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COVID-19 responses among university students of Bangladesh: assessment of status and individual view toward COVID-19

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ABSTRACT

COVID-19 has become one of the poignant infectious diseases in human history. This cross-sectional study intended to evaluate the adverse impact of COVID-19 among university students of Bangladesh. It also disclosed the COVID-19 responses through knowledge, attitude, and practice level across these university students. A rapid online survey was conducted to administer a self-reported questionnaire among these university students during the country's COVID-19 induced lockdown period. Convenience and snowball sampling technique was employed for this study. Total of 418 university students participated. Statistical analyses were conducted based on type and normality distribution of data. Majority of the participated students experienced high impact (61.48%) on their study. They were also exceedingly concerned with their mental health (47.84%) due to this pandemic. Large number of students attended online classes (69.62%). Students living in the capital city Dhaka, reported more unsafe current places than the students living outside Dhaka. Furthermore, universities supported their students through multiple financial and mental assistance initiatives. Participated students reported moderate knowledge, attitude, and high practice scores. They were also observed moderate total KAP score in this study. Female students demonstrated good knowledge and practice scores than the male students.

KEYWORDS

University students; infectious disease; COVID-19; developing settlement; lockdown

Introduction

Coronavirus disease 2019 (COVID-19) was declared a pandemic by the World Health Organization (WHO) on March 11, 2020 (Hua & Shaw, 2020; Zhang & Shaw, 2020; Zhong et al., 2020). This emerging respiratory disease, caused by a novel coronavirus, was first reported in Wuhan, China in late December, 2019 (Deng, 2020; Hayat et al., 2020; Hua & Shaw, 2020; Zhang & Shaw, 2020; Zhong et al., 2020). The rapid expansion of this virus with three major characteristics such as spreading at high rate due to the globalization, people with lower immunity, and aged people are more vulnerable and different recovery rates from the infection, have been identified across the world (Shaw et al., 2020). The epicenter of this infectious disease has been shifted from China, Europe, the United States, Brazil, and

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South-East Asia (Johns Hopkins Coronavirus Resource Center, 2020; WHO, 2020). As of July 28, 2020 the total globally confirmed COVID-19 cases were 16,534,345 where 655,084 were reported dead due to this infectious disease (Johns Hopkins Coronavirus Resource Center, 2020). This pandemic has already marked almost all the countries' incapacitation in many sectors, where the frontline health care sector has already been paralyzed (Zhou et al., 2020). The developing countries with fragile healthcare systems could have the worst catastrophic effects due to this pandemic if sufficient steps are not taken (Arshad Ali et al., 2020; Hayat et al., 2020; Lai et al., 2020). Along with the frontline healthcare sector, this pandemic also became an important socio-economic, behavioral, psycho-social, governance and technological issues (Zhang & Shaw, 2020). Health crisis has already been translated to the global economic crisis (Ozili & Arun, 2020). It has already been predicted massive macro implications of this pandemic in wider sectors across the world (McKibbin & Fernando, 2020; Nicola et al., 2020; Ozili & Arun, 2020; Sintema, 2020). Education sector is also one of the worst affected sectors for this pandemic (DAAD, 2020; Sintema, 2020; UNESCO, 2020). Many educational institutions were forced to close to control the outbreak. Some of those educational institutions went online to continue the academic activities. Students along with the direct COVID-19 impact on their health, family members, and the community, have struggled to continue their study. Some educational institutions have supported their students both academically and mentally. Students are considered one of the most active group in many societal systems. In addition, university students can be the best hub to reach the general people. Most university students have access internet and other media where the information about COVID-19 are available (DGHS, 2020; WHO, 2020). Knowledge, attitude, and practices against this pandemic should be up to date from authentic and reliable sources. This authentic information to follow should also be promoted in the way that can reach to the general people.

Bangladesh is one of worst-affected countries in this pandemic (Johns Hopkins Coronavirus Resource Center, 2020; Mamun & Griffiths, 2020; Shammi et al., 2020; WHO, 2020). As of July 28, 2020, a total of 229,184 confirmed COVID-19 cases were detected in this developing country where 3,000 death cases were reported already (Johns Hopkins Coronavirus Resource Center, 2020). On this date, this developing country was placed 16th in the number of global COVID-19 cases. Along with several natural hazards, infectious diseases, this country has now experienced unprecedented catastrophic situations (Ali, 1999; Anwar et al., 2020; Mutsuddy et al., 2019). Bangladesh had already been struggled climate change-induced problems (Ali, 1999; Banu et al., 2014; Haque, 1995). The adverse impact of this pandemic has already plunged over one of the most densely populated countries in the world. This country has faced several challenges in this pandemic, such as maintaining social distancing, inadequacy of COVID-19 testing facilities, limited mitigation measures against COVID-19, financial support (Anwar et al., 2020). Like many other countries, Bangladesh had to declare lockdown from March 26, 2020 to control this pandemic (Anwar et al., 2020). All educational institutions were closed as education sector is country's one of the worst hit due to the pandemic. However, many universities in Bangladesh have already started their activities online to reduce the pandemic's adverse impact. They are also working hard to reach their students with financial and mental support. The number of university students reported COVID-19 positive are not negligible (Daily Bangladesh, 2020; The Daily Star, 2020). University students of Bangladesh need to grasp authentic knowledge, optimistic attitude, and reliable practices to prevent not only

their own infection but also disseminate this information to their family members and the community.

This study considered the COVID-19 impact on their study and their mental health concern due to this pandemic. In addition, it investigated the university support for their students to reduce any impact. This study has attempted to measure the knowledge level, attitude, and practices among university students of Bangladesh. Prior to this study, knowledge, attitude, and practices have successfully been used in many research to estimate the preparedness and response level of students (Basir et al., 2020; Chen et al., 2015; Gillani et al., 2020; Hayat et al., 2020; Zhong et al., 2020). Cross sectional study was conducted to identify the vulnerable group toward COVID-19. Bangladesh government has already targeted to control this pandemic substantially with multiple initiatives. However, education and public awareness are required activities in the battle against COVID-19. University students can be one the strongest groups along with the front-liners to have the definitive win in this battle. Therefore, the outcome of the present study can provide vital information to the social, non-government, and governmental organizations to control the pandemic significantly as well as pave the baseline for further future researches.

