

PAPER

Perception and Preference of the Students for Online Education during COVID-19 in Bangladesh: A Study Based on Binary Logistic Regression

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ABSTRACT

The COVID-19 pandemic has had a significant impact on both public health, and the global educational system. In response to the concerns surrounding the spread of the disease, many educational institutions, including those in Bangladesh, have shifted to online learning. This study aimed to investigate the perceptions and preferences of university students in Bangladesh towards online classes during the COVID-19 pandemic. The research was based on Binary Logistic Regression (BLR) and was conducted on a sample of 1116 university students in Bangladesh. The results of the study showed that while students faced a range of challenges while participating in online classes, including technical issues and limited access to study materials, they still preferred to participate in online courses due to the ongoing pandemic and the support of their teachers. Furthermore, the study revealed that there were differences in students' attitudes toward online learning based on gender, geographic location, and type of university. The findings of this study are of great significance to governments, policymakers, technology developers, and university administrators, as they provide valuable information for the development of effective policies for online education in the future. These findings should be taken into consideration as a crucial guide to making in-formed decisions in the area of online education.

KEYWORDS

online education, COVID-19-induced pandemic, binary logistic regression analysis, students' perception and preference, Bangladesh

1 INTRODUCTION

The COVID-19 pandemic has had a profound and widespread impact on the global community, creating public health concerns and resulting in an unprecedented loss of life [1]. The effects of the pandemic have been felt across various

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sectors, including education [2], the economy [3], the workplace [4–5], and the food system [6–8]. The changes brought about by the pandemic have been reflected in the educational system as well, leading to a paradigm shift in teaching and learning methods [9].

The shift to online learning has been particularly notable during the COVID-19 pandemic and has brought with it new opportunities and challenges [10]. Despite the advantages of this new approach, the transition to online classes has not always been smooth for both students and teachers [11]. Online education has become increasingly popular due to its accessibility, technical advancements, and convenience [12]. To prevent the spread of COVID-19 among students and academic staff, educational institutions around the world have had to cancel on-campus events and resort to alternative forms of instruction, such as online courses. This has had a significant impact on the academic life of 1.3 billion learners from schools, colleges, and universities in 185 countries [13].

However, in Bangladesh, the COVID-19 pandemic has exposed inequalities in the higher education system, including disparities between rural and urban students, public and private university students and teachers, males and females, and laboratory and field-based disciplines versus other disciplines [14–15]. Institutions have implemented various social distancing strategies, such as remote work for teachers and the transition to virtual online learning environments [16–20]. To continue their studies, the University Grants Commission (UGC) of Bangladesh has allowed public and private institutions to enroll students in online courses [21].

Multiple studies have explored the benefits and drawbacks of online learning and have found that it can increase student involvement and participation in extra-curricular activities [22–28]. One study found that online tools can promote higher-order thinking [29], while another found that online discussion boards and increased inter-activity in the classroom are linked to better course success [30–31]. However, online education also presents challenges for both students and teachers, including difficulties implementing new online lessons and assessment techniques [31].

In Bangladesh, most university students are from rural areas, and the declaration of lockdown led to their return to their homes, where they continued their education through online instructions [32]. These students participated in online courses and other educational activities using their cell phones and computers [31–32]. However, the high cost of mobile data and the lack of broadband and high-speed internet connections in rural Bangladesh created difficulties for these students, who had to rely on expensive services to continue their education [33–34]. Weak networks also occasionally impeded their learning [31].

Despite the many studies that have focused on the benefits, drawbacks, difficulties, and issues of online learning, little research has been done on how Bangladeshi university students perceive and prefer online education during the COVID-19 pandemic. This study seeks to fill this gap by using Binary Logistic Regression (BLR) to determine students' perceptions and preferences for online education during COVID-19. The study will examine the following five hypotheses to partially answer the research question [35].

- H1: There is a significant relationship between students' participation and online education.
- H2: There is a significant relationship between the problem of network systems and online education.

