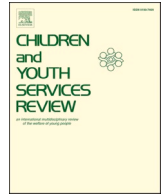




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Mental health difficulties in students with suspected COVID-19 symptoms and students without suspected COVID-19 symptoms: A cross-sectional comparative study during the COVID-19 pandemic

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ARTICLE INFO

Keywords:

COVID-19 symptoms
Mental health
PTSS
Fear of COVID-19
Anxiety
Depression
Bangladesh

ABSTRACT

Introduction: Mental health problems are taking a heavy toll on students during the COVID-19 pandemic. The purpose of this study was to compare the level of anxiety symptoms, depressive symptoms, post-traumatic stress symptoms (PTSS), and fear of COVID-19 between students with suspected COVID-19 symptoms and students without any suspected symptoms during the pandemic in Bangladesh.

Methods: This cross-sectional comparative study was conducted online among Bangladeshi students from May to July 2020. Anxiety symptoms, depressive symptoms, PTSS, and fear of COVID-19 were assessed by using the Generalized Anxiety Disorder scale, Patient Health Questionnaire, the Impact of Event Scale, and Fear of COVID-19 Scale, respectively. College and University students were the participants of the study.

Results: Among 3777 students, 1259 had suspected COVID-19 symptoms and 2518 had no suspected COVID-19 symptoms. Students who experienced suspected COVID-19 symptoms had higher prevalence (moderate to severe) of depressive symptoms (61.15% vs. 47.62%), anxiety symptoms (44.96% vs. 36.97%), and PTSS (48.3% vs. 39.75%) compared to those who had no such symptoms. The study identified having suspected COVID-19 symptoms as a significant associated factor for anxiety symptoms ($\beta_1' = 1.39$; 95% CI: 1.03–1.74), depressive symptoms ($\beta_1' = 1.88$; 95% CI: 1.43–2.32), PTSS ($\beta_1' = 3.66$; 95% CI: 2.66–4.65), and fear of COVID-19 ($\beta_1' = 0.48$; 95% CI: 0.02 to 0.94). Students with suspected COVID-19 symptoms thought more that they would be better off dead, or of hurting themselves ($P < 0.01$) and felt more afraid as if something awful might happen ($P < 0.01$) than their counterparts.

Conclusion: Mental health difficulties are more prevalent among students with suspected COVID-19 symptoms than the students without having such symptoms. This finding suggests that public health practitioners should deploy a rapid diagnostic system and consider psychological intervention in addition to clinical management for those who have COVID-19 like symptoms during the pandemic.

1. Introduction

Mental health is known to be the most important factor for a good quality of life (Zhou et al., 2020) and the COVID-19 pandemic has emerged as the most daunting problem by creating a psycho-emotional chaotic situation with a sharp rise of excruciating psychological outcomes, including anxiety, depression, stress as well as post-traumatic stress in the contemporary world (Khan et al., 2020; Sultana et al., 2021). About 150 countries across the world shut down schools and educational facilities by 25 March 2020 either postponing or banning

campus-based events which has affected over 80% of the student population worldwide (Sahu, 2020). Institutional closure has forced students to confine themselves at home and such confinement negatively impacted students more than any other groups of people in the community (Marelli et al., 2020).

Bangladesh, a developing country is currently being devastated by the COVID-19 pandemic with the increasing number of cases (798,830) and death (12,583) (as of 31 May 2021) (World Health Organization, 2020a). This elevated infection rate has raised anxiety among the public about getting infected (Bao et al., 2020). The situation in Bangladesh for

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<https://doi.org/10.1016/j.childyouth.2021.106137>

Received 11 January 2021; Received in revised form 4 June 2021; Accepted 30 June 2021

Available online 2 July 2021

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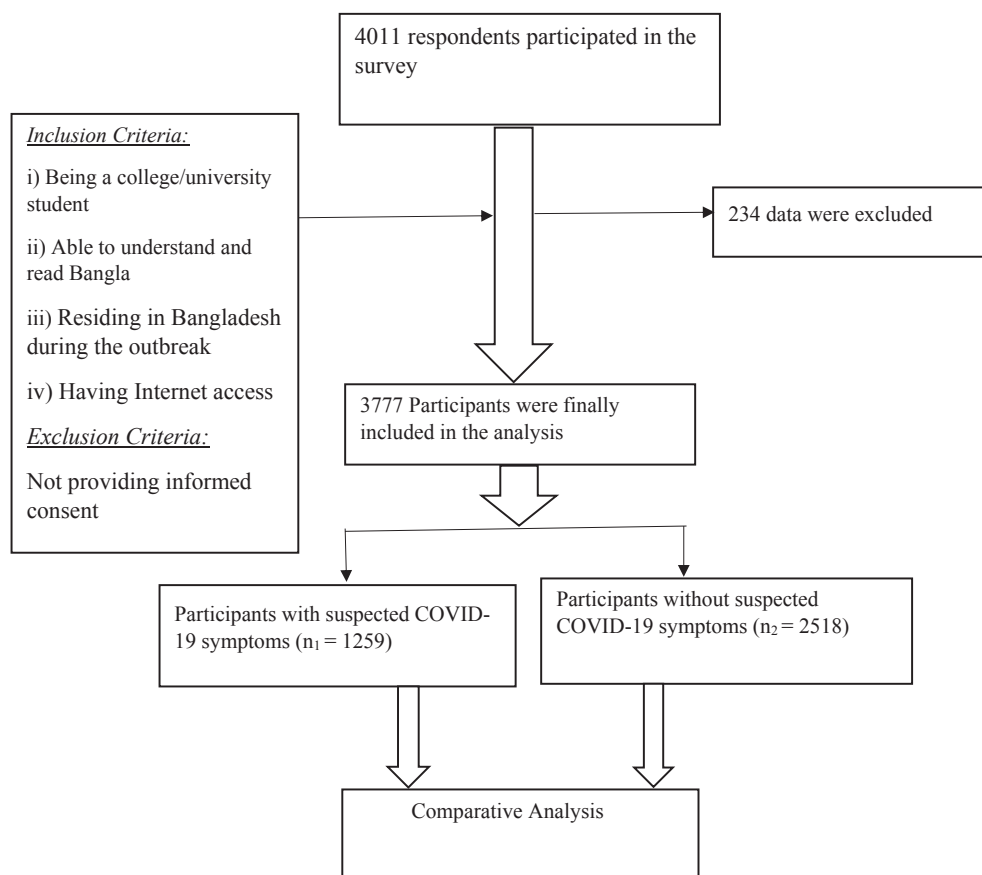