Materials and methods

Study design

A cross-sectional study was conducted among university students of Bangladesh during the COVID-19 induced lockdown. A self-reported rapid online-based survey was selected because of ongoing lockdown in the country and it was easily reachable to the university students (Tanner & Doberstein, 2015). Many relevant research have already been employed self-reported survey successfully (Basolo et al., 2009; Bourque et al., 2012; Gillani et al., 2020; Nguyen et al., 2006). Concentrating on the country's COVID-19 worst affected capital city, area was divided into two categories; Dhaka and outside Dhaka. Some comparisons were also followed considering these categories.

Survey instrument

Literature reviews were conducted thoroughly to develop the questionnaire (Chang et al., 2020; DGHS, 2020; Harapan et al., 2020; Hayat et al., 2020; Li et al., 2020; WHO, 2020). Discussions with the experts were also considered to develop the final questionnaire. Developed questionnaire had three main parts: demographic and academic profile of the participants, such as age, gender, origin, current location, university location, university type, university year and university major; information about COVID-19 impact; university support in the ongoing pandemic; and the final part was to investigate students' Knowledge, Attitude, and Practices (KAP). First, this study investigated any concern (high, moderate, and low) due to the COVID-19 induced lockdown among the participated student's study and mental health. For these purposes, two simple questions following 3-point Lickert scale were asked: concern about the study and their mental health due to the COVID-19. No further analysis on the impact of mental health was considered. In addition, to investigate the safety of their current place against COVID-19, a question with 5-point Lickert scale was asked about their confidence (very safe, safe, moderately safe, unsafe, and very unsafe) on

current living place. The university support section had three questions if they had COVID-19 related subject in university curriculum, any financial and mental health support from the university and if their university conducted online classes to continue the study during the pandemic-induced lockdown period. The knowledge section had total nine close-ended questions. This section was based on the literature review (DGHS, 2020; Hayat et al., 2020; WHO, 2020). It had questions about signs and symptoms, mode of transmission and measures to prevent transmission of COVID-19, considering the Bangladesh perspectives. Each question had score range 0–1. The attitude section had five close-ended questions following the 5-point Lickert scale (Strongly agree, Agree, Neutral, Disagree, and Strongly disagree). The questions were about the confidence on both national and international battle against COVID-19, communication with the community, non-government and governmental organization. It also considered if they received any support from these organizations. The final part of KAP section was to understand the practices comprised 10 questions with binary answer (Yes/No). It had questions about regular measures to prevent COVID-19 (DGHS, 2020; Hayat et al., 2020; WHO, 2020). Each question had 0–1 score. Pilot testing was conducted among some students before it went live for all students. After required modifications considering Bangladesh perspectives and perception (for example, coronavirus disease or only coronavirus term was used frequently instead of COVID-19), final version of the questionnaire was ready to share. The questionnaire was in English considering the English medium of instruction in universities of Bangladesh. Internal consistency and reliability of the questionnaire, for binary and Lickert scale type KAP questions, were measured which indicated the accepted Cronbach's standard alpha value (0.60–0.80) (Ursachi et al., 2015). To categorize the score, cutoffs were followed quartile (25^{th} quartile was for low score, 26^{th} to 75^{th} quartile was for moderate score and the high score was considered for greater than 75^{th} quartile).

Data collection and ethical issues

Convenience and snowball sampling method was used considering only the undergraduate level university students of Bangladesh. Students in school, college, higher than the Bachelor study, in abroad and on study leave were considered outliers of the boundary condition. Data were collected through a rapid online survey from mid-May to June 1, 2020. Bangladesh had both partial and complete lockdown in this period due to the COVID-19 pandemic. All universities campus was closed. Different online media platforms such as Facebook, WhatsApp, E-Mail service, Google Classroom were used to administer the survey. After discussion with some students, they were assigned to fill up and share the questionnaire link with other students. They also requested other students to share again to other students as well after fill up the questionnaire. Any students with all boundary conditions were accepted for this rapid online survey. This study was conducted as a part of approved research project from the author's university, Bangladesh University of Professionals. It has maintained all ethical issues compliance with the university's Institutional Review Board. It has also been granted by the Bangladesh University of Professionals' Institutional Review Board. The objective of the survey was described on the cover page of questionnaire. Participated students were also assured that their responses would remain confidential and will be used only for the research purpose.

Data analysis

'R' software, version 3.6.3 (R Development Core Team, 2019) was employed for all statistical analyses. Chi-square tests were conducted to analyze the association of demographic and academic profile (gender, origin, current location, university location, university type, university year, and major) with the university supports (COVID-19 related subject in university curriculum, help (financial/mental) from university, online class); and with the high, moderate and low score of knowledge, attitude, practice, and total KAP categories. Shapiro-Wilk and Kolmogorov-Smirnov tests were conducted to check the normality of numeric data (concern about study, concern about mental health, confidence on safety of current place, and the total score of knowledge, attitude, practice, and total KAP score). The data were not normally distributed. Non-parametric tests such as Kruskal-Wallis or Mann Whitney U tests were conducted to analyze the association of demographic and academic profile with the concern on study, concern about mental health, confidence on safety of current place, and the score of knowledge, attitude, practice, and total KAP. Where required, post hoc analyses were also performed through Dunn's test and Bonferroni correction was used to adjust p value. Pearson's correlation test and linear regression analysis were considered to examine the correlation between total KAP score and other three parameters (knowledge, attitude, and practice). Descriptive statistics (frequency, percentage, median, and interquartile) were also conducted where required. α level for all statistical analyses was set to 0.05.

