii) respondents with cigarette smoking versus without, (ix) respondents with unsatisfactory versus satisfactory feelings about their studies, (x) respondents with versus without past suicidal thoughts, (xi) respondents with versus without suicidal attempt histories, (xii) respondents with versus without familial suicidality, (xiii) respondents with versus without considerable depression, (xiv) respondents with versus without considerable anxiety, and (xv) respondents with versus without considerable stress.

Univariable regression analysis was performed to assess potential risk and protective factors for suicidal ideation (Table 2). Males were 0.75 times less likely to have suicidal ideation than females. Additional protective factors mitigating against suicidal ideation were reflected in individuals from lower vs. higher SES; individuals from middle vs. higher SES; individuals living in rural vs. urban areas; individuals with vs. without regular exercise; and individuals with vs. without having satisfactory feelings regarding their studies.

Respondents sleeping fewer than normal hours were 3.25 times more likely to have suicidal ideation than those sleeping a normal range. Additional potential risk factors of suicidal ideation included more than normal vs. normal sleep; smoking vs. non-smoking status; individuals with vs. without past suicidal thought; individuals with vs. without suicidal attempt history; individuals with vs. without family suicidal history; individuals with versus without considerable depression; individuals with versus without considerable anxiety; and individuals with versus without considerable stress.

Multivariable analyses with predictors (only significant variables from unadjusted model) entered together in the model revealed that most factors remained significant, with only gender losing statistical significance (see Table 3).

4. Discussion

Our study hypotheses were partially supported. According to this study's findings, 12.8% of students had suicidal ideation during the COVID-19 pandemic, 18% had past suicidal thoughts, and 6.6% had prior suicide attempts. Factors significantly associated with suicidal ideation included less sleep, more sleep, cigarette smoking, past suicidal thoughts, suicide attempt history, family history of suicidality, depression, anxiety, and stress. Suicidal ideation was less prevalent among male students, although gender was no longer significant in multivariate analyses. Further, lower SES, less regular physical exercise, and not having satisfactory feelings about one's academic studies were associated with suicidal ideation. Implications are discussed below.

University students are important for a country's future. Suicidal

Table 1
Distribution of demographic characteristics and suicidal ideation of participants.

Characteristics	Total N = 3331		Suicidal ideation				χ^2	df	p-value
			No		Yes				
	n	(%)	n	(%)	n	(%)			
Gender									
Male	1979	(59.4)	1752	(88.5)	227	(11.5)	7.934	1	0.005
Female	1352	(40.6)	1152	(85.2)	200	(14.8)			
Age									
18–20 years	1189	(35.7)	1065	(89.6)	124	(10.4)	12.001	2	0.002
21–23 years	1719	(51.6)	1466	(85.3)	253	(14.7)			
24–28 years	423	(12.7)	373	(88.2)	50	(11.8)			
Marital status									
Unmarried	2735	(82.1)	2399	(87.7)	336	(12.3)	4.179	2	0.124
In a relation	489	(14.7)	416	(85.1)	73	(14.9)			
Married	107	(3.2)	89	(83.2)	18	(16.8)			
Family type									
Nuclear	2725	(81.8)	2389	(87.7)	336	(12.3)	3.201	1	0.074
Joint	606	(18.2)	515	(85.0)	91	(15.0)			
Socio-economic status									
Lower	497	(14.9)	466	(93.8)	31	(6.2)	68.034	2	<0.001
Middle	1159	(34.8)	1056	(91.1)	103	(8.9)			
Higher	1675	(50.3)	1382	(82.5)	293	(17.5)			
Residence									
Rural	1065	(32.0)	988	(92.8)	77	(7.2)	43.757	1	<0.001
Urban	2266	(68.0)	1916	(84.6)	350	(15.4)			
Physical exercise									
Yes	1478	(44.4)	1346	(91.1)	132	(8.9)	35.937	1	<0.001
No	1853	(55.6)	1558	(84.1)	295	(15.9)			
Sleeping status									
Less than normal	510	(15.3)	382	(74.9)	128	(25.1)	106.053	2	<0.001
More than normal	391	(11.7)	319	(81.6)	72	(18.4)			
Normal (7–9 h)	2430	(73.0)	2203	(90.7)	227	(9.3)			
Cigarette smoking status									
Yes	629	(18.9)	475	(75.5)	154	(24.5)	94.403	1	<0.001
No	2702	(81.1)	2429	(89.9)	273	(10.1)			
Satisfaction with studies									
Yes	1253	(37.6)	1184	(94.5)	69	(5.5)	96.095	1	<0.001
No	2078	(62.4)	1720	(82.8)	358	(17.2)			
Past suicidal thought									
Yes	600	(18.0)	379	(63.2)	221	(36.8)	377.634	1	<0.001
No	2731	(82.0)	2525	(92.5)	206	(7.5)			
Suicidal attempt history									
Yes	221	(6.6)	134	(60.6)	87	(39.4)	149.273	1	<0.001
No	3110	(93.4)	2770	(89.1)	340	(10.9)			
Family history of suicidality									
Yes	105	(3.2)	61	(58.1)	44	(41.9)	82.070	1	<0.001
No	3226	(96.8)	2843	(88.1)	383	(11.9)			
Depression									
Yes	2100	(63.0)	1694	(80.7)	406	(19.3)	215.777	1	<0.001
No	1231	(37.0)	1210	(98.3)	21	(1.7)			
Anxiety									
Yes	2129	(63.9)	1742	(81.8)	387	(18.2)	151.590	1	<0.001
No	1202	(36.1)	1162	(96.7)	40	(3.3)			
Stress									
Yes	1961	(58.9)	1569	(80.0)	392	(20.0)	219.379	1	<0.001
No	1370	(41.1)	1335	(97.4)	35	(2.6)			