- H3: There is a significant relationship between the cooperation of teachers and online education.
- H4: There is a significant relationship between a lack of study materials and online education.
- H5: There is a significant relationship between difficulties in online classes and online education.

2 METHOD AND MATERIALS

2.1 Study design and settings

Adopting a quantitative cross-sectional research design, this study was conducted among students from several public and private universities in Bangladesh between February 1 and October 1, 2021.

2.2 Population and sample size

The target population of this study is the university-level students in Bangladesh, comprising 1,585,690, of which 1,172,901 are male, and 412,789 are female [36]. As the target population is comparatively large and heterogeneous, this study adopted ‘Cochran’s sample size formula’ (see formula 1) to estimate the ideal sample size [37–38].

$$n = \frac{t^2 * p * q}{d^2} \quad (1)$$

Therefore, the required minimum sample size for this study was calculated to be 384, where $t = 1.96$ (at 95% confidence level), $p * q = .25$ (estimate of variance), and $d = .05$ (margin of error). However, the sample size of this study comprised 1116 university-level students, where 712 (63.8%) were male, while 404 (36.2%) were female. To choose this sample, a convenience sampling technique was followed, focusing on ‘participants’ availability and accessibility due to COVID-19 [39].

2.3 Data collection instrument

The primary data for this study was gathered from several public and private universities from different districts of Bangladesh between February 1 and October 1, 2021. A self-administered semi-tailored electronic questionnaire was developed through a literature review as instructed in the study [40]. The questionnaire comprised 32 questions from 4 different categories (socio-demographic information, perceptions, and experiences of online education, sudden transition-driven barriers, and challenges and attitudes towards online education) that were designed and developed by quantitative research experts. To measure the homogeneity of items, items-internal consistency reliability of the instrument was ensured by acceptable coefficient alpha ($\alpha = .86$) [41–42]. On the other hand, following the study’s recommendation [43], the content validity of the questionnaire was ensured based on the judgment of a panel of 6 experts (education practitioners).

2.4 Statistical analysis

IBM SPSS Statistics 26 was used for data analysis. Both descriptive statistics (frequency and percentage) and inferential statistics (t-test, R (correlation), Ordinary Least Square Model, and Binary Logistic Model) were used to analyze and interpret data. Bivariate correlational analysis was performed to assess whether there is a relationship between factors and whether this correlation is statistically significant. A p-value of 0.05 was considered a significance level.

2.5 Binary logistic regression (BLR)

Regression analysis of the binary logistic kind uses a dummy variable as the dependent variable [44]. It is a valuable tool for categorical response variable-based data analysis. Using binary logistic regression analysis, relationships between the dependent and independent variables are also found [45]. The dependent variable in Binary Logistic Regression is categorical [46]. As an illustration, the dependent variable can be “unemployed/ employed,” which is correlated with age, sex, and ethnicity, among other factors. The assumptions of this technique won't hold because we cannot carry multiple regression models in this situation, as will be demonstrated theoretically. Given that the dependent variable in this situation is categorical and the logistic regression model is similar to multiple linear regressions, it may be applied [46]. In this study, the categorical variable is online education (Do you prefer online education?) which is related to gender (students). This study uses binary logistic analysis to determine how students perceive and prefer online education during COVID-19 because the dependent variable is categorical.

2.6 Ethical approval

Daffodil International University Ethical Review Board approved this study (Ref: Ethics/fouad (3)/2021). The respondent's identity was kept anonymous. Each interview required prior consent from the participants, who also had the option to revoke participation at any time.

3 RESULT AND DISCUSSION

3.1 Descriptive analysis

Numerous factors were included in this analysis that contributed to the shift to online teaching and learning. The key elements are student involvement, network system issues, instructor coordination, lack of online equipment, and issues with online classes. We polled 1116 respondents for this study from various universities in Bangladesh.

Demographic profile. According to the demographic data in Table 1, 63.8% of respondents are men and 36.2% are women. The majority of respondents (58.9%) are between the ages of 21 and 25. Dhaka is home to the vast majority of respondents (41.6%). 47.8% of those polled live in rural areas, while 52.2% live in cities. Public universities account for 20.9% of respondents, while private universities account for 79.1%.