Results

Demographic and academic profile

Total of 418 students participated in this rapid online survey with boundary condition. Table 1 shows the frequencies and percentages of participated students. Among the participants, male students were more (n = 232, 55.50%) than the female students (n = 186, 44.50%). Student's location and origin were divided into two categories: Dhaka and outside Dhaka. Majority of participated students were originated outside Dhaka city (n = 311, 74.40%) where Dhaka showed high proportion (n = 234, 55.98%) in case of the current location. Participated student's university location was also categorized into Dhaka and outside Dhaka. Majority of the participated students were from universities located in Dhaka (n = 340, 81.34%) where most of them were from government-funded public university (n = 340, 81.34%). In case of university year first-year student's participation were more (n = 142, 33.97%) than the second year (n = 111, 26.56%), third-year (n = 95, 22.73%) and fourth year (n = 70, 16.75%) students. Students majoring in Arts and Social Science made up the highest proportion (n = 180, 43.06%) in the sample where students with major in Science and Engineering (n = 150, 35.89%) and Business Administration and Economics (n = 88, 21.05%) were placed second and third position, respectively.

Impact of COVID-19 on participated university students

Many participated students concerned about their study (high = 61.48% and moderate = 32.30%), about their mental health (high = 47.84% and moderate = 46.41%) and they also had moderate confidence on their current place's safety (moderately safe = 37.56%

Table 1. Student's concern about study, mental health and safety of current place during COVID-19.

Features	Frequency (*n*)	Percentage (%)	Impact on Study (Median (IQR))	Concern about Mental Health (Median (IQR))	Confidence on Safety of Current Place (Median (IQR))
1. Gender					
a. Male (M)	232	55.50	3.0 (1.0)	2.0 (1.0)	3.0 (1.0)
b. Female (F)	186	44.50	3.0 (1.0)	2.0 (1.0)	2.5 (1.0)
2. Origin					
a. Dhaka	107	25.60	3.0 (1.0)	2.0 (1.0)	3.0 (1.0)
b. Outside Dhaka	311	74.40	3.0 (1.0)	2.0 (1.0)	3.0 (1.0)
3. Current Location					
a. Dhaka	234	55.98	3.0 (1.0)	3.0 (1.0)	3.0 (1.0)
b. Outside Dhaka	184	44.02	3.0 (1.0)	2.0 (1.0)	3.0 (1.0)*
4. University Location					
a. Dhaka	340	81.34	3.0 (1.0)	3.0 (1.0)	3.0 (1.0)
b. Outside Dhaka	78	18.66	3.0 (1.0)	2.0 (1.0)	3.0 (1.0)*
5. University Type					
a. Public	340	81.34	3.0 (1.0)	2.0 (1.0)	3.0 (1.0)
b. Private	78	18.66	3.0 (1.0)	2.5 (1.0)	3.0 (1.0)
6. University Year					
a. First year	142	33.97	3.0 (1.0)	2.0 (1.0)	3.0 (1.0)
b. Second year	111	26.56	3.0 (1.0)	3.0 (1.0)	2.0 (1.0)
a. Third year	95	22.73	3.0 (1.0)	3.0 (1.0)	3.0 (1.0)
b. Fourth year	70	16.75	3.0 (1.0)	2.0 (1.0)	3.0 (1.0)
7. Major					
a. Arts and Social Science	180	43.06	3.0 (1.0)	2.0 (1.0)	3.0 (1.0)
b. Business Administration and Economics	88	21.05	3.0 (1.0)*	3.0 (1.0)	2.0 (1.0)
c. Science and Engineering	150	35.89	3.0 (1.0)	2.0 (1.0)	3.0 (1.0)

***p < 0.05; **p < 0.01; ***p < 0.001.*

and unsafe = 33.97%) for COVID-19. Table 1 presents the participated student's concerned about study and mental health due to COVID-19. Sigficant result was overserved in case of COVID-19 impact when university major was considered. Post hoc analysis was conducted. Participated students majoring Business Administaration and Economics experienced highest impact on their study following Arts and Social Science, and Science and Engineering background participated students. A significant result was identified when compared between the participated students majoring Business Administaration and Economics, and Science and Engineering. Participated students living outside Dhaka and university location outside Dhaka reported significantly more safe of their current place for COVID-19.

University support for COVID-19

Large number of the participated students (n = 226, 54.07%) confirmed the absence of COVID-19 relevant subject in their university curriculum. Many participated students (n = 265, 63.40%) received financial and mental health support from their university where many of the them (n = 291, 69.62%) attended online classes. Table 2 presents the universtiy support for COVID-19 by demographic and academic profile of the participated students. In case of COVID-19 relevant subject in their current university curriculum,

Table 2. University supports during COVID-19 pandemic among participated university students of Bangladesh.