ideation during this pandemic should be addressed to prevent premature ending of life. With regard to suicide in Bangladesh, this study presents an assessment of suicide ideation students across universities in Bangladesh soon after the COVID-19 outbreak.

4.1. Comparison with other studies

Despite variations across surveys involving populations studied, methods and cultures, the current findings may be compared with those from prior studies investigating suicidal ideation and related factors among students and other populations.

We observed the prevalence of suicidal ideation during early stages of the COVID-19 pandemic to be 12.8%, and the prevalence of lifetime time suicidal thoughts to be 18.0%. A prior Bangladeshi study conducted during the pre-COVID-19 period reported a 13.8% prevalence of suicidal ideation among university students over the past 12 months (Rahman,

Islam, Mamun, et al., 2020). In contrast, one earlier Bangladeshi study showed a 5% prevalence estimate of suicidal ideation among (rural) youth (Begum et al., 2017), and an 11.7% prevalence estimate was found in another study among school-going adolescents in Bangladesh (Khan et al., 2020). Another study (conducted across 17 countries) showed a 9.2% prevalence of suicidal ideation (Nock et al., 2008). Some studies have reported prevalent suicidal ideation (22.5%) among adolescent high school students in Ethiopia pre-COVID-19 (Amare et al., 2018). An international study reported lifetime prevalence of suicidal ideation among students to be 12.6% (Pereira & Cardoso, 2015), which is comparable to the current findings. A prior study in Ethiopia among university students found lifetime prevalence of suicidal ideation to be 58.3% (Abdu et al., 2020). These prior studies were not conducted at the time of COVID-19 pandemic, and further studies (especially longitudinal ones that directly assess relationships with COVID-19 factors) are needed to examine the potential impact of this pandemic on suicidal

Table 2

Regression analysis (unadjusted estimates) by suicidal ideation of the participants.

Characteristics	Unadjusted model		
	COR	95% CI	p-value
Gender			
Male	0.746	(0.609–0.915)	0.005
Female	Reference		
Age			
18–20 years	0.869	(0.613–1.231)	0.429
21–23 years	1.287	(0.931–1.780)	0.126
24–28 years	Reference		
Marital status			
Unmarried	0.693	(0.412–1.164)	0.165
In a relation	0.868	(0.493–1.526)	0.622
Married	Reference		
Family type			
Nuclear	0.796	(0.620–1.022)	0.074
Joint	Reference		
Socio-economic status			
Lower	0.314	(0.214–0.461)	<0.001
Middle	0.460	(0.362-0.584)	<0.001
Higher	Reference		
Residence			
Rural	0.427	(0.329–0.552)	<0.001
Urban	Reference		
Physical exercise			
Yes	0.518	(0.417–0.644)	<0.001
No	Reference		
Sleeping status			
Less than normal	3.252	(2.552–4.144)	<0.001
More than normal	2.190	(1.639–2.927)	<0.001
Normal (7–9 h)	Reference		
Satisfaction with studies			
Yes	0.280	(0.214–0.366)	<0.001
No	Reference		
Cigarette smoking status			
Yes	2.885	(2.313–3.597)	<0.001
No	Reference		
Past suicidal thought			
Yes	7.147	(5.745–8.892)	<0.001
No	Reference		
Suicidal attempt history			
Yes	5.290	(3.948–7.086)	<0.001
No	Reference		
Family history of suicidality			
Yes	5.354	(3.582–8.004)	<0.001
No	Reference		
Depression			
Yes	13.810	(8.851–21.545)	<0.001
No	Reference		
Anxiety			
Yes	6.454	(4.622–9.012)	<0.001
No	Reference		
Stress			
Yes	9.530	(6.693–13.569)	<0.001
No	Reference		

Note: *COR*: Crude Odds Ratio; CI: Confidence Interval.

