Article

Factors Associated with the Perception of Risk and Knowledge of Contracting the 2019-nCoV among Adults in Bangladesh: Analysis of Online Surveys

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Abstract: This study investigated risk perception and awareness among Bangladeshi adult participants about Coronavirus Disease 2019 (COVID-19). Two self-administered online surveys were conducted on 1005 respondents (322 and 683 participants, respectively) during the lockdown period in Bangladesh at two separate time points from 26-31 March 2020 (early lockdown) and 11-16 May 2020 (late lockdown) via social media. Univariate and multiple linear regression models were used to examine risk perception and knowledge-related factors toward COVID-19. Scores of mean knowledge (8.4 vs. 8.1, P=0.022) and perception of risk (11.2 vs. 10.6, P < 0.001) differ significantly between early and late lockdown. There was a significant decrease in perceived risk scores for contracting 2019-nCoV [β=-0.85, 95%CI: -1.31, -0.39], while knowledge about 2019-nCoV decreased but not significant [β=-0.22, 95%CI: -0.46, 0.03] in late lockdown compared with early lockdown period. High practised quarantine and quarantined at the request of public health authorities during COVID-19 were common factors associated with increased perceived risk and knowledge of contracting 2019-nCoV. Any initiative in Bangladesh to raise public knowledge and understanding of COVID-19 would then prioritize male who have performed low quarantine and are less concerned about the transmission of this kind of pathogen.

Keywords: COVID-19; Knowledge; Perception of Risk; Pandemic Outbreak; Disease Control; Cross-sectional Study

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1. Introduction

The increasingly busy human civilization has been interrupted by a deadly pandemic which, no matter how distinctive, threatens every nation in the world [1]. SARS-CoV-2 is a beta coronavirus genetic closely linked to the SARS-CoV-1 (79% sequence identity) than to the MERS-CoV (51,8% identity) [2]. This virus was first detected in the city of Wuhan, a Chinese province of Hubei, in December 2019 when few patients were documenting a very different form of the acute pneumonia-like disease in that area [3]. The signs included dry cough, dyspnea, fever and lung trouble [4]. The infection quickly becomes a source of concern, since no accepted cure or current drug is available to combat the virus [5]. 2019-nCoV propagates extremely rapidly, infecting millions in just a few days [6].

Whereas most of the affected persons can recover at their own, severe illness is most likely to develop amongst people of advanced age and those with co-existing conditions including hypertension, diabetes cardiovascular disease, chronic lung disease, and obesity. The overall mortality rate for COVID-19 will likely be in the range of 0.5% to 3.5% [7; 8]. The most common symptoms of COVID-19 are fever and cough, and later in the disease, patients are more likely to have the difficulty of breathing and develop pneumonia. At diagnosis, 80% of cases are asymptomatic or will have mild disease, 15% are severe and 5% are considered critical [7; 8]. There are currently no approved drugs, immune therapies or vaccines against SARS-CoV-2. Another real concern has been the frequency at which the infection spreads in a quite relatively short period [9], with potentials to overwhelm the healthcare system including that of the likelihood that those who need emergency health attention can succumb to death as a result of overwhelming health services [10]. To delay the spread of infection and dispersing pressures on hospitals, public health authorities in most of the country adopted vigorous public health measures, such as surveillance, exhaustive contact tracing, social distancing, travel restrictions, and educating the public on hand hygiene, and postponing non-essential operations and services [11]. As previous research reveals, interpersonal distancing, personal hygiene and people's collective consciousness inhibited 2019-nCoV from spreading [12; 13].

The virus has now infected more than 200 countries and nearly all of them are shut down to prevent the virus from transmitting [14]. Starting from China this virus hit European, American, African and Asian countries. Spreading continues to be an issue in Asia, where the disease began and the spread probably will continue, even though it now seems to have reached its height in China. In South Asia, it is now quite prevalent. Yet this worldwide pandemic surge hasn't exempted Bangladesh, a nation of approximately 170 million inhabitants where the largest population in the world lies. The Bangladesh Government took stringent measures, including community shutdown, social isolation and self-hygiene, to restrict the transmission of the virus [15; 16; 5]. Since Bangladesh reported its first case of 2019-nCoV infection in early March 2020, there has been a rising number of cases and deaths from the virus throughout the community [6].