	COVID-19 related Subject in University Curriculum *(n(%))*			Help (Financial/Mental) from University *(n(%))*		Online Class *(n(%))*	
Features	Yes	No	Maybe	Yes	No	Yes	No
1. Gender							
a. Male	66 (28.45)	135 (58.19)	31 (13.36)	140 (60.34)	92 (39.66)	161 (69.40)	71 (30.60)
b. Female	60 (32.26)	91 (48.92)	35 (18.82)	125 (67.20)	61 (32.80)	130 (69.89)	56 (30.11)
2. Origin							
a. Dhaka	21 (19.63)	69 (64.49)	17(15.89)*	67 (62.62)	40 (37.38)	77 (71.96)	30 (28.04)
b. Outside Dhaka	105 (33.76)	157 (50.48)	49 (15.76)	198 (63.67)	113 (36.33)	214 (68.81)	97 (31.19)
3. Current Location							
a. Dhaka	70 (29.91)	134 (57.26)	30 (12.82)	144 (61.54)	90 (38.46)	173 (73.93)	61 (26.07)*
b. Outside Dhaka	56 (30.43)	92 (50.00)	36 (19.57)	63 (34.24)	121 (65.76)	118 (64.13)	66 (35.87)
4. University Location							
a. Dhaka	114 (33.53)	170 (50.00)	56(16.47)**	220 (64.71)	120 (35.29)	262 (77.06)	78(22.94)***
b. Outside Dhaka	12 (15.38)	56 (71.79)	10 (12.82)	45 (57.69)	33 (42.31)	29 (37.18)	49 (62.82)
5. University Type							
a. Public	108 (31.76)	180 (52.94)	52 (15.29)	233 (68.53)	107(31.47)***	227 (66.76)	113(33.24)*
b. Private	18 (23.08)	46 (58.97)	14 (17.95)	32 (41.03)	46 (58.97)	64 (82.05)	14 (17.95)
6. University Year							
a. First year	50 (35.21)	60 (42.25)	32(22.54)***	93 (65.49)	49 (34.51)	96 (67.61)	46(32.39)**
b. Second year	40 (36.04)	57 (51.35)	14 (12.61)	70 (63.06)	41 (36.94)	84 (75.68)	27 (24.32)
c. Third year	25 (26.32)	61 (64.21)	9 (9.47)	59 (62.11)	36 (37.89)	74 (77.89)	21 (22.11)
d. Fourth year	11 (15.71)	48 (68.57)	11 (15.71)	43 (61.43)	27 (38.57)	37 (52.86)	33 (47.14)
7. Major							
a. Arts and Social Science	88 (48.89)	60 (33.33)	32(17.78)***	139 (77.22)	41(22.78)***	133 (73.89)	47(26.11)**
b. Business Administration and Economics	3 (3.41)	75 (85.23)	10 (11.36)	57 (64.77)	31 (35.23)	69 (78.41)	19 (21.59)
c. Science and Engineering	35 (23.33)	91 (60.67)	24 (16.00)	69 (46.00)	81 (54.00)	89 (59.33)	61 (40.67)

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

significant differences were observed for origin of the participated students (outside Dhaka = 33.76% vs. Dhaka = 19.63%); university location (Dhaka = 33.53% vs. outside Dhaka = 15.38%); university year (second year = 36.04%, first year = 35.21%, third year = 26.32% and fourth year = 15.71%) and major (Arts and Social Science = 48.89%, Science and Engineering = 23.33% and Business Administration and Economics = 3.41%). Significant results were identified among the participated students from different types of university (public = 68.53% vs. private = 41.03%) and major (Arts and Social Science = 77.22%, Business Administration and Economics = 64.77% and Science and Engineering = 46.00%) when financial and mental health support from the university was considered. In case of online class, significant results were observed when considered participated students' current location (Dhaka = 73.93% vs. outside Dhaka = 64.13%); university location (Dhaka = 77.06% vs. outside Dhaka = 37.18%); university type (private = 82.05% vs. public = 66.76%); university year (third year = 77.89%, second year = 75.68%, first year = 67.61%, and fourth year = 52.86%) and major (Business Administration and Economics = 78.41%, Arts and Social Science = 73.89%, and Science and Engineering = 59.33%).

Knowledge of the participated university students

Table 3 presents the knowledge of the participated students toward COVID-19. The participated university students for this study are normally considered intellectual and they have enough knowledge compared to the general people. However, many participated students selected unexpected responses in case of the questions about main clinical symptoms (fever, fatigue, and dry cough) of COVID-19 (55.26%), person (old people with chronic illness) normally develops severe cases (51.20%), wrong action (wearing rubber gloves only is the very effective when go outside) for COVID-19 (63.16%) and emergency number (333) for COVID-19 health assistance in Bangladesh (52.87%). Many participated students also responded the expected answers when it was asked about any cure (early symptomatic and supportive treatment can help most patients to recover) to recover from COVID-19 (69.14%), who (person with coronavirus but no fever which can be considered presymptomatic or asymptomatic; and person had contact with infected one, both answers were considered as expected responses) can infect others with the COVID-19 (75.60%), how does (via respiratory droplets of infected individuals) the coronavirus spread (60.29%), which (wear general medical mask, avoid crowded places, regular wash hand) can prevent

Table 3. Knowledge of the participated university students of Bangladesh toward COVID-19.

Question	Right Answers (*n* (%))	Wrong Answers (*n* (%))
Main clinical symptoms of COVID-19 are?	187 (44.74)	231 (55.26)
Is there presently any cure to recover from COVID-19 disease?	289 (69.14)	129 (30.86)
Which person with COVID-19 normally develop severe cases?	204 (48.80)	214 (51.20)
Who can infect others with the COVID-19?	316 (75.60)	102 (24.40)
How does the COVID-19 spread?	252 (60.29)	166 (39.71)
Which can prevent people from COVID-19 infection?	398 (95.22)	20 (4.78)
Which of the following is the WRONG action for COVID-19 infection?	244 (58.37)	174 (41.63)
Which of the following is the WRONG action for COVID-19 infection?	154 (36.84)	264 (63.16)
Which one is emergency number for COVID-19 health assistance in Bangladesh?	197 (47.13)	221 (52.87)

people from coronavirus infection (95.22%) and identify wrong action (minimum preventive measures are fine for children and young adults) for coronavirus infection (58.37%).

Attitude of the participated university students

Table 4 shows the attitude of the participants toward COVID-19. Most of the participated students reported neutral attitude when they were asked if national and international communities can successfully win in the battle against COVID-19; 30.62% participated students agreed that COVID-19 will be successfully controlled. Many participated students were observed with lack of communication and support from social, non-government, and governmental organization for COVID-19.

Practices of the participated university students

Table 5 shows the particpants' practices during COVID-19 outbreak. Majority of the participated students (more than 90%) reported good practictes to reduce COVID-19. However, many participated students (30.14%) were not accustomed to avoid touching their eyes, nose, and mouth which are the main routes of coronavirus transmission to

Table 4. Attitude of the participated university students of Bangladesh about COVID-19.