Fig. 1. Flow diagram of the study participants.

the students is deteriorating as all educational institutions were closed for more than 14 months now (from 26th March 2020) by creating uncertainty about academic study and career progression. Those uncertainties have not only intensified mental health problems (Mei et al., 2011) but also affected daily routines and habits which may increase the risk of developing posttraumatic stress disorder (PTSD) among students (Boyras & Legros, 2020). While living under COVID-19 restrictions, it was found that Bangladeshi students who were dissatisfied with their academic pursuits were more likely to suffer from depression and anxiety (Islam et al., 2020). Another study revealed that depression and anxiety might lead to suicidal ideation among Bangladeshi students during the COVID-19 pandemic (Tasnim et al., 2020). Two recent Bangladeshi studies on students also showed a substantial proportion of participants were suffering from anxiety (33.3%), depression (46.92%), and PTSS (40.91%) (Khan et al., 2020; Sultana et al., 2021). Furthermore, efforts to adopt preventative measures against COVID-19 may relate to a higher level of anxiety among individuals including students (Cowling et al., 2010; Rubin et al., 2009). In addition to that, a higher risk of anxiety (3.5-fold) and depressive symptoms (2.7-fold) were found among Bangladeshi students who were severely tensed of getting infected by the virus (Safa et al., 2021). A recent Bangladeshi study among students showed that 42.8%, 80.8%, and 58.1% of the students perceived that the COVID-19 pandemic has negatively affected their lives, education, and mental health, respectively (Sayeed et al., 2020). All of those perceptions were found to be positively associated with negative psychological consequences (Sayeed et al., 2020).

Some common COVID-19 symptoms are fever, headache, dry cough, breathing difficulties, sore throat, and fatigue which are all very similar to usual flu or cold (Huang et al., 2020). Patients with suspected COVID-19 symptoms who need to be in hospitals have been reported to be vulnerable (Nguyen et al., 2020). Besides, 861 Bangladeshi people

passed away with COVID-19 like symptoms and lacking in testing facilities and hospital rejection negatively impacted those incidents (NEWAGE, 2020). Individuals with any of those symptoms may have higher risk perception which may put them in greater psychological distress (Mihashi et al., 2009). Previous studies from Bangladesh and China also showed a significant association between having suspected COVID-19 symptoms (fever, cold, myalgia, dizziness, chills, sore throat) and higher psychological problems like anxiety, depressive symptoms, PTSS, etc. (Sultana et al., 2021; Wang, Pan, Wan, Tan, Xu, Ho, et al., 2020; Wang, Pan, Wan, Tan, Xu, McIntyre, et al., 2020). It is to highlight that 14.64% students out of 3997 participants perceived suspected COVID-19 symptoms as having COVID-19 infection which impacted negatively with a higher risk of depressive symptoms and PTSS (Sultana et al., 2021). Therefore, research with a focus on suspected COVID-19 symptoms impacting mental health is crucial at this critical time.

Although there is a study regarding mental health problems of adults with COVID-19-like symptoms in Bangladesh (Begum et al., 2021), no literature is available comparing mental health difficulties in Bangladeshi students with suspected COVID-19 symptoms and students without suspected COVID-19 symptoms during this pandemic. Thus, the study was undertaken to fill this knowledge gap by investigating the level of mental health difficulties among students with suspected COVID-19 symptoms compared to the students who had no such symptoms during the COVID-19 pandemic in Bangladesh. We hypothesized that mental health problems will be higher among symptomatic respondents than asymptomatic respondents.

Table 1

Demographic characteristics in groups of students with S-COVID-19-S and students without S-COVID-19-S.

Variable	N = 3777 (%)	Students with suspected COVID-19 symptoms (n = 1259)	Students without suspected COVID-19 symptoms (n = 2518)	X ² (df)	P-value
Age					
≤19	588 (15.57%)	182 (14.46%)	406 (16.12%)	1.87 (2)	0.39
20–24	2662 (70.48%)	896 (71.17%)	1766 (70.14%)		
≥25	527 (13.95%)	181 (14.38%)	346 (13.74%)		
Gender					
Male	2389 (63.25%)	768 (61.00%)	1621 (64.38%)	4.11* (1)	0.04
Female	1388 (36.75%)	491 (39.00%)	897 (35.62%)		
Marital status					
Unmarried	3501 (92.69%)	1172 (93.09%)	2329 (92.49%)	0.44 (1)	0.51
Married	276 (7.31%)	87 (6.91%)	189 (7.51%)		
Number of family members					
<5	1559 (41.28%)	499 (39.63%)	1060 (42.10%)	4.70 (2)	0.10
5–7	1764 (46.70%)	590 (46.86%)	1174 (46.62%)		
>7	454 (12.02%)	170 (13.50%)	284 (11.28%)		
Institute					
College	611 (16.18%)	177 (14.06%)	434 (17.24%)	6.25** (1)	0.01
University	3166 (83.82%)	1082 (85.94%)	2084 (82.76%)		
Field of Study					
Science	2021 (53.51%)	669 (53.14%)	1352 (53.69%)	2.73 (3)	0.44
Business studies	944 (24.99%)	321 (25.50%)	623 (24.74%)		
Arts and humanities	490 (12.97%)	152 (12.07%)	338 (13.42%)		
Social science	322 (8.53%)	117 (9.29%)	205 (8.14%)		

*P-value ≤ 0.05; **P-value ≤ 0.01.