The rapid spread of the virus has put enormous pressure on many countries' local health care systems and, if expected to proceed, this pandemic will have profound economic consequences together with other potential dangers [17]. Many countries, which are affected by the 2019-nCoV virus is already under strict partial or full lockdown procedure [4]. For instance, the Chinese provinces that were affected were locked down from any kind of communication for more than three months [9]. Italy, Canada, Spain, the United States and other full-locking countries, avoiding any national reunification. Wide-scale domestic and foreign religious events have been cancelled for fear of 2019-nCoV outbreak [18]. Such actions have an enormous socio-economic impact on the country [15] and the shutdown, has upstretched fears of economic repercussions [19]. Because of this pandemic, everything about human life including exports and imports of goods, business, infrastructural development, agriculture and education seem to have stopped [18].

Economic crises may have severe effects in parts of the world like Bangladesh. It is predicted that more than $3 billion could've been expected to spend if this infectious disease causes a large outbreak in Bangladesh and therefore that approximately 800,000 jobs in Bangladesh could be ended

up [20]. It may contribute to a big economic tragedy in a country like Bangladesh, which is still attributed to everyday wages, as seen in other heavily affected regions of the world.

Since the sheer illness of the whole country is sufficient to destroy the health care system, this current study is to examine changes of individual perception of risk for contracting 2019-nCoV, and the awareness level in Bangladesh during early and late lockdown implemented by the government of Bangladesh. The findings of this study will provide an understanding of people's knowledge level, perception of risk and awareness which can be used to implement emergency policies to counter the spread of 2019-nCoV.

2. Methodology

From 26-31 March 2020, the first cross-sectional survey entitled 'Early lockdown' was performed, referring to the week of the lockdown period in Bangladesh and the second cross-sectional survey entitled 'Late lockdown' was carried out from 11-16 May 2020. Even though a national community-based sampling survey throughout that time wasn't conceivable, the data was collected electronically using the Google Form. A standardized synchronized questionnaire was uploaded on social networking sites such as Facebook and WhatsApp which are widely used by investigators and local people throughout the country. Emails with the survey link were sent in the second step via contact lists of the researchers to broaden the scope of the survey. Participants in the survey received no incentives.

2.1. Sample size

The first survey (Early lockdown) assumed a proportion of 50% with 90% confidence. Because the main objective of this research was on COVID-19 and there are no previous studies from Bangladesh that examined factors associated with 2019-nCoV, an online sample size calculator [21], was used and we assumed a sample size of approximately 300 including 10% non-response rate. The second survey (Late lockdown) assumed a proportion of 31% (very worried about COVID-19) reported in the first study (Early lockdown) with 90% confidence [21]. The calculation of total sample size for the second survey was 710 including a 10% non-response rate.

2.3. Consent and Ethical Consideration

The participants responding to a 'yes' or 'no' question obtained voluntary on-line consent to express their willingness to attend the study via Google forms. This study was approved by the Ethics Committee (Approval Number: BRUR/DWRTI/a.n.003) of the Dr Wazed Research and Training Institute, Begum Rokeya University, Rangpur. Rangpur-5404, Bangladesh.

2.4. Questionnaire

Table 1 presents the questionnaire used in this study. The questionnaire was divided into three sections including demographics, knowledge, and perception. The demographic variables included age, gender, marital status, education, employment and religion. There were 12 items on the questionnaire that assessed the respondent's knowledge of COVID- 19, most of which required a 'yes' or 'no' response. Each question used a binary scale. The scores for each item ranged from 0 (No) to 1 (Yes). The knowledge score ranged from 0–12 points. These items have been validated elsewhere to have an acceptable internal consistency [22]. The survey tool for the COVID-19 knowledge questionnaire was developed based on the guidelines from the World Health Organization [5; 23] for clinical and community management of COVID-19.

We asked the respondent about risk perception towards COVID-19 (P1-P4). Each question used a Likert scale with five levels. The scores for each item ranged from 1 (lowest) to 5 (highest). The risk

perception score ranged from 5–20 points. The Cronbach's alpha coefficients of the perception items were 0.74 and demonstrated that the internal consistency of perception items was satisfactory. Respondents were also asked about '*How they felt about the quarantine'* (P6-P11). Each question used a Likert scale with five levels. The scores for each item ranged from 1 (lowest) to 5 (highest) and the Cronbach's alpha coefficient of the *How they felt about the quarantine* items was 0.70, indicating acceptable internal consistency

Table 1. Questionnaire of knowledge and perception towards COVID-19.