Statement	*SA (*n* (%))	*A (*n*(%))	*N (*n*(%))	*DA (*n*(%))	*SDA (*n* (%))
COVID-19 will finally be successfully controlled.	49 (11.72)	128 (30.62)	135 (32.30)	79 (18.90)	27 (6.46)
Bangladesh will win in the battle against COVID-19.	36 (8.61)	91 (21.77)	134 (32.06)	91 (21.77)	46 (11.00)
I have enough communication and support from community/social organization for any emergency support for COVID-19 issue.	23 (5.50)	100 (23.92)	153 (36.60)	116 (27.75)	26 (6.22)
I have enough communication and support from NGO for any emergency support for COVID-19 issue.	17 (4.07)	44 (10.53)	150 (35.89)	175 (41.87)	32 (7.66)
I have enough communication and support from government organizations for any emergency support for COVID-19 issue.	24 (5.74)	75 (17.94)	157 (37.56)	132 (31.58)	30 (7.18)

*SA = Strongly Agree, A = Agree, N = Neutral, DA = Disagree and SDA = Strongly Disagree.

Table 5. Practices of the participated university students of Bangladesh during the COVID-19 outbreak.

Statement	Yes (*n*(%))	No (*n*(%))
Do you regularly and thoroughly wash your hands with an alcohol-based hand rub or wash them with soap and water?	410 (98.09)	08 (1.91)
Do you maintain or try to maintain 1 meter (3 feet) distance from others?	387 (92.58)	31 (7.42)
Do you always avoid crowding or crowded places?	405 (96.89)	13 (3.11)
Do you avoid touching your eyes, nose and mouth?	292 (69.86)	126 (30.14)
Do you cover your mouth and nose with your bent elbow or tissue when you cough or sneak and then dispose the tissue and wash your hands immediately?	389 (93.06)	29 (6.94)
Do you stay home and self-isolate even with minor symptoms such as cough, headache, mild fever, until you recover?	383 (91.63)	35 (8.37)
Do you always wear mask when you go outside?	393 (94.02)	25 (5.98)
Do you always wash or change your clothes when you return from outside?	391 (93.54)	27 (6.46)
Do you call in advance your local health authority and follow the directions for medical care early particularly in COVID-19 disease time?	238 (56.94)	180 (43.06)
Do you follow the latest information from trusted sources, such as WHO or your local and national health authorities?	400 (95.69)	18 (4.31)

human body. Many participated students (43.06%) did not have practice to call their local health authority in advance to get medical support during COVID-19 pandemic.

Table 5. Practices of the participated university students of Bangladesh during the COVID-19 outbreak.

KAP score of the participated university students

Table 6 presents the association of different KAP score categories (high, moderate, and low) with different demographic and academic profiles where Table 7 shows the comparison of KAP score regarding COVID-19 by demographic and academic profile. Many participated students reported moderate knowledge score (57.18%) where 31.58% of the participants were observed with low knowledge score. Significantly high number of female-participated students were identified in high (11.83%) and moderate (62.90%) knowledge score category compared to their counterpart male participated students (10.78% and 52.59%, respectively). Female-participated students were also reported significantly better total knowledge score (Table 6). A significant result was identified accross university type in case of total knowledge score category (public = 12.94% vs private = 3.85%).

Many participated students (46.65%) reported moderate attitude score where 31.58% of the participated students had low attitude score. A significant result was identified in the case of attitude score category across the university year; first-year students placed most (29.58%) in high attitude score category following by third-, fourth-, and second-year students. Significant result was also observed when these group of participated students were compared based on their total attitude score. Post hoc analysis was conducted. Significant result was identified when compared between first- and second-year students' total attitude score.

Many respondents (36.41%) reported good practices (high practice score) with 32.39% of the students with moderate practice score; 31.21% of the students also reported low practice score. Significant number of female students reported high practice score (40.86%) than their counterpart males (33.62%). Female participated students also scored high practice score significantly than the male counterparts.

Many of the respondent students reported moderate total KAP score (44.26%), where 32.54% of the participated students were observed with low total KAP score. Significant results were observed in case of total KAP score across university year and major. First-year (27.46%) and third-year (27.37%) students reported high total KAP score where participated students majoring Arts and Social Science (23.89%) also reported high total KAP score. However, students majoring Science and Engineering (23.33%), and Business Administration and Economics (21.59%) also reported high total KAP score. Significant result was also identified when first-year students' total KAP score was compared with the second-year students' total KAP score.

Pearson's correlation analysis identified the interrelationship between knowledge, attitude, and practices with total KAP score. Linear regression model also identified knowledge, attitude, and practices as significant predictors ($p < .001$) for total KAP. Attitude was also identified as significant predictor (Beta = 0.080, $R^2 = 0.054$, $p < .001$) for Practices.

Table 6. Demographic and academic profile associations with different Knowledge (K), Attitude (A), Practice (P) and Total (KAP) score categories regarding COVID-19.