2. Methodology

2.1. Participants

College and University students were the participants of the study. Eligibility criteria for the participants were: (i) Bangladeshi national, living in the country at the time of the COVID-19; (ii) can read and understand Bangla; (iii) having internet access. The participants were asked if they had any of the most common symptoms (fever, cough, myalgia, dizziness, diarrhea, sore throat, chills, and difficulty in breathing) of COVID-19 indicated by WHO over the past 14 days (World Health Organization, 2020b). People with any of those symptoms were classified as students with suspected COVID-19 symptoms. Participants were from all 8 divisions in Bangladesh. Participants who were unwilling to provide informed consent were excluded from the study.

2.2. Study design & data collection

A cross-sectional comparative study was undertaken to assess mental health difficulties among students. A structured and self-administered questionnaire was developed by using a google form to collect data. The questionnaire was developed in English first, then it was translated in Bangla by two bilingual researchers. Back translation was done from Bangla to English by a bilingual expert. The Bangla version of the questionnaire was used in the online survey. A pilot test was performed on 30 respondents to confirm the reliability of the questionnaire and some minor adjustments were incorporated in the questionnaire to prevent any bias. Those data were excluded from the final analysis.

An online survey was conducted among Bangladeshi students from 29 May 2020 to 22 July 2020, approximately after 2 months of the first identification of the COVID-19 case in Bangladesh. Convenient sampling was used for collecting data. The questionnaire was disseminated by 24

research assistants for data collection via social media (e.g., Facebook). Research assistants received a training session on data collection by two senior researchers prior to starting final data collection. Data were collected from two groups: i) students who had suspected COVID-19 symptoms ($n_1 = 1259$) and ii) students who had no suspected COVID-19 symptoms ($n_2 = 2518$) during the COVID-19 pandemic. A total of 4011 data were collected, and 234 data was excluded from this study for not adhering to the inclusion criteria and incomplete submission. Finally, 3777 participants were included in the final analysis (Fig. 1).

2.3. Ethics

An electronic cover page showing the research purpose, confidentiality statement, and right to revoke the participation without prior justification, and a consent form appeared after clicking on the survey's link. All respondents signed that electronic informed consent form assuring their willingness to participate in the study prior to participation. All the respondents voluntarily participated in this study and they were not provided any financial incentives. The study was conducted following the Checklist for Reporting Results of Internet ESurveys (CHERRIES) guidelines (Eysenbach, 2004). Furthermore, this study fully complied with the provisions of the Declaration of Helsinki regarding research on human participants. The ethical clearance certificate (Ref No: BBEC, JU/M 2020/COVID-19/(8)1) was obtained from the Institutional Review Board, "Biosafety, Biosecurity & Ethical Committee" of the Jahangirnagar University.

2.4. Measures

The questionnaire was split into five sections: (i) socio-demographics, (ii) depressive symptoms, (iii) anxiety symptoms, (iv) fear of COVID-19, and (v) post-traumatic stress symptoms. Socio-

Table 2

Group differences of having specific PHQ-9 items in students by having suspected COVID-19 symptoms.

Variable	N = 3777 (%)	Students with suspected COVID-19 symptoms (n = 1259)	Students without suspected COVID-19 symptoms (n = 2518)	X ² (df)	P-value
Little interest or pleasure in doing things					
Agree [†]	2821 (74.69%)	991 (78.71%)	1830 (72.68%)	16.18** (1)	<0.01
Disagree ^{††}	956 (25.31%)	268 (21.29%)	688 (27.32%)		
Feeling down, depressed, or hopeless					
Agree [†]	2771 (73.37%)	984 (78.16%)	1787 (70.97%)	22.19** (1)	<0.01
Disagree ^{††}	1006 (26.63%)	275 (21.84%)	731 (29.03%)		
Trouble falling or staying asleep, or sleeping too much					
Agree [†]	2590 (68.57%)	985 (78.24%)	1605 (63.74%)	81.84** (1)	<0.01
Disagree ^{††}	1187 (31.43%)	274 (21.76%)	913 (36.26%)		
Feeling tired or having little energy					
Agree [†]	2571 (68.07%)	979 (77.76%)	1592 (63.22%)	81.59** (1)	<0.01
Disagree ^{††}	1206 (31.93%)	280 (22.24%)	926 (36.78%)		
Poor appetite or overeating					
Agree [†]	2364 (62.59%)	899 (71.41%)	1465 (58.18%)	62.69** (1)	<0.01
Disagree ^{††}	1413 (37.41%)	360 (28.59%)	1053 (41.82%)		
Feeling bad about yourself or that you are a failure or have let yourself or your family down					
Agree [†]	2317 (61.34%)	849 (67.43%)	1468 (58.30%)	29.53** (1)	<0.01
Disagree ^{††}	1460 (38.66%)	410 (32.57%)	1050 (41.70%)		
Trouble concentrating on things, such as reading the newspaper or watching television					
Agree [†]	2322 (61.48%)	833 (66.16%)	1489 (59.13%)	17.51** (1)	<0.01
Disagree ^{††}	1455 (38.52%)	426 (33.84%)	1029 (40.87%)		
Moving or speaking so slowly that other people could have noticed. Or the opposite being so fidgety or restless that you have been moving around a lot more than usual					
Agree [†]	1611 (42.65%)	548 (43.53%)	1063 (42.22%)	0.59 (1)	0.44
Disagree ^{††}	2166 (57.35%)	711 (56.47%)	1455 (57.78%)		
Thoughts that you would be better off dead, or of hurting yourself					
Agree [†]	1460 (38.66%)	513 (40.75%)	947 (37.61%)	3.48 (1)	0.06
Disagree ^{††}	2317 (61.34%)	746 (59.25%)	1571 (62.39%)		

*P-value ≤ 0.05; **P-value ≤ 0.01; Abbreviations: df = Degree of freedom.