Knowledge	
K1	Are you aware of the Coronavirus disease (COVID-19) outbreak?
K2	Do you think Coronavirus disease (COVID-19) outbreak is dangerous?
K3	Do you think Public Health Authorities in Bangladesh are doing enough to control the Coronavirus disease (COVID-19) outbreak?
K4	Do you think Hand Hygiene / Hand cleaning is important to control the spread of the Coronavirus disease (COVID-19) outbreak?
K5	Do you think wearing masks is important to control the spread of the Coronavirus disease (COVID-19) outbreak?
K6	Which mask(s) do you think is better to control the spread of the Coronavirus?
K7	Do you think antibiotics can be effective in preventing Coronavirus disease (COVID-19) outbreak?
K8	Do you think there are any specific medicines to treat Coronavirus disease (COVID-19)?
K9	Those that have contact with someone who has COVID-19 infection should be isolated in the right place immediately. The observation period is usually 14 days
K10	Children and young adults should not take steps to prevent the COVID-19 virus from infection.
K11	COVID-19 individuals cannot spread the virus to anyone if there's no fever
K12	Individuals should stop being crowded to prevent COVID-19 infection.
Perception	
Please rate your chances of personal risk of infection with COVID-19 for each of the following?	
P1	Risk of becoming infected.
P2	Risk of becoming severely infected
P3	Risk of dying from the infection
P4	How much worried are you because of COVID-19?
P5	Are you currently or have you been in (domestic/home) quarantine because of COVID- 19?
How do you feel about the quarantine?	
P6	I am worried/anxious/alarmed and frightened by the quarantine.
P7	I consider the quarantine as necessary and reasonable.
P8	I am nervous about the quarantine.
P9	I am bored by the quarantine.
P10	I am frustrated by the quarantine.
P11	I am angry because of quarantine.

(Source: Revised and Adopted from World Health Organization, 2019)

2.4. Independent variables

The explanatory (independent) variable included basic characteristics and explanatory factors including gender, age in categories, level of education, marital, employment and religion status. The question of worrying about quarantine score ranged from 6–30 points. The worried about quarantine score was divided into 3 categories. The bottom 33.3% of the score was arbitrarily referred to as 'low Quarantine practice, the next 33.3% as 'average Quarantine practice', and the top 33.3% as 'high Quarantine practice'. Furthermore, "high quarantine practice" which was derived by combining the average quarantine practice (33.3%) with the high quarantine practice (33.3%), and low quarantine practice was "low quarantine practice scores" 33.3%.

2.5. Statistical analysis

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Data analysis was performed using Stata version 14.1 (Stata Corp. College Station United States of America). Categorical variables were presented as frequency and percentage. This was followed by using a t-test to compare the differences between means for early and late lockdown for knowledge and risk perception items. In the univariate linear regression analysis, all confounding variables with a P-value < 0.20 were retained and was used to build a multivariable linear regression model and to determine factors associated with the knowledge and perception score towards COVID-19. For regression analysis, we checked homogeneity of variance and multicollinearity using Variance Inflation Factors (VIF).

3. Results

3.1. Descriptive statistics

The descriptive statistics of the explanatory and dependent variables are shown in Table 2. This summary of responses obtained from those who participated in the survey distributed during the early lockdown (26-31 March 2020) and late lockdown (11-16 May 2020) periods. Total responses were a combination of both. Most of the respondents (53.2%, n=532) were 18-28 years old with equal representation of males and females. Most respondents (58.2%, n=585) were married, and almost all (83.1%, n=835) had completed University education or its equivalent. Of the respondents, 88.8% (n=892) were Muslims. About two-thirds of the respondents (65.5%, n=658) voluntarily quarantined themselves during the study period while about a quarter of the 19.2%, (n=193) did not. Regarding their concern on the spread of the 2019-nCoV virus, the majority (68.7%, n=690) stated they were very worried. Descriptive analysis of each Lockdown periods is reported in supplementary table 1.