	Score (*n*(%))		
Features	*High*	*Moderate*	*Low*
Knowledge Score	47 (11.24)	239 (57.18)	132 (31.58)
1. Gender*			
a. Male	25 (10.78)	122 (52.59)	85 (36.64)
b. Female	22 (11.83)	117 (62.90)	47 (25.27)
2. Origin			
a. Dhaka	6 (5.61)	65 (60.75)	36 (33.64)
b. Outside Dhaka	41 (13.18)	174 (55.95)	96 (30.87)
3. Current Location			
a. Dhaka	19 (8.12)	141 (60.26)	74 (31.62)
b. Outside Dhaka	28 (15.22)	98 (53.26)	58 (31.52)
4. University Location			
a. Dhaka	34 (10.00)	200 (58.82)	106 (31.18)
b. Outside Dhaka	13 (16.67)	39 (50.00)	26 (33.33)
5. University Type*			
a.Public	44 (12.94)	186 (54.71)	110 (32.35)
b. Private	3 (3.85)	53 (67.95)	22 (28.21)
6. University Year			
a. First year	17 (11.97)	82 (57.75)	43 (30.28)
b. Second year	7 (6.31)	65 (58.56)	39 (35.14)
c. Third year	11 (11.58)	53 (55.79)	31 (32.63)
d. Fourth year	12 (17.14)	39 (55.71)	19 (27.14)
7. Major			
a. Arts and Social Science	23 (12.78)	106 (58.89)	51 (28.33)
b. Business Administration and Economics	7 (7.95)	46 (52.27)	35 (39.77)
c. Science and Engineering	17 (11.33)	87 (58.00)	46 (30.67)
Attitude Score	91 (21.77)	195 (46.65)	132 (31.58)
1. Gender			
a. Male	56 (24.14)	96 (41.38)	80 (34.48)
b. Female	35 (18.82)	99 (53.23)	52 (27.96)
2. Origin			
a. Dhaka	19 (17.76)	47 (43.93)	41 (38.32)
b. Outside Dhaka	72 (23.15)	148 (47.59)	91 (29.26)
3. Current Location			
a. Dhaka	44 (18.80)	110 (47.01)	80 (34.19)
b. Outside Dhaka	47 (25.54)	85 (46.20)	52 (28.26)
4. University Location			
a. Dhaka	71 (20.88)	157 (46.18)	112 (32.94)
b. Outside Dhaka	20 (25.64)	38 (48.72)	20 (25.64)
5. University Type			
a. Public	73 (21.47)	163 (47.94)	104 (30.59)
b. Private	18 (23.08)	32 (41.03)	28 (35.90)
6. University Year**			
a. First year	42 (29.58)	67 (47.18)	33 (23.24)
b. Second year	12 (10.81)	60 (54.05)	39 (35.14)
c. Third year	23 (24.21)	34 (35.79)	38 (40.00)
d. Fourth year	14 (20.00)	34 (48.57)	22 (31.43)
7. Major			
a. Arts and Social Science	45 (25.00)	83 (46.11)	52 (28.89)
b. Business Administration and Economics	13 (14.77)	41 (46.59)	34 (38.64)
c. Science and Engineering	33 (22.00)	71 (47.33)	46 (30.67)
Practice Score	154 (36.41)	137 (32.39)	132 (31.21)
1. Gender**			
a. Male	78 (33.62)	68 (29.31)	86 (37.07)
b. Female	76 (40.86)	69 (37.10)	41 (22.04)
2. Origin			
a. Dhaka	43 (40.19)	36 (33.64)	28 (26.17)
b. Outside Dhaka	111 (35.69)	101 (32.48)	99 (31.83)
3. Current Location			
a. Dhaka	94 (40.17)	76 (32.48)	64 (27.35)

(*Continued*)

Table 6. (Continued).

Features	Score (*n*(%))		
	High	*Moderate*	*Low*
b. Outside Dhaka	60 (32.61)	61 (33.15)	63 (34.24)
4. University Location			
a. Dhaka	125 (36.76)	113 (33.24)	102 (30.00)
b. Outside Dhaka	29 (37.18)	24 (30.77)	25 (32.05)
5. University Type			
a. Public	125 (36.76)	105 (30.88)	110 (32.35)
b. Private	29 (37.18)	32 (41.03)	17 (21.79)
6. University Year			
a. First year	56 (39.44)	46 (32.39)	40 (28.17)
b. Second year	40 (36.04)	33 (29.73)	38 (34.23)
c. Third year	37 (38.95)	27 (28.42)	31 (32.63)
d. Fourth year	21 (30.00)	27 (38.57)	22 (31.43)
7. Major			
a. Arts and Social Science	69 (38.33)	58 (32.22)	53 (29.44)
b. Business Administration and Economics	32 (36.36)	31 (35.23)	25 (28.41)
c. Science and Engineering	53 (35.33)	48 (32.00)	49 (32.67)
Total Score	97 (23.21)	185 (44.26)	136 (32.54)
1. Gender			
a. Male	50 (21.55)	97 (41.81)	85 (36.64)
b. Female	47 (25.27)	88 (47.31)	51 (27.42)
2. Origin			
a. Dhaka	22 (20.56)	43 (40.19)	42 (39.25)
b. Outside Dhaka	75 (24.12)	142 (45.66)	94 (30.23)
3. Current Location			
a. Dhaka	52 (22.22)	97 (41.45)	85 (36.32)
b. Outside Dhaka	45 (24.46)	88 (47.83)	51 (27.72)
4. University Location			
a. Dhaka	76 (22.35)	151 (44.41)	113 (33.24)
b. Outside Dhaka	21 (26.92)	34 (43.59)	23 (29.49)
5. University Type			
a. Public	78 (22.94)	156 (45.88)	106 (31.18)
b. Private	19 (24.36)	29 (37.18)	30 (38.46)
6. University Year*			
a. First year	39 (27.46)	69 (48.59)	34 (23.94)
b. Second year	18 (16.22)	47 (42.34)	46 (41.44)
c. Third year	26 (27.37)	35 (36.84)	34 (35.79)
d. Fourth year	14 (20.00)	34 (48.57)	22 (31.43)
7. Major*			
a. Arts and Social Science	43 (23.89)	91 (50.56)	46 (25.56)
b. Business Administration and Economics	19 (21.59)	30 (34.09)	39 (44.32)
c. Science and Engineering	35 (23.33)	64 (42.67)	51 (34.00)

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

Discussion

Bangladesh, already with the high risk of several hazards (Ali, 1999; Chanda Shimi et al., 2010; Mutsuddy et al., 2019; Steckler et al., 2016), has been recognized as one of the most affected countries in COVID-19 (Johns Hopkins Coronavirus Resource Center, 2020). The impact of the pandemic has already thrusted in different sectors of the country. Country's education sector is one of the worst affected sectors for the pandemic. Along with the direct health and socio-economic impact of COVID-19 on university students, they are in an unprecedented situation to continue their study due to the scenario bent by the pandemic. In addition, like any other countries, this country's students are one of the first to play critical role to respond any major impediment. On the perspective of Bangladesh, several new knowledge, attitude, and practices are required to control this pandemic adequately.

Table 7. Comparison of total Knowledge, Attitude, Practice and KAP scores regarding COVID-19 by demographic and academic profile.