[†]Include 3 response options of PHQ-9 scale: "Several days", "More than half the days", "Nearly every day".

^{††}Include 1 response option of PHQ-9 scale: "not at all".

demographic information included age, gender, educational institute, field of study, marital status, and number of family members.

2.4.1. Depressive symptoms

Depressive symptoms were assessed using a Bangla validated nine-item Patient Health Questionnaire (PHQ-9) (Chowdhury et al., 2004; Kroenke et al., 2010), which is based on the diagnostic criteria for depression from the Diagnostic and Statistical Manual of Mental Disorders, 4th Edition (DSM-IV). With a focus on the previous two weeks, respondents answered on a 4-point Likert scale ranging from "0 = not at all" to "3 = nearly every day". The total score ranges from 0 to 27. The

five cut-off points were used for the categorization of depressive symptoms as: i) '0–4' for 'normal'; ii) '5–9' for 'mild depressive symptoms'; iii) '10–14' for 'moderate depressive symptoms'; iv) '15–19' for 'moderately severe depressive symptoms'; and finally, v) '20 or higher' for 'severe depressive symptoms'. In the present study, the Cronbach's alpha of the scale was 0.84.

2.4.2. Anxiety symptoms

Anxiety symptoms were assessed by using the Bangla version of a widely used seven-item scale, the Generalized Anxiety Disorder scale (GAD-7), which showed good sensitivity (89%) and specificity (82%) for measuring the severity of anxiety in clinical practice alongside general population was utilized in this study (Hossain et al., 2020; Löwe et al., 2008; Spitzer et al., 2006). With a focus on the previous two weeks, participants were asked how often they were bothered by each GAD-7 item. There were 4 answer options, ranging from "0 = not at all" to "3 = nearly every day". The total score ranges from 0 to 21. The cut-off points for the categorization of the level of GAD symptoms were as follows: i) '0–4' for normal, ii) '5–9' for mild, iii) '10–14' for moderate and iv) '15–21' for severe anxiety. The scale demonstrated good internal consistency in this study (Cronbach's alpha = 0.82).

2.4.3. Fear of COVID-19

The COVID-19 specific fear of the students was assessed by using the 7-item Fear of COVID-19 Scale (Cronbach's alpha 0.81 in the present study) (Ahorsu et al., 2020). Bangla validated version of this scale was utilized in the study (Sakib et al., 2020). Example items of the questionnaire include "I am most afraid of corona" and "My hands become clammy when I think about corona". The response options included "strongly disagree", "disagree", "neutral", "agree" and "strongly agree" where the score ranged from 7 to 35. The scale was previously used in the Bangladeshi context (Mahmud et al., 2020).

2.4.4. Post-traumatic stress

The Impact of Event Scale (IES) was used to assess the post-traumatic stress symptoms (PTSS) (Horowitz et al., 1979). This scale is known as a substantial and valid scale to be commonly used and offers a low-cost short self-report assessment of PTSD (Rothbaum et al., 1992). The IES comprises 15 elements scattered over two subscales that measure intrusion (7 items) and avoidance (8 items). There were four options to answer to each item: 0 (not at all), 1 (rarely), 3 (sometimes), or 5 (often). The highest possible total score on the IES is 75. The cut-off points for the categorization of the level of PTSS were as follows: i) '0–8' for subclinical, ii) '9–25' for mild, iii) '26–43' for moderate and iv) '44+' for severe PTSS. In this study, the Cronbach's alpha was high 0.87. The scale was previously used in Bangladesh during the COVID-19 pandemic (Sultana et al., 2021).

2.5. Statistical analysis

The STATA version 14.1 program (StataCorp LP., College Station, TX, USA) was used to carry out all the analyses. Firstly, descriptive analysis was used to explore the distribution of different variables and to summarize the socio-demographic characteristics. Chi-square test and reliability test (Cronbach's alpha) were executed as first-order analyses. The chi-square test was utilized to determine whether there is a statistically significant difference between two groups regarding anxiety symptoms, depressive symptoms, and fear of COVID-19. For PHQ-9 and GAD-7 scales, "not at all" response option was considered as "not approving that specific symptom" (coded as 0), and the remaining 3 response options were considered as "approving that specific symptom" (coded as 1). For the FCV-19 scale, "agree" and "strongly agree" response options were considered as "approving that specific symptom" (coded as 1), and the remaining 3 response options were considered as "not approving that specific symptom" (coded as 0). Linear regression was used to test associations of anxiety symptoms, depressive symptoms,