Table 2. Sociodemographic characteristics of the study

Characteristics	Early Lockdown, n (%)	Late Lockdown, n (%)	Total, n (%)
Responses	322 (32.0)	683 (68.0)	1005 (100.0)
Demography			
Gender			
Male	163 (50.6)	352 (51.6)	515 (51.3)
Female	159 (49.4)	330 (48.4)	489 (48.7)
Age stratification (years)			
18-28	191 (59.3)	341 (50.2)	532 (53.2)
29-38	52 (16.1)	139 (20.5)	191 (19.1)
39-48	53 (16.5)	117 (17.2)	170 (17.0)
49+years	26 (8.1)	82 (12.1)	108 (10.8)
Education Level			
Master's Degree or Equivalent	125 (38.8)	237 (34.7)	362 (36.0)
Bachelor's Degree	152 (47.2)	321 (47.0)	473 (47.1)
Primary/Secondary	45 (14.0)	125 (18.3)	170 (16.9)
Marital Status			
Not married	150 (46.6)	270 (39.5)	420 (41.8)
Married	172 (53.4)	413 (60.5)	585 (58.2)
Employment Status			
Unemployed	158 (49.1)	260 (38.1)	418 (41.6)
Employed	164 (50.9)	423 (61.9)	587 (58.4)
Religious status			
Muslim	284 (88.2)	608 (89.2)	892 (88.8)
Others (Christian/Hindu)	38 (11.8)	74 (10.9)	112 (11.2)

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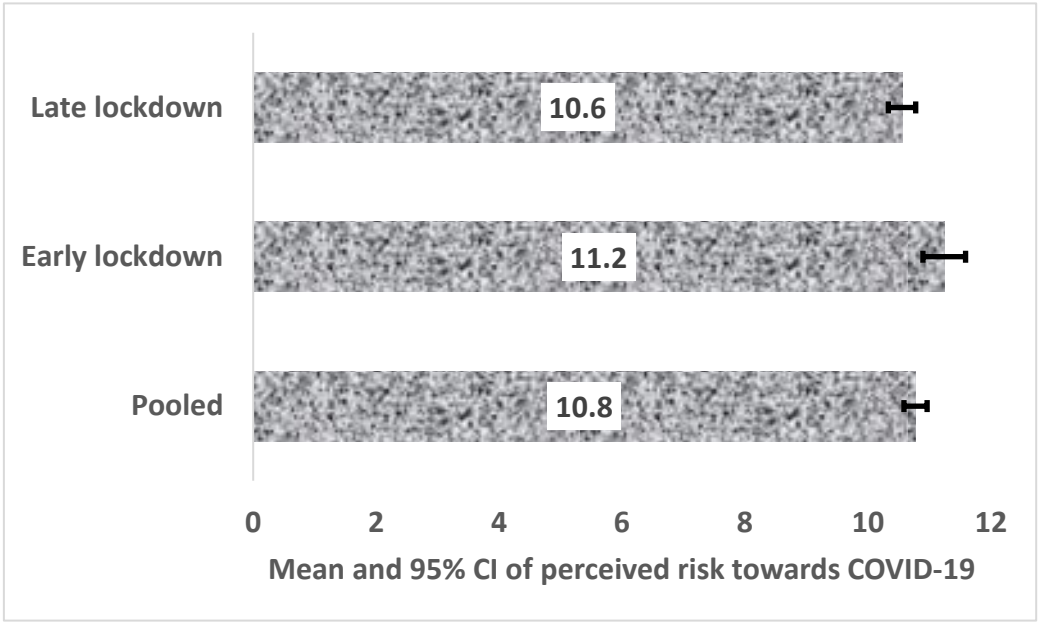
Perceived risk of COVID-19			
Practice on quarantine			
low Practice Quarantine	132 (41.0)	242 (35.4)	374(37.2)
High Practice Quarantine	190 (59.0)	441 (64.6)	631(62.8)
Current, previously Quarantined for COVID-19			
Yes, voluntarily	185 (57.5)	473 (69.4)	658 (65.5)
Yes, public health officers request	61 (18.9)	92 (13.5)	153 (15.4)
No	76 (23.6)	117 (17.2)	193 (19.2)
COVID-19 worries			
Somehow worried[&]	223 (69.3)	92 (13.5)	315 (31.3)
Very worried	99 (30.8)	591 (86.5)	690 (68.7)

$ = low, neutral & moderate; variables in this table were used in the predictive modelling of risk factors and knowledge level presented in subsequent tables.