Table 1. Demographic profile

Items	Characteristics	Response (%)
Gender	Male	63.8%
	Female	36.2%
Age	16–20 Years	39.4%
	21–25 Years	58.9%
	26–30 Years	1.3%
	>31 Years	0.4%
Division	Dhaka	41.6%
	Barisal	4.6%
	Chittagong	18.3%
	Khulna	8.2%
	Mymensingh	5.7%
	Rajshahi	12.5%
	Sylhet	1.3%
	Rangpur	7.9%
Type of locality	Urban	52.2%
	Rural	47.8%
Education	Private University	79.1%
	Public University	20.9%

Gender-based perception and preference. The study revealed (Table 2) that 67.0% of men and 77.0% of women did not participate in online classes before COVID-19. During COVID-19, 90.4% of men and 93.8% of women took part in online courses. During COVID-19, we found that 55.9% of men and 73.5% of women joined online classes inside their homes. Also, 86.7% of male and 89.6% of female respondents experienced difficulties during class time. 49.6% of male and 52.2% of female respondents would like to continue online classes after the COVID-19 pandemic. 68.4% of male and 66.3% of female respondents believe that the government should help universities (public and private) develop the necessary infrastructure and facilities to conduct online education. This data shows that during COVID-19, female students preferred online education more than male students.

Table 2. Gender-based perception and preference

Items	Characteristics	Total Population (N = 1116)			
		Male		Female	
		Frequency (712)	Percentage/Value (63.8%)	Frequency (404)	Percentage/Value (36.2%)
Where are you living now?	Urban	316	44.4%	267	66.1%
	Rural	396	55.6%	137	33.9%
Are you a student of a private/public university?	Private University	586	82.3%	297	73.5%
	Public University	126	17.7%	107	26.5%
Did you take part in online education before COVID-19 lockdown?	Yes	235	33.0%	93	23.0%
	No	477	67.0%	311	77.0%
Did you take part in online education during COVID-19?	Yes	644	90.4%	379	93.8%
	No	19	2.7%	6	1.5%
	Partially	49	6.9%	19	4.7%
Where did you take part in online classes during COVID-19?	Inside House	398	55.9%	297	73.5%
	Outside House	314	44.1%	107	26.5%
Did you feel any difficulties during class time?	Yes	617	86.7%	362	89.6%
	No	95	13.3%	42	10.4%
Do you prefer that universities and teachers should continue online education after the COVID-19 pandemic?	Yes, I prefer to continue it entirely	135	19.0%	48	11.9%
	Yes, I prefer to continue partially	353	49.6%	211	52.2%
	No, I prefer a traditional face-to-face class	105	14.7%	55	13.6%
	Better to practice blended learning (online and face-to-face) approach	119	16.7%	90	22.3%
Do you think that government should assist universities (Public and Private) in developing the necessary infrastructure and facilities to run online education?	Yes, I think so	487	68.4%	268	66.3%
	No, universities should do it by own-selves	130	18.3%	104	25.7%
	It is necessary, but I don't know who should do it	73	10.3%	17	4.2%
	It is unnecessary	22	3.1%	15	3.7%

Technological problems and challenges. Figure 1 shows that mobile devices were the most commonly used (66%) for online education during COVID-19. Figure 2 shows that, of the 1116 respondents, 835 used Google Meet as their primary online learning platform for COVID-19. Figure 3 shows that during COVID-19, 88.2% of men and 84.7% of women reported technical issues and challenges with online education. Figure 4 also shows that 946 respondents supported the expansion of online education by recommending it as a cost-effective option.