DISTRIBUTION OF DEPRESSIVE SYMPTOMS AMONG STUDENTS

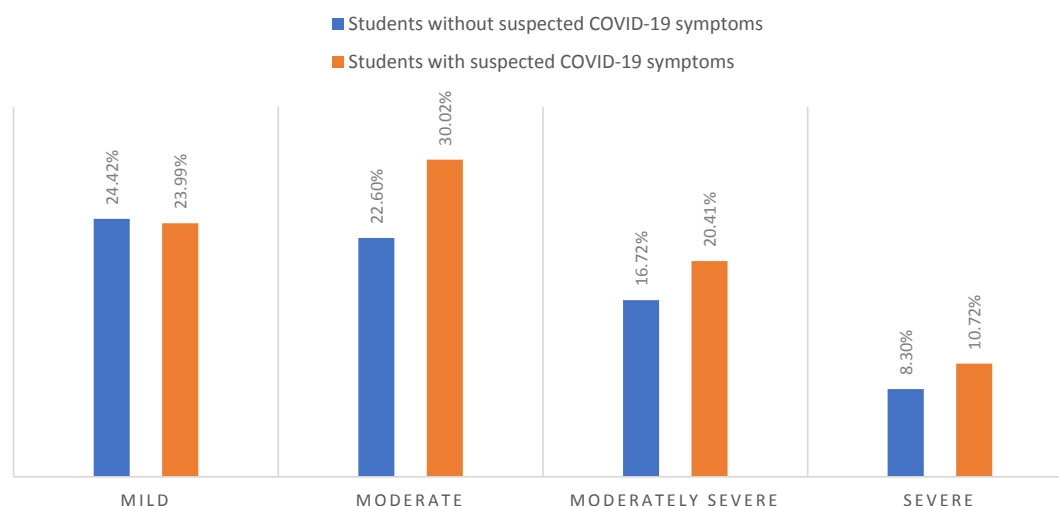


Fig. 2. Comparison of prevalence rate of depressive symptoms in students according to having suspected COVID-19 symptom.

PTSS, and fear of COVID-19 (outcome variables) with having suspected COVID-19 symptoms. The strength of estimated associations was demonstrated by the Beta (Co-efficient) with a 95% confidence interval (CI) and p-value. Statistical significance was evaluated as $p \leq 0.05$ for all tests.

3. Results

The study revealed that the majority of the respondents belonged to age group 20–24 years old (70.48%), were male (63.25%), and unmarried (92.69%). Suspected COVID-19 symptoms were more prevalent among males (61% vs 39% females, $P = 0.04$) which was statistically significant (Table 1).

3.1. Depressive symptoms

Gleaned from Fig. 1, students with suspected COVID-19 symptoms had a higher prevalence rate of moderate depressive symptoms (33.02% vs. 22.60% in students without suspected COVID-19 symptoms), moderately severe depressive symptoms (20.41% vs. 16.72% in students without suspected COVID-19 symptoms) and severe depressive symptoms (10.72% vs. 8.30% in students without suspected COVID-19 symptoms).

It was also seen that, for specific PHQ-9 items, students with suspected COVID-19 symptoms had higher rates of agreement to most of the items compared to students without suspected COVID-19 symptoms. For instance, students with suspected COVID-19 symptoms had little interest or pleasure in doing things (78.71% vs. 72.68% among students without suspected COVID-19 symptoms, $p < 0.01$), were feeling down, depressed or hopeless (78.16% vs. 70.97% among students without suspected COVID-19 symptoms, $p < 0.01$), were feeling tired or having little energy (77.76% vs. 63.22% among students without suspected COVID-19 symptoms, $p < 0.01$) (Table 2).

3.2. Anxiety symptoms

Gleaned from Fig. 2, students with suspected COVID-19 symptoms had a higher prevalence rate of mild anxiety symptoms (33.84% vs. 28.63% in students without suspected COVID-19 symptoms), moderate anxiety symptoms (32.17% vs. 27.08% in students without suspected COVID-19 symptoms), and severe anxiety symptoms (12.79% vs. 9.89%

in students without suspected COVID-19 symptoms).

The study further explored specific GAD-7 items among students and it was noticeable that agreement to specific items of the GAD-7 scale was higher among students with suspected COVID-19 symptoms than students without suspected COVID-19 symptoms. In addition to that, all the items were statistically significant. For instance, students with COVID-19 symptoms were feeling more nervous, anxious, or on edge (78.95% vs. 63.38% among students without suspected COVID-19 symptoms, $p < 0.01$), were unable to stop or control worrying (68.74% vs. 57.47% among students without COVID-19 symptoms, $p < 0.01$) and had trouble relaxing (64.81% vs. 57.74% among students without suspected COVID-19 symptoms, $p < 0.01$) (Table 3).

3.3. Fear of COVID-19

For specific items of FCV-19S, the study showed that students with suspected COVID-19 symptoms were more uncomfortable to think about the coronavirus (the COVID-19 infection) (65.85% vs. 57.35% among students without suspected COVID-19 symptoms, $p < 0.01$), became nervous watching news and stories about coronavirus on social media (60.13% vs. 53.02% among students without suspected COVID-19 symptoms, $p < 0.01$) and had their heart racing or palpitating thinking about getting coronavirus (51.31% vs. 44.12% among students without suspected COVID-19 symptoms, $p < 0.01$) (Table 4).

3.4. Post-traumatic stress symptoms

Gleaned from Fig. 3, students with suspected COVID-19 symptoms had a higher prevalence rate of moderate PTSS (38.05% vs. 31.45% in students without suspected COVID-19 symptoms), and severe PTSS (10.25% vs. 8.30% in students without suspected COVID-19 symptoms) (see Fig. 4).

3.5. Association of suspected COVID-19 symptoms with anxiety, depression, fear of COVID-19 and PTSS

Regression analysis showed increased scores for all the scales (GAD-7, PHQ-9, FCV-19S, and IES among students with suspected COVID-19 symptoms in reference to students without suspected COVID-19 symptoms. The highest increase in score was noticed in PTSS ($\beta_4 = 3.66$; 95% CI: 2.66 to 4.65) among students with suspected COVID-19 symptoms.

Table 3

Group differences of having specific GAD-7 items in students by having suspected COVID-19 symptoms.