3.2. Prevalence of perceived risk and knowledge towards COVID-19

Figure 1a and 1b showed the mean and 95% Confidence Intervals of perceives risk and knowledge towards COVID-19, respectively. Data of early and late lockdown period presented here correspondingly. Figure 1a indicated statistical differences between early and late lockdown ($P < 0.001$) with early lockdown reporting the highest mean values. Additionally, as indicated in figure 1b, knowledge towards COVID-19 for early lockdown significantly reported the highest mean value compared with late lockdown (P=0.022). The horizontal values in Figure 1 a & b are the minimum and maximum of perceived risk and knowledge scores.

a



b

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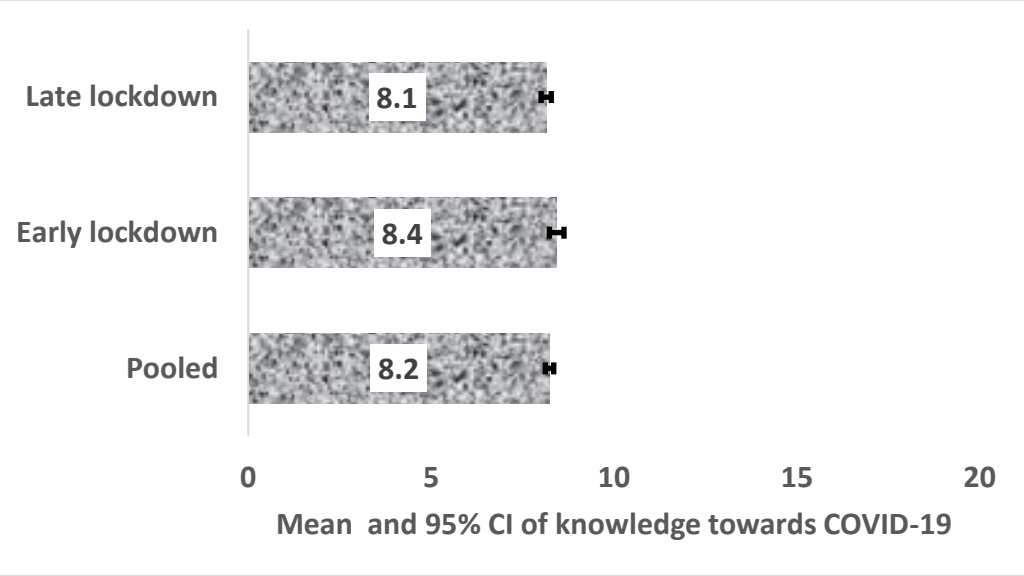

Figure 1. Mean and 95% CI of perceived risk and knowledge towards 2019-nCoV in Bangladesh.

3.3. Factors associated with the perceived risk of the 2019-nCoV infection

The unadjusted and adjusted coefficients for factors associated with a perceived risk of contracting 2019-nCoV are presented in Table 3. Compared with early lockdown period, the results indicated that perceived risk scores for contracting COVID-19 in late lockdown period reduced significantly (adjusted coefficients (β) -0.85, 95%CI -1.31, -0.39). Other factors associated with perceived risk scores for contracting COVID-19 are females, practised high quarantine, very worried about COVID-19 and quarantined at the request of public health order during COVID-19. The factors associated with perceived risk scores for contracting COVID-19 in early lockdown and late lockdown period are presented in Supplementary Table 2.

Table 3. Factors associated with the perceived risk of COVID-19 among the respondents in Bangladesh during the lockdown period. *Bold indicates a significant association.*

Demography	Coefficient	95 %CI	Adjusted coefficient	95%CI
Time (Ref=early lockdown)	**Ref**		**Ref**	
late lockdown	-0.69	-1.09, -0.29	-0.85	**-1.31,-0.39**
Gender				
Male	Ref		Ref	
Female	-0.79	-1.16, -0.42	-0.60	**-0.96, -0.24**
Age stratification (years)				
18-28	Ref		-	-
29-38	-0.47	-0.97, -0.03		
39-48	-0.34	-0.87, 0.18		
49+years	-0.78	-1.41, -0.15		
Education level				
Master's Degree or Equivalent	Ref		- -	
Bachelor's Degree	-0.11	-0.53, 0.31	- -	
Primary/Secondary	-0.19	-0.74, 0.37	- -	
Marital Status				
Not married	Ref		- -	

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Married	-0.3	-0.68, 0.09	- -	
Employment Status				
Unemployed	Ref		- -	
Employed	-0.17	-0.55,0.21	- -	
Religious status				
Muslim	Ref		- -	
Others (Christian/Hindu)	-0.6	-1.19, -0.00	- -	
Perceived risk of COVID-19				
Practice on quarantine				
low Practice quarantine	Ref		Ref	
High Practice quarantine	1.18	0.80, 1.57	1.14	**0.77, 1.50**
Current, previously Quarantined for COVID-19				
Yes, voluntarily	Ref		Ref	
Yes, public health officers request	1.57	1.06, 2.09	1.47	**0.97, 1.97**
No	1.85	1.39, 2.32	1.59	**1.17, 3.92**
COVID-19 worries				
Somehow worried[$]	Ref		Ref	
Very worried	0.07	-0.34, 0.47	0.50	**0.04, 0.96**