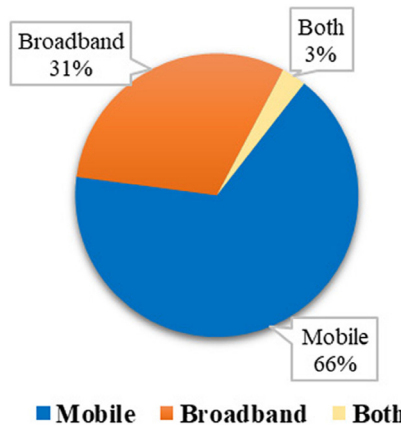


Fig. 1. Most used internet service for online education during this COVID-19

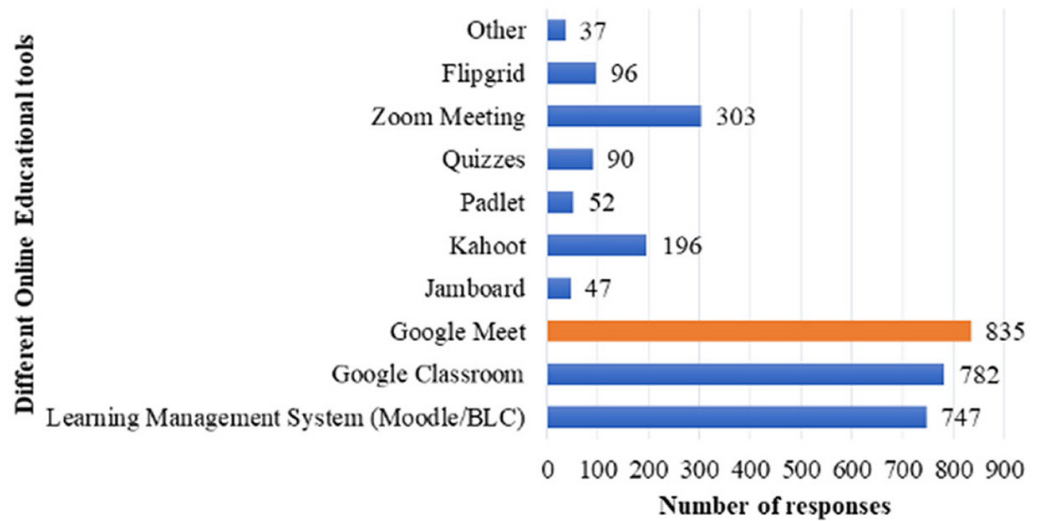


Fig. 2. Most used online educational tools or platforms during COVID-19

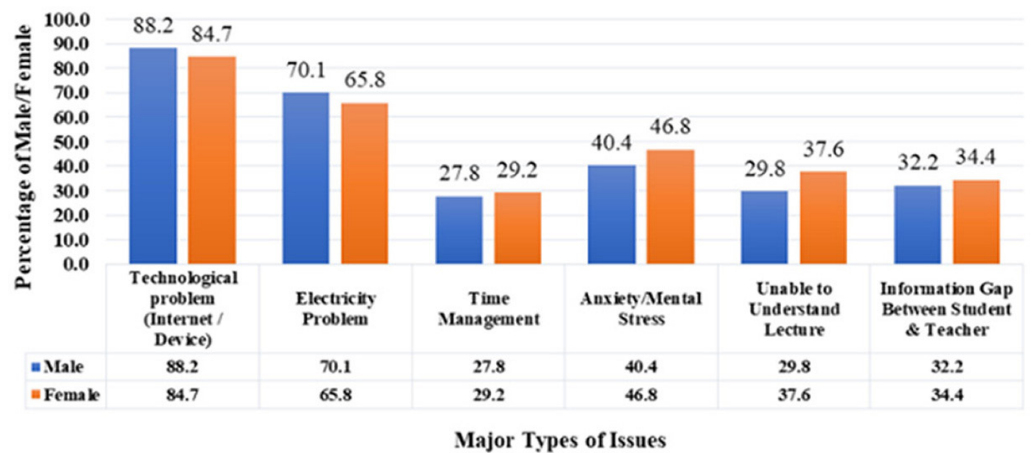


Fig. 3. Problems and challenges faced by students in online education during the COVID-19 lockdown