Variable	N = 3777 (%)	Students with suspected COVID-19 symptoms (n = 1259)	Students without suspected COVID-19 symptoms (n = 2518)	X ² (df)	P-value
Feeling nervous, anxious, or on edge					
Agree [€]	2590 (68.57%)	994 (78.95%)	1596 (63.38%)	94.39** (1)	<0.01
Disagree ^{€€}	1187 (31.43%)	265 (21.05%)	922 (36.62%)		
Not being able to stop or control worrying					
Agree [€]	2309 (61.13%)	862 (68.47%)	1447 (57.47%)	42.75** (1)	<0.01
Disagree ^{€€}	1468 (38.87%)	397 (31.53%)	1071 (42.43%)		
Worrying too much about different things					
Agree [€]	2798 (74.08%)	1027 (81.57%)	1771 (70.33%)	55.21** (1)	<0.01
Disagree ^{€€}	979 (25.92%)	232 (18.43%)	747 (29.67%)		
Trouble relaxing					
Agree [€]	2270 (60.10%)	816 (64.81%)	1454 (57.74%)	17.49** (1)	<0.01
Disagree ^{€€}	1507 (39.90%)	443 (35.19%)	1064 (42.26%)		
Being so restless that it's hard to sit still					
Agree [€]	1855 (49.11%)	647 (51.39%)	1208 (47.97%)	3.92* (1)	0.05
Disagree ^{€€}	1922 (50.89%)	612 (48.61%)	1310 (52.03%)		
Becoming easily annoyed or irritable					
Agree [€]	2738 (72.49%)	987 (78.40%)	1751 (69.54%)	33.01** (1)	<0.01
Disagree ^{€€}	1039 (27.51%)	272 (21.60%)	767 (30.46%)		
Feeling afraid as if something awful might happen					
Agree [€]	2655 (70.29%)	958 (76.09%)	1697 (67.39%)	30.41** (1)	<0.01
Disagree ^{€€}	1122 (29.71%)	301 (23.91%)	821 (32.61%)		

*P-value ≤ 0.05; **P-value ≤ 0.01; Abbreviations: df = Degree of freedom.

€ Include 3 response options of GAD-7 scale: "Several days", "More than half the days", "Nearly every day".

€€ Include 1 response option of GAD-7 scale: "not at all".

Furthermore, having suspected COVID-19 symptoms also appeared as significant associated factors for depressive symptoms ($\beta_2 = 1.88$; 95% CI: 1.43 to 2.32), anxiety symptoms ($\beta_1 = 1.39$; 95% CI: 1.03 to 1.74) and fear of COVID-19 ($\beta_3 = 0.48$; 95% CI: 0.02 to 0.94) (Table 5).

4. Discussion

The study provides important and timely findings about the impact of having suspected COVID-19 symptoms on students' mental health. It was found that the level of psychological distress during the COVID-19 crisis was moderately and contradictorily higher among the students who had suspected COVID-19 symptoms compared to their counterparts. This finding is consistent with a recent Bangladeshi study which showed that there were 20–30% higher prevalence estimates of poor mental health in symptomatic respondents than the asymptomatic group (Begum et al., 2021). Symptomatic respondents had 2.7- and 1.5-times higher odds of experiencing mild or greater levels of anxiety symptoms and depressive symptoms, respectively, than the healthy respondents (Begum et al., 2021). The study showed that having suspected COVID-19 symptoms was significantly associated with higher FCV-19S scores. It is more likely that students who had such symptoms perceived themselves riskier to COVID-19 and higher risk perception has

Table 4

Group differences of having specific FCV-19S items in students by having suspected COVID-19 symptoms.

Variable	N = 3777 (%)	Students with suspected COVID-19 symptoms (n = 1259)	Students without suspected COVID-19 symptoms (n = 2518)	X ² (df)	P-value
I am most afraid of Corona					
Agree [¥]	2400 (63.54%)	826 (65.61%)	1574 (62.51%)	3.48 (1)	0.06
Disagree ^{¥¥}	1377 (36.46%)	433 (34.39%)	944 (37.49%)		
It makes me uncomfortable to think about Corona					
Agree [¥]	2273 (60.18%)	829 (65.85%)	1444 (57.35%)	25.30** (1)	<0.01
Disagree ^{¥¥}	1504 (39.82%)	430 (34.15%)	1074 (42.65%)		
My hands become clammy when I think about Corona					
Agree [¥]	1087 (28.78%)	361 (28.67%)	726 (28.83%)	0.01 (1)	0.92
Disagree ^{¥¥}	2690 (71.22%)	898 (71.33%)	1792 (71.17%)		
I am afraid of losing my life because of Corona					
Agree [¥]	1553 (41.12%)	516 (40.98%)	1037 (41.18%)	0.01 (1)	0.91
Disagree ^{¥¥}	2224 (58.88%)	743 (59.02%)	1481 (58.82%)		
When I watch news and stories about Corona on social media, I become nervous or anxious					
Agree [¥]	2092 (55.39%)	757 (60.13%)	1335 (53.02%)	17.17** (1)	<0.01
Disagree ^{¥¥}	1685 (44.61%)	502 (39.87%)	1183 (46.98%)		
I cannot sleep because I'm worrying about getting Corona					
Agree [¥]	982 (26.00%)	338 (26.85%)	644 (25.58%)	0.70 (1)	0.40
Disagree ^{¥¥}	2795 (74.00%)	921 (73.15%)	1874 (74.42%)		
My heart races or palpitates when I think about getting Corona					
Agree [¥]	1757 (46.52%)	646 (51.31%)	1111 (44.12%)	17.43** (1)	<0.01
Disagree ^{¥¥}	2020 (53.48%)	613 (48.69%)	1407 (55.88%)		

*P-value ≤ 0.05; **P-value ≤ 0.01; Abbreviations: df = Degree of freedom.