Table 3

Regression analysis (adjusted estimates) by suicidal ideation of the participants.

Characteristics	Adjusted model		
	AOR	95% CI	p-value
Gender			
Male	0.861	(0.649–1.144)	0.303
Female	Reference		
Socio-economic status			
Lower	0.486	(0.313–0.754)	0.001
Middle	0.582	(0.442–0.767)	<0.001
Higher	Reference		
Residence			
Rural	0.734	(0.540–0.998)	0.049
Urban	Reference		
Physical exercise			
Yes	0.761	(0.589–0.983)	0.037
No	Reference		
Sleeping status			
Less than normal	2.078	(1.541–2.802)	<0.001
More than normal	1.419	(1.015–1.982)	0.041
Normal (7–9 h)	Reference		
Satisfaction on study			
Yes	0.674	(0.496–0.917)	0.012
No	Reference		
Cigarette smoking status			
Yes	2.300	(1.683–3.144)	<0.001
No	Reference		
Past suicidal thought			
Yes	3.964	(3.022–5.200)	<0.001
No	Reference		
Suicidal attempt history			
Yes	1.551	(1.062–2.263)	0.023
No	Reference		
Family history of suicidality			
Yes	2.666	(1.593–4.462)	<0.001
No	Reference		
Depression			
Yes	4.085	(2.484–6.716)	<0.001
No	Reference		
Anxiety			
Yes	1.806	(1.220–2.674)	0.003
No	Reference		
Stress			
Yes	2.743	(1.817–4.143)	<0.001
No	Reference		

Note: *AOR*: Adjusted Odds Ratio; CI: Confidence Interval.

suicidality found in another Bangladeshi study (Khan et al., 2020). Also, strong associations between suicidal ideation and depression were seen in prior studies among Bangladesh university students (Pervin & Ferdowshi, 2016; Rahman, Islam, Mamun, et al., 2020), resonating with research among adolescents in Germany linking suicidality with depression/anxiety (Brunner et al., 2007).

Several studies suggest that females are more vulnerable to suicidal thoughts than males (Begum et al., 2017; Borges et al., 2008; Brunner et al., 2007; Donath et al., 2014, 2019; Kaess et al., 2011; Nock et al., 2008; Pereira & Cardoso, 2015; Rahman, Islam, Mamun, et al., 2020). Some studies have found no link between gender and suicidal ideation (Amare et al., 2018). The current findings are in line with these studies in that suicidal ideation was more prevalent among females, and this finding no longer remained significant in multivariate models, suggesting that other factors (e.g., anxiety, depression, stress) may in part account for this relationship.

The current research revealed a significant relationship between suicidal ideation and sleeping problems, smoking, and dissatisfaction with studies. These findings resonate with those from previous studies (Begum et al., 2017; Dolsen et al., 2020; Donath et al., 2014; Khader et al., 2020). The current research also indicated associations between physical exercise and suicidal ideation, similar to prior reports (Becker et al., 2018). Prior studies have associated poor physical exercise with depression and anxiety (Carek et al., 2011; Islam et al., 2020) and suggest that physical exercise may reduce depression (Dinas et al.,

thoughts and behaviors (Klomek, 2020).

Many students in this study had suicide-attempt histories (6.6%), and these appear higher than those from a *meta*-analysis of college students conducted in China (pooled prevalence was 2.8% with estimates ranging from 0.4% to 10.5%) (Yang et al., 2015), and another study of university students in Ethiopia (4.4%; Abdu et al., 2020). However, in other studies (before COVID-19), suicide attempt prevalence was higher, at 7.1% among Turkish college students (Toprak et al., 2011), and 16.2% among high school students in Ethiopia (Amare et al., 2018). As such, longitudinal studies are needed given that suicide attempts may take time to occur, and interventions currently appear warranted to help prevent such events.

Suicidal ideation was higher among people with depression, anxiety, and stress. Similar findings have been observed previously (Levy et al., 2019), prior to COVID-19, similar to relationships between anxiety and

2011). Future studies should examine relationships among these domains longitudinally.