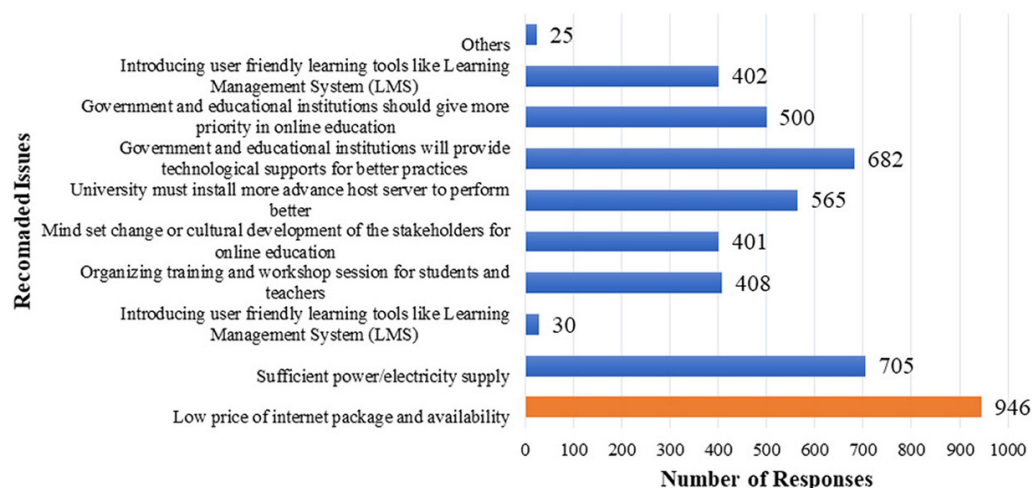


Fig. 4. Recommendation of possible solutions for the development of online education

Public and private university-based perception and preference. As illustrated in Figure 5, this section of the analysis is based on the type of university, such as public or private. Prior to the COVID-19 lockout, 87.98% of public university students did not participate in online learning. In contrast, only 66.02% of students at private universities engaged in online learning. During COVID-19, online learning was used by 89.70% of students at public universities and 92.19% of students at private universities. Finally, 85.62% of private teachers or educational institutions and 64.81% of public teachers or educational institutions assisted students with their online studies. During COVID-19, private university students and faculty members preferred online learning over traditional classroom instruction, according to this study.

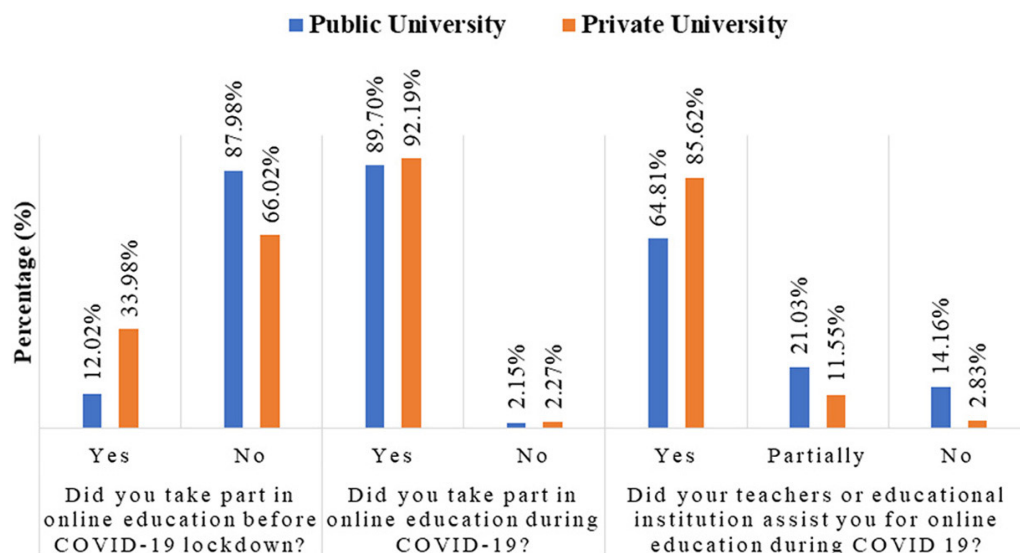


Fig. 5. Public and private university-based perception and preference

Rural and urban-based preference and perception. The study now considers several regional categories, including urban and rural, as shown in Table 3. During COVID-19, 45.5% of respondents in urban areas used a mobile device to access the internet for online learning, while 85.2% of respondents in rural areas used a mobile device to access the internet for online learning. 76% of respondents in cities and