¥ Include 2 response options of FCV-19 scale: "agree" and "strongly agree".

¥¥ Include 3 response options of FCV-19 scale: "strongly disagree," "disagree," "neutral".

been found to be associated with higher psychological problems (Mihashi et al., 2009). Students who had suspected COVID-19 symptoms were more likely to become more nervous or anxious (60.13% vs 53.02%) when they watched news and stories about coronavirus (COVID-19 infection) on social media (Table 4). During the pandemic, it was found that 28% of all infected cases were between 21 and 31 age group in Bangladesh which comprises the highest positive case rate (Institute of Epidemiology Disease Control and Research, 2020). Such reports on media can largely contribute to increased fear by increasing risk perception among students who have COVID-19 like symptoms (Choi et al., 2017). Furthermore, students with suspected COVID-19 symptoms approved another FCV-19S item "My heart races or palpitates when I think about getting corona virus" more than their counterparts (51.31% vs 44.12%). People are linking virus contraction with the paranoia of falling sick, impotence, and even death (Hall et al., 2008) which might be a reason for this higher prevalence of the 7th item of FCV-19S among the students.

Our study suggests that students with suspected COVID-19 symptoms are experiencing an unparalleled growth of depression (61.15% vs. 47.62%), and PTSS (48.3% vs. 39.75%) under the current global pandemic situation which are higher compared to their counterpart group. This prevalence of depression and PTSS are higher than that

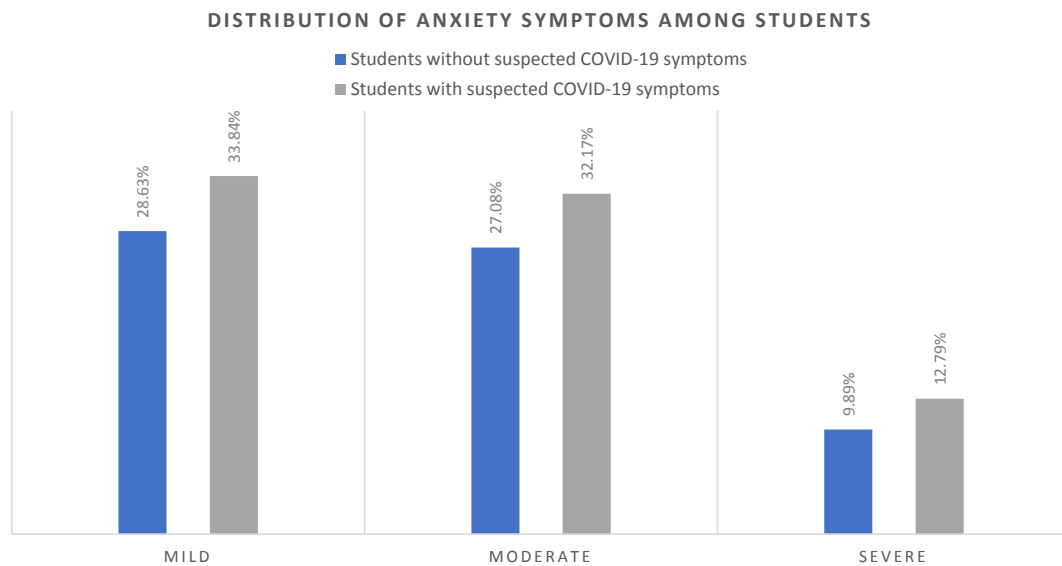


Fig. 3. Comparison of prevalence rate of anxiety symptoms in students according to having suspected COVID-19 symptoms.

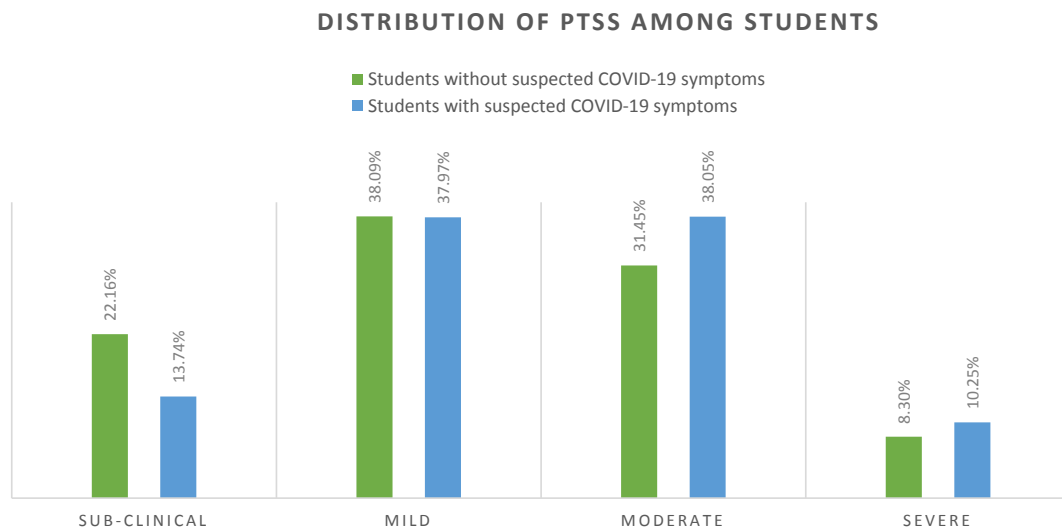


Fig. 4. Comparison of the prevalence rate of PTSS in students according to having suspected COVID-19 symptoms.

Table 5

Association of having suspected COVID-19 symptoms with anxiety, depressive symptoms, fear of COVID-19 and PTSS.