Features	Knowledge (Median (IQR))	Attitude (Median (IQR))	Practice (Median (IQR))	Total (Median (IQR))
1. Gender				
a. Male	5.0 (3.25)	14.5 (5.00)	9.0 (2.00)	28.0 (7.00)
b. Female	6.0 (2.75)**	15.0 (5.00)	9.0 (1.00)**	29.0 (6.75)
2. Origin				
a. Dhaka	5.0 (2.50)	14.0 (5.00)	9.0 (2.00)	28.0 (6.50)
b. Outside Dhaka	6.0 (3.00)	15.0 (5.00)	9.0 (2.00)	29.0 (6.00)
3. Current Location				
a. Dhaka	5.0 (3.00)	14.0 (5.00)	9.0 (2.00)	28.5 (6.75)
b. Outside Dhaka	6.0 (3.00)	15.0 (6.00)	9.0 (2.00)	29.0 (6.00)
4. University Location				
a. Dhaka	6.0 (3.00)	14.5 (5.00)	9.0 (2.00)	28.5 (6.00)
b. Outside Dhaka	5.5 (3.00)	15.0 (5.50)	9.0 (2.00)	29.5 (7.00)
5. University Type				
a. Public	6.0 (3.00)	15.0 (5.00)	9.0 (2.00)	29.0 (6.00)
b. Private	6.0 (3.00)	14.0 (6.00)	9.0 (1.00)	28.5 (7.00)
6. University Year				
a. First year	6.0 (3.00)	15.0 (5.00)**	9.0 (2.00)	30.0 (6.00)**
b. Second year	5.0 (3.00)	14.0 (4.00)	9.0 (2.00)	27.0 (5.50)
c. Third year	5.0 (3.00)	15.0 (6.00)	9.0 (2.00)	29.0 (8.00)
d. Fourth year	6.0 (3.00)	14.0 (5.00)	9.0 (2.00)	28.5 (5.75)
7. Major				
a. Arts and Social Science	6.0 (3.00)	15.0 (5.25)	9.0 (2.00)	29.0 (6.00)
b. Business Administration and Economics	5.0 (4.00)	14.0 (6.00)	9.0 (2.00)	28.0 (6.25)
c. Science and Engineering	6.0 (3.00)	15.0 (5.00)	9.0 (2.00)	29.0 (6.75)

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

University students can assist to disseminate and implement these knowledge, attitude, and practices among their families and communities. To the best of our knowledge, this study has focused on the impact of COVID-19 on university students along with the university support, and their level of understanding, attitude, and practices toward the control of COVID-19, is the first to report in Bangladesh perspectives.

This study identified that many university students of Bangladesh are concerned about their study and mental health due to the COVID-19 pandemic. This result supports the current study where the impact of COVID-19 was identified both on students and general people (Mamun & Griffiths, 2020; H. T. Nguyen et al., 2020; Rzymski & Nowicki, 2020). Majority students identified their current living places moderately safe and then unsafe against COVID-19. Arts and Social Science, and Business Administration and Economics experienced high impact of COVID-19 on their study. As of July 2020, Dhaka is one of worst COVID-19 affected cities in Bangladesh, where half of the total COVID-19 infections were detected in Dhaka. Along with the frequent urban hazards and high risk due to the densely populated area (Akram, 2019; Chowdhury, 2017; Paul & Bhuiyan, 2010), this city students were concerned more about their safety compared to other cities of Bangladesh.

This study revealed that more than 50% participated university students did not have COVID-19- related subject in their curriculum. Education on disaster is required to prepare university students and disaster preparedness should be considered as a pivotal ingredient of any university curriculum (Jose & Dufrene, 2014; Loke & Fung, 2014; Tan et al., 2017). The world has been struggling to tackle this unprecedented disaster which already has

caused massive losses in both human lives and socio-economic conditions. It has also placed the world into the unendurable health, economic, and geopolitical crisis (Djalante et al., 2020). Among all other natural and human-induced hazards, biological hazards should also be included in university curriculum to prepare for future outbreak. This study indicated that the universities in Bangladesh are also working hard to support their main body, students, along with other COVID-19 related research activities. Many universities in Bangladesh have already embraced online education to continue the study, students were also found to be supported (both financially and/or mentally) from their respective universities. This result supports the necessity of COVID-19 risk management initiatives by the universities (Wang et al., 2020). Even with lot of challenges for online classes in Bangladesh, online class can not only assist in the continuation of the study, but also provide support to reduce the impact on both study and mental health. University Grants Commission (UGC) of Bangladesh has put emphasis on ensuring the online classes for all universities in Bangladesh (UGC, 2020). UGC is already in the process to prepare appropriate guidelines for online classes conducted by the universities (UGC, 2020). This study revealed that universities located in Dhaka supported their students more than the universities located outside Dhaka. The capital city's universities of Bangladesh are generally well-equipped to support their students compared to other universities located outside Dhaka. It was observed in the study that most of the private universities conducted online classes to complete their semester in due time (UGC, 2020), however, public universities showed and provided more financial and mental supports for their students in this pandemic. In Bangladesh, public university receives support directly from the government, where many private universities are expected to suffer massive losses due to the enforced lockdown (Dhaka Tribune, 2020). This study showed that the fresher students (first- and second-year students) identified more COVID-19 related subjects in their curriculum than the third- and fourth-year students. This result supports other study (Tan et al., 2017) where fresher students demanded more disaster education compared to the others. However, disaster management education should be conducted in formal education with the multiple forms systematically in different class years where fresher students can have in-class lectures about disaster preparedness and response, and the final year students should have hands-on disaster preparedness activities (Hoffmann & Muttarak, 2017; Tan et al., 2017). Furthermore, this study revealed that the students from Arts and Social Science major had more COVID-19 related subjects in their curriculum followed by Science and Engineering, and Business Administration and Economics majoring students. This result supports previous study (Tan et al., 2017) where Arts and Social Science majoring students demanded more systematic disaster education than other majoring students. In case of university support and online classes, Arts and Social Science, and Business Administration and Economics majoring students showed higher percentage than that of the Science and Engineering majoring students. On the other hand, online classes are more feasible for theoretical and presentation related courses than the courses required laboratory experiments. In Bangladesh, laboratory experiment requirement courses are frequent in Science and Engineering major.