89.7% in rural areas said it was difficult to get internet service. In cities, 89.9% of respondents reported having difficulty in class. In contrast, 92.3% of respondents in rural areas reported difficulty in class. During class, 90.6% of respondents in rural areas and 83.5% of respondents in urban areas reported having technical issues with their devices or the internet. The exam was rated as difficult by 86.1% of urban respondents and 89.5% of rural respondents. These problems persisted during exams, with 79.4% of urban respondents and 89.3% of rural respondents reporting technological problems (internet/device) during the test. According to this data, students in rural areas had significantly more difficulties than those in urban areas during COVID-19.

Table 3. Rural-urban-based preference

Items	Characteristics	Total Population (N = 1116)			
		Urban		Rural	
		Frequency 583	Percentage (%) 52.24	Frequency 533	Percentage (%) 47.76
What type of internet service are you using for online education during this COVID-19?	Mobile	265	45.5	454	85.2
	Broadband	267	45.8	77	14.4
	Both	51	8.7	2	0.4
Have you faced any challenges to buy internet service during COVID-19?	Yes	443	76.0	478	89.7
	No	140	24.0	55	10.3
Did you experience any difficulties during class time?	Yes	524	89.9	492	92.3
	No	59	10.1	41	7.7
What types of difficulties you've faced during class time?	Technological Problem (Internet/Device)	487	83.5	483	90.6
	Electricity Problem	405	69.5	360	67.5
	Time Management	165	28.3	151	28.3
	Anxiety/Mental Stress	264	45.3	213	40.0
	Unable to Understand Lecture	207	35.5	157	29.5
	Information Gap Between Student & Teacher	197	33.8	257	48.2
Did you face any difficulties during the exam?	Yes	502	86.1	477	89.5
	No	81	13.9	56	10.5
What types of difficulties you've faced during Exam time?	Technological Problem (Internet/Device)	463	79.4	476	89.3
	Electricity Problem	372	63.8	346	64.9
	Time Management	251	43.1	206	38.6
	Anxiety/Mental Stress	264	45.3	195	36.6
	Unable to Understand the Question	141	24.2	131	24.6
	Information Gap Between Student & Teacher	106	18.2	86	16.1

3.2 Hypothesis testing and regression analysis

Testing hypotheses is an important step in experimental research [32]. In this case, five hypotheses were tested to determine whether or not a relationship between two variables is statistically significant. The research objectives can be met by testing hypotheses.

H₁: Hypothesis test (Participation of the students and online education).

H₀: There is no significant relationship between the participation of students and online education.

H₁: There is a significant relationship between the participation of students and online education.

Table 4 shows that the students' participation increases online education by 89%. Here, the t value is 9.629 and the p-value is 0.000. We know that when the t value is $t > 2$ and the p-value is $p < 0.05$, the null hypothesis (H₀) is rejected and statistically significant. As the beta coefficient is 0.89, there is a positive and significant relationship between the participation of the students and online education. R (correlation) is 0.84. So, there is a strong correlation between the participation of students and online education. After all, there is a positive effect on student participation and online education.

H₂: Hypothesis test (Problem of network systems and online education).

H₀: There is no significant relationship between the problem of network systems and online education.

H₁: There is a significant relationship between the problem of network systems and online education.

Table 4 shows that the problem of the network system decreases online education by 73%. Here, the t value is 4.109 and the p value is 0.000. So, the null hypothesis (H₀) is rejected and statistically significant. As the beta coefficient is -0.73, there is a significant negative relationship between the problem of the network system and online education. R (correlation) is 0.75. So, there is a high correlation between problems with the network system and online education. After all, there is a negative effect on the problem of network systems and online education.