This study found a significant relationship between suicidal ideation and socioeconomic status: students from higher SES families had more suicidal ideation than those from lower SES families, similar to prior findings among adolescents (Kokkevi et al., 2012). Lower SES backgrounds appeared to be protective in this study. This finding differs from that in a prior Bangladeshi study, which indicates that suicidal ideation was higher among university students (Rahman, Islam, Mamun, et al., 2020) and adolescents from lower SES groups (Begum et al., 2018). A study in Brazil also seemingly reported different findings (Santos et al, 2017), similar to other studies linking lower SES to suicidal ideation (Goodman et al., 2017; Ju et al., 2016). The extent to which the present findings are related to Bangladesh culture, student samples, COVID-19, or other factors warrants more study.

Suicidal family history was found to correlate with suicidal ideation in this study, similar to a prior study conducted among a community sample (Lee et al., 2010) and among university students (Santos et al, 2017). Family suicide background may elicit negative emotions, and related psychological pain may lead to suicide ideation (Mento et al., 2020). This study also found that individuals living in urban versus rural areas appeared more prone to suicidal ideation. These findings resonate with a study of Chinese students that observed a correlation between rural living and suicidal ideation (Meng et al., 2013).

4.2. Interpretation

This study assessed suicidal ideation during the onset of the COVID-19 outbreak among university students in Bangladesh. The study observed a high prevalence of suicidal ideation and raises the possibility that COVID-19 may be having emotional and psychological impacts on university students. Associations with demographic and potential risk and protective factors demonstrated similarities with previous studies. Future studies should examine directly possible relations with COVID-19, monitor changes over time, and test the efficacies of mental health interventions. In the interim and in order to promote better mental and overall health, students should strive to comply with health recommendations during the COVID-19 pandemic (Roma et al., 2020; Király et al., 2020). General recommendations may include a daily routine involving adequate sleep and appropriate exercise, maintaining hydration and personal hygiene, engaging in relaxing and social activities, making/taking personal time and staying informed about current health information (Király et al., 2020).

4.3. Limitations

Limitations should be noted. First, the research was cross-sectional, so causality cannot be determined. Second, self-report measures were used, and these have potential biases including with respect to social desirability and declarative memory. However, the study's online format may have increased the veracity of responses compared to offline and/or face-to-face surveys, although this notion is largely speculative. Third, this research may not be regarded as representative due to the online survey using a nonprobability sampling. Moreover, suicidal ideation was measured using a single-item question with a binary response rather than a validated instrument. Likewise, non-suicidal self-injury, an important factor linked to suicidal ideation and behaviors, was not assessed in this study, and future studies should assess non-suicidal self-injury.

5. Conclusions

Over one in eight university students reported suicidal ideation during the COVID-19 pandemic. The findings provide important baseline information on suicidal ideation among Bangladeshi university students during the COVID-19 pandemic. Students' mental health concerns, especially depression, were strongly correlated with suicidal ideation during the COVID-19 pandemic. Effective strategies are needed to support the mental health of students. Students should be aware of treatment options available to them during the COVID-19 pandemic. The extent to which specific awareness programs or counseling efforts may be developed and enacted to promote mental health and prevent suicidal ideation and behaviors during and following the pandemic warrants examination.

Ethical approval

The study was approved by the Biosafety, Biosecurity, and Ethical Clearance Committee, the ethical review board of the Faculty of Biological Sciences, Jahangirnagar University, Savar, Dhaka-1342, Bangladesh (Ref No: BBEC, JU/ M 2020/COVID-19/(8)6).

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CRediT authorship contribution statement

Rafia Tasnim: Conceptualization, Methodology, Investigation, Writing - original draft, Validation. **Md. Saiful Islam:** Conceptualization, Methodology, Investigation, Data curation, Formal analysis, Writing - original draft, Validation. **Md. Safaet Hossain Sujan:** Conceptualization, Investigation, Writing - original draft, Validation. **Md. Tajuddin Sikder:** Supervision, Writing - review & editing, Validation. **Marc N. Potenza:** Writing - review & editing.

Conflict of interest and disclosures

The authors report no conflicts of interest with respect to the content of this manuscript. Dr. Potenza has: consulted for and advised Game Day Data, the Addiction Policy Forum, AXA, Idorsia, and Opiant/Lakelight Therapeutics; received research support from the Veteran's Administration, Mohegan Sun Casino, and the National Center for Responsible Gaming (no the International Center for Responsible Gambling); participated in surveys, mailings, or telephone consultations related to drug addiction, impulse-control disorders or other health topics; consulted for law offices and the federal public defender's office in issues related to impulse-control and addictive disorders; provided clinical care in the Connecticut Department of Mental Health and Addiction Services Problem Gambling Services Program; performed grant reviews for the National Institutes of Health and other agencies; edited journals and journal sections; given academic lectures in grand rounds, CME events and other clinical/scientific venues; and generated books or chapters for publishers of mental health texts. Other authors report no disclosures. The views presented in this manuscript represent those of the authors.

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