This study revealed that the participated university students were more aware of practices than the knowledge and attitude toward COVID-19. This pandemic is completely new case for many university students where rapid overwhelming news has been circulated massively. These students might not have engaged with that basic information. Another

possible explanation could be, the knowledge section had some critical questions considering university student's level of understanding and intellectuality. Many students were identified without knowing emergency number *333* for any COVID-19 related health assistance in Bangladesh, has drawn an alarming image about this group who are expected to support their family members and the community. Large number of participants failed to identify the main clinical symptom of COVID-19. Even though many participated students were unable to identify the most vulnerable group (old people with chronic illness) for COVID-19, large number of the students in the sample believed that pre-symptomatic and asymptomatic persons could also infect others. Prior studies have found that the person without symptom can be responsible for the coronavirus transmission (He et al., 2020; Oran & Topol, 2020). Most of the participated students knew the urgency of wearing medical mask; avoid crowd and regular hand wash to reduce the COVID-19 outbreak. These are the most important basic knowledge to follow instructed by both national and international organizations (DGHS, 2020; WHO, 2020). Many students failed to answer that the wearing rubber gloves only is not the only effective way to prevent the infection, proper hand wash is required even after wearing rubber gloves (WHO, 2020). These young participants also shared their concern that even the children and young people can be affected due to the COVID-19. On the contrary, the lack of expected responses (more than 70%) indicates the required activities and knowledge transmission to this group, through which social, non-government, and governmental organizations can reach (since university students have more access to the Internet and other communication services) to the whole community and can be implemented thereby. These participants showed their neutral position in the attitude toward COVID-19. Large number of participated students did not show optimistic attitude against this pandemic. Many students identified the insufficient communication with and support from the social, non-government, and governmental organizations. This can be identified as the lack of basic knowledge and gaps between this group and working organizations. These participated university students showed optimistic practices against the COVID-19 outbreak. However, many students were not concerned about the main route of coronavirus into the body. They should adopt the mandatory practice "do not touch your face" to prevent the infection. It was also strictly instructed to follow for many previous infections along with the existing fast-spreading coronavirus infection (Macias et al., 2009; WHO, 2020). Many participated students do not typically call their local health authorities to follow the directions before going to the hospital. This result indicates the previous result identified in this study about the lack of communication with the organizations.

Moderate total knowledge, total attitude, and total KAP scores were observed among participated undergraduate university students where total practices placed high score. Good knowledge and practice score of female-participated students can support other gender-specific observational research and reports for COVID-19 (Covid-19: 73% of the deceased in Bangladesh are male, 2020; Walter & McGregor, 2020) which indicates male are more likely to get infected due to the biological, behavioral, and cultural factors. This result also indicated an understanding of the pandemic impact on male due to their lack of awareness and practices to prevent COVID-19 infection. These can be considered as important factors along with already identified factors responsible for the worst affected male candidates due to the coronavirus infection. Likewise, considering Bangladesh perspective, females are normally more concerned about their lives than that of their male

counterpart. Public university students showed more knowledge about COVID-19 than the private university respondents; this indicates the previous result of this study, which showed public university students had more support from their university than the students from private university. In Bangladesh, selected courses (depending on the job market value in Bangladesh) have only been offered in private university where many are more concerned about the commercial value of the courses than the basic protective learning even it is required to survive. First-year students placed top in both attitude and total KAP score. This result supports the previous result where they have more COVID-19 related courses in their curriculum. This result also supports previous study where fresher showed more awareness about disaster preparedness efforts [16,43]. Participated students majoring in Arts and Social Science received more support from university placed in high total KAP score; which is more compared to other majoring students. This study also revealed the interaction of total knowledge, attitude, and practice score with total KAP score among university students of Bangladesh regarding COVID-19. It also indicated the attitude as significant predictor for practices among these participants.

This study addressed current status and personal view toward COVID-19 pandemic among university students of Bangladesh. However, it has some limitations too. It considered self-reported Internet-based survey due the lockdown situation of COVID-19 which might have some biasness. Only university students living in Bangladesh were considered in the current study. Due to the urgency of understanding the conditions and lack of funding, large sample size was not possible to collect. Convenience and snowball sampling were employed considering the ongoing pandemic. In case of impact of COVID-19, this study only considered the view and concern of the respondents, no particular approach was considered. However, this exploratory study can give substantial baseline to the social, non-government and governmental organizations for effective responses in the ongoing pandemic. It can also support preparedness effort to reduce future pandemic outbreak. This study also addressed the gaps among university, organizations, and university students. It disclosed the dire requirement of collaboration among these important parties to prepare and response to any pandemic.

Conclusion

Bangladesh is one of the worst affected countries in COVID-19 pandemic. The adverse impact due to this pandemic has spilled over from the health care sector to the socio-economic and education sector of this country. University students were considered as target group for this study. Authentic knowledge, attitude, and practices are required to control the pandemics like COVID-19 outbreak. However, this information might have the difficulties to reach the general people; thus, University students can play crucial role here due to their educational connectivity and controlling adaptability for their family member and the community. They can apply the authentic knowledge, attitude, and practices to prevent their own infection. With their accessibility to information and better understanding capability toward COVID-19, they can also act as vital hub to assist their family members and the community. Considering these, the present study was conducted to evaluate the adverse COVID-19 impact on the university students of Bangladesh. It also measured the recent COVID-19 knowledge, attitude, and practices among these young participants. University students were concerned about the impact of COVID-19

on this present study. They are also concerned about their mental health during the COVID-19 induced lockdown period. In addition, they demonstrated moderate knowledge and attitude level with good practice scores toward COVID-19. University, community, non-government and governmental organizations should have enough collaboration where all parties can contribute the best. University students sometimes were overlooked in many preparedness and response efforts. However, they can play pivotal role to reduce any kind of risk whether it is natural hazards or infectious diseases. This study can assist in this regard where university students' responses to COVID-19 were evaluated.

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