Table 4. Hypotheses testing

Variables	Beta Coefficient	t-value	p-value	R
Participation of the students	0.89	9.629	0.000	0.84
Problem of network system	-0.73	4.109	0.000	0.75
Co-operation of the teachers	0.81	7.764	0.000	0.79
Lack of study materials	-0.64	2.399	0.000	0.67
Difficulties during online class	-0.69	3.563	0.000	0.72

H₃: Hypothesis test (Teacher cooperation and online education).

H₀: There is no significant relationship between the cooperation of teachers and online education.

H₁: There is a significant relationship between the cooperation of teachers and online education.

Table 4 shows that teacher cooperation increases online education by 81%. The t value is 7.764 and the p value is 0.000 in this case. So, the null hypothesis (H_0) is rejected and statistically significant. As the beta coefficient is 0.81, there is a positive and significant relationship between the teachers' cooperation and online education. R (correlation) is 0.79. So, there is a high correlation between the co-operation of the teachers and online education. After all, there is a positive effect on the cooperation of the teachers and on online education.

H4-Hypothesis test (Lack of study materials and online education).

- H_0 : There is no significant relationship between the lack of study materials and online education.
- H_1 : There is a significant relationship between the lack of study materials and online education.

Table 4 shows that the lack of study materials decreases online education by 64%. Here, the t value is 2.399 and the p value is 0.000. So, the null hypothesis (H_0) is rejected and statistically significant. As the beta coefficient is -0.64 , there is a significant negative relationship between the lack of study materials and online education. R (correlation) is 0.67. So, there is a high correlation between the lack of study materials and online education. After all, there is a negative effect on the lack of study materials and online education.

H5-Hypothesis test (Difficulties in online class and online education).

- H_0 : There is no significant relationship between the difficulties during online class and online education.
- H_1 : There is a significant relationship between the difficulties during online classes and online education.

Table 4 shows that the difficulties during online class decrease online education by 69%. Here, the t value is 3.563 and the p value is 0.000. So, the null hypothesis (H_0) is rejected and statistically significant. Because the beta coefficient is -0.69 , there is a negative significant relationship between online class difficulties and online education. R (correlation) is 0.72. As a result, there is a high link between difficulties in online classes and online education. After all, there is a negative effect on the difficulties of online classes and online education.

3.3 Binary logistic regression analysis

In this analysis dependent variable is online education (Do you prefer online education?) which has two values 1 if students prefer online education and 0 if students don't prefer online education. On the other hand, independent variable is gender (students). The independent variable is statistically significant as $p < 0.05$, indicating that the model is able to distinguish between respondents who prefer online education and who don't prefer online education. Table 5, the model as a whole explained 23% (Cox and Snell R square) and 36% (Nahelkerke R squared) of the variance in preference. Here odd ratio is 0.58 which means that from 100% students, 58% students prefer online education but 42% students don't prefer online education. This data reveals that students preferred online education over face-to-face instruction during COVID-19.

Table 5. Binary Logistic Regression Analysis

					95.0% Confidence Interval for OR	
	B	S.E.	P-value	OR	Lower	Upper
Gender	2.72	0.18	0.00	0.58	0.46	0.84
Constant	1.04	0.27	0.03	0.35		

Cox & Snell R Square = 0.234

Nagelkerke R Square = 0.361

Notes: B = Beta Coefficient, S.E. = Standard Error, OR = Odd Ratio, In this Binary logistic analysis, Dependent variable = Online education (Do you prefer online education?), 1 = Students prefer online education, 0 = Students don't prefer online education, Independent variable = Gender (Male and Female).