Variable	N = 3777	Anxiety(β_1) (95% CI)	Depression (β_2) (95% CI)	Fear of COVID-19 (β_3) (95% CI)	PTSS (β_4) (95% CI)
Students with suspected COVID-19 symptoms	1259 (33.33%)	1.39** (1.03–1.74)	1.88** (1.43–2.32)	0.48* (0.02–0.94)	3.66** (2.66–4.65)
Students without suspected COVID-19 symptoms	2518 (66.67%)	Ref.	Ref.	Ref.	Ref.

*P-value ≤ 0.05 ; **P-value ≤ 0.01 .

found in a recent Bangladeshi study (Sultana et al., 2021). Moreover, a study which was conducted on Bangladeshi adults revealed that the respondents who had COVID-19 like symptoms had 60.1% depression (Begum et al., 2021) which is comparatively less than the present study. Students with suspected COVID-19 symptoms may isolate themselves in home more than the students without having such symptoms for containing the virus spread. Such reduction of social interactions may induce more mental distress like depression and PTSS (Kawachi & Berkman, 2001). However, further qualitative explorations are needed regarding this particular finding. In consonance with previous studies,

the study showed that having suspected COVID-19 symptoms was associated with higher depressive symptoms and PTSS (Nguyen et al., 2020; Sultana et al., 2021). This finding indicates that the onset of symptoms can strengthen the sense of vulnerability and menace of infection (Sim et al., 2010). Students with suspected COVID-19 symptoms perceived that they had COVID-19 infection due to the similarity of those symptoms with COVID-19 which led them to PTSS and depressive symptoms (Sultana et al., 2021) by creating “hypochondriac concerns” (worry about being infected) (Wang, Pan, Wan, Tan, Xu, Ho, et al., 2020; Wang, Pan, Wan, Tan, Xu, McIntyre, et al., 2020).

Anxiety symptoms were found to be also higher (44.96% vs. 36.97%) in students who had suspected COVID-19 symptoms than the other group. This anxiety symptoms' prevalence is higher than the students from Bangladesh during the pandemic but lower than the patients suffering from Middle East Respiratory Syndrome from Korea during isolation (Jeong et al., 2016). Moreover, the prevalence of anxiety is higher than a previous Bangladeshi study of which showed respondents with COVID-19 symptoms had 40.6% anxiety (Begum et al., 2021). Worry about their family members to be infected with the COVID-19 might be a prominent reason for the higher anxiety (Wang, Pan, Wan, Tan, Xu, Ho, et al., 2020; Wang, Pan, Wan, Tan, Xu, McIntyre, et al., 2020). Besides, the study was conducted in a critical time when there was a higher likelihood of spreading rumors from social media which can heighten anxiety among students. The most recent and reliable news regarding the number of people who have recovered and the development of drugs and vaccines can minimize the level of anxiety (Wang, Pan, Wan, Tan, Xu, Ho, et al., 2020; Wang, Pan, Wan, Tan, Xu, McIntyre, et al., 2020). Moreover, medical personnel can build a system where psychological supports can be provided in addition to clinical management to those who have suspected COVID-19 symptoms to curb psychological distress in this critical time.

4.1. Strengths & limitations

To the best of our knowledge, this is one of the first few studies to evaluate the differences in mental health difficulties between students who had suspected COVID-19 symptoms and students who don't have such symptoms during the COVID-19 pandemic. A better understanding about this issue will help appropriate authorities in designing and implementing adequate interventions to address psychological aspects among the symptomatic population during a pandemic even if they are not tested positive.

However, the study has some limitations that should be considered. Cross-sectional design limited us to draw any cause-and-effect relationship but, it provided some valuable information about how suspected COVID-19 symptoms can negatively impact mental health. Although online survey is an efficient way for mental health assessment especially during a pandemic (Henderson et al., 2012), sampling bias may occur for the possibility of unintentionally ruling out people from the study who had no internet access. Usage of self-reported questionnaire and convenience sampling technique might include reporting bias and affect the generalizability of the study, respectively.

5. Conclusion

In conclusion, our results indicate the fact that the COVID-19 pandemic has affected the student's mental health profoundly who experienced suspected COVID-19 symptoms more seriously. Having suspected COVID-19 symptoms was found to be an important factor to develop higher psychological issues like anxiety, depressive symptoms, and PTSS. This finding suggests that public health practitioners should deploy a rapid diagnostic system and consider psychological intervention in addition to clinical management for diagnosed and symptomatic people during the COVID-19 pandemic. The information derived from the present study can assist in tailoring interventions to better cope with the worsening situation during this pandemic and beyond.

CRedit authorship contribution statement

Mst. Sadia Sultana: Conceptualization, Methodology, Investigation, Data curation, Writing - original draft, Writing - review & editing, Validation. **Abid Hasan Khan:** Formal analysis, Data curation, Validation. **Sahadat Hossain:** Supervision, Writing - review & editing, Validation. **M. Tasdik Hasan:** Writing - review & editing, Validation.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgment

The authors would like to express gratitude to all of the respondents who participated in this study voluntarily. Furthermore, the authors highly appreciate the contribution of Md. Tanzirul Alam, Tauhidul Islam, Md. Shahjahan, Md. Arifur Rahman, Md. Sabbir Mia, Rakebul Hasan, Md. Fazle Rabby, Sadia Yasmin, Mahjabeen Siddique, Jannatul Ferdous Tora, Anik Dutta, A. K. M. Sadikur Rahman Siam, Mohuya Jannat Masuma, Md. Rahmatullah, Md. Kamruzzaman, Nasim Chowdhury, Hazara Sultana, Md. AsifurRahaman, Md. Rakibul Alam Sorkar Rabby, Bishakha Mutsuddy, Mst. Jemi Khatun, Rebeka Sultana, Mak-suda Akter Tane, Md. Momshad Reza during data collection periods.

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