Above all, this study's primary objective was to determine students' perceptions of and preferences for online learning during COVID-19, which is based on Binary Logistic Regression Analysis. Between February 1 and October 1 of 2021, a quantitative cross-sectional research approach was used to gather data from many Bangladeshi public and private universities. 1116 university students made up the sample size for this study, and 712 (63.8%) of them were men while 404 (36.2%) were women. Convenience sampling was used to choose this sample, emphasizing participants' accessibility and availability because of COVID-19 [39]. A self-administered semi-tailored electronic questionnaire was developed through a literature review as instructed in the study [40]. The questionnaire comprised 32 questions. Data analysis was carried out using IBM SPSS Statistics 26. Data were analyzed and interpreted using both descriptive statistics (frequency and percentage) and inferential statistics (t-test, R (correlation), Ordinary Least Square Model, and Binary Logistic Regression). Online education (Do you favor online education?) is a categorical variable in this study that is related to gender (students). This study uses binary logistic analysis to determine the perception and preference of the students for online education during COVID-19 because the dependent variable is categorical [46]. It was discovered that 63.8% of respondents are men and 36.2% are women. Most respondents (58.9%) are between the ages of 21 and 25. The majority of respondents (41.6%) reside in Dhaka. 79.1% of respondents are graduates of private universities, while 20.9% are graduates of public universities. Of the respondents, 52.24% live in urban areas, and 47.8% live in rural areas. These findings are consistent with earlier research [14 & 15]. We can see that during COVID-19, female students preferred online education more than male students did. Once more, private university students and faculty members favor online learning more than those at public universities.

Additionally, during COVID-19, students in rural areas experienced significantly more difficulties with online education than students in urban areas. Similar results were also found in the study that follows [31]. Mobile internet usage for online education has increased to 66% during COVID-19. Of 1116 respondents, 835 chosen Google Meet as their primary online learning medium for COVID-19. Again, during the COVID-19-induced lockdown, 88.2% of men and 84.7% of women respondents had technology issues and difficulties in online education. Finally, 946 respondents supported the accessibility and affordability of internet packages for the growth of online education. These findings are consistent with earlier research that asserts students have various technology issues [31–34]. In this study, five hypotheses were used, showing that while student's participation and teacher's co-operation were

positively associated with online education, network system issues, a lack of study materials, and difficulties during online classes were negatively related. These findings are consistent with earlier research [22–30 & 31–34]. Using this logistic analysis, we can observe that the overall proportion is 58%, meaning that out of 100% of students, 58% like online learning while 42% don't. According to the analyses, students preferred online education over face-to-face instruction during COVID-19. These findings are consistent with earlier research [22–24] that discovered comparable academic ambiguities.

4 STUDY LIMITATION

This study may be subject to some limitations. First, this survey was carried out in Bangladeshi universities. A further longitudinal study is needed to better comprehend tertiary-level students' online education experiences, including those at different educational institutions. Second, it was difficult to define research gaps due to a paucity of earlier research investigations. Thirdly, this study did not examine additional variables that might affect online learning, such as the psychosocial and socioeconomic circumstances of students during the epidemic, their access to power, and other pertinent circumstances.

5 CONCLUSION AND POLICY IMPLICATIONS

Most educational institutions in Bangladesh still use conventional face-to-face instruction. More than 1.6 billion pupils in more than 150 countries now attend school online due to COVID-19 [47]. Online education has created a lot of issues and difficulties for students and professors. This study's hypothesis testing and use of Binary Logistic Analysis found that students during COVID-19 preferred online education over face-to-face instruction. Online courses are valued by students in order to prevent virus transmission. According to this study, online learning improves student engagement and instructor collaboration. Although students confront numerous difficulties (such as network system issues, a shortage of study resources and materials and electricity problems during online classes), they favor online education more than the conventional method. Online learning makes education more accessible, particularly for those who face geographic or physical barriers. This provides new learning opportunities for everyone, regardless of location or ability. Online learning has increased access while also creating new inequalities such as the digital divide and gaps in technology and internet access. Policymakers must address these issues if all students are to have equal access to online learning opportunities. The rapid growth of online learning has raised concerns about course quality and consistency. Policymakers must establish quality assurance mechanisms to ensure that online education is rigorous, relevant, and as good as in-person instruction. Countries and educational authorities struggle to make a sudden transition to an online learning environment due to a lack of resources and proper planning. Academic institutions struggle to retain students while also covering costs. To teach online, teachers must use digital pedagogy, technology integration, and online facilitation. Policymakers must fund professional development programs to assist teachers and institutions in adapting to the new learning environment.

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