Note: $ = low, neutral & moderate; CI including '0' indicates non-statistically significant

3.4. Factors associated with adequate knowledge of the 2019-nCoV infection

Table 4 showed the unadjusted and adjusted coefficients and 95% confidence Intervals (CIs) of the knowledge level of COVID-19. After adjustment for potential confounding factors, knowledge about COVID-19 has decreased but not significant [β=-0.22, 95%CI: -0.46, 0.03] in late lockdown period compared to early lockdown period. Additionally, factors associated with reduced knowledge of COVID-19 were those who did quarantine at the request of health authorities during the lockdown, bachelor's degree and completed secondary or primary education while factors associated with increased knowledge of COVID-19 were non-Muslims, practised high quarantine and quarantined at the request of health authorities during the lockdown. Factors associated with the knowledge level of COVID-19 for each lockdown periods are reported in Supplementary Table 3.

Table 4 Factors associated with the knowledge level of COVID-19 among the respondents in Bangladesh during the lockdown period. *Bold indicates a significant association.*

Demography	**Coefficient**	**95 %CI**	**Adjusted coefficient**	**95%CI**
Time (Ref=early lockdown)	Ref		Ref	
late lockdown	-0.29	-0.53, -0.04	-0.22	-0.46, 0.03
Gender				
Male	Ref		Ref	
Female	-0.01	-0.24, 0.22		
Age stratification (years)				
18-28	Ref		Ref	
29-38	0.06	-0.25, 0.36	-	-
39-48	0.38	0.06, 0.70	-	-
49+years	0.23	-0.15, 0.61	-	-
Education level				

Master's Degree or Equivalent	Ref		Ref	
Bachelor's Degree	-0.3	-0.56, -0.05	-0.26	**-0.51, -0.01**
Primary/Secondary	-0.61	-0.95, -0.27	-0.50	**-0.83, -0.16**
Marital Status				
Not married	Ref		Ref	
Married	0.05	-0.19, 0.28	-	-
Employment Status				
Unemployed	Ref		Ref	
Employed	0.24	0.01, 0.47	-	-
Religious status				
Muslim	Ref		Ref	
Others (Christian/Hindu)	0.45	0.09,0.82	0.38	**0.02, 0.74**
Perceived risk of COVID-19				
Practice on quarantine				
low Practice quarantine	Ref		Ref	-
High Practice quarantine	-0.16	-0.40, 0.08	1.14	**0.77, 1.50**
Current, previously Quarantined for COVID-19				
Yes, voluntarily	Ref		Ref	
Yes, public health officers request	0.49	0.17, 0.81	0.42	**0.10, 0.75**
No	0.19	-0.10, 0.48	0.15	-0.14, 0.45
COVID-19 worries				
Somehow worried[$]	Ref		-	
Very worried	-0.16	-0.41, 0.09	-	

$ = low, neutral & moderate

4. Discussion

This current study reported a higher mean of perception of risk and low knowledge of contracting the 2019-nCoV among adults in Bangladesh. The study also revealed factors associated with the perception of risk and knowledge of contracting the 2019-nCoV in Bangladesh and found that females and those with bachelor degree reported decreased perceived risk and knowledge of contracting 2019-nCoV than males, and Masters/higher degree holders, respectively practised high quarantine, very worried and quarantined at the request of public health order during COVID-19 reported higher perceptive risk of contracting COVID-19 while, non- Muslims (Christian/Hindu), practised high quarantine and quarantined at the request of public health order during COVID-19 reported increased knowledge scores of contracting the infection.

The higher mean score of risk perceptions stated in this analysis can be because the Bangladesh government has taken exceptional measures to track the rapid spread of the current global COVID-19 disease outbreak [24]. When the number of individuals infected and the fatalities from this epidemic escalate, residents will stick to preventive measures because they are influenced by their knowledge, perceptions and practices towards this disease outbreak [25]. In this study, we analyzed the opinion of Bangladesh people about vulnerability and awareness towards COVID-19 during the drastic rise period of the disease outbreak. Researchers identified that many were extremely concerned about the transmission of the infectious disease in this predominantly well-educated young Muslim population and more than one-third considered themselves to be at low risk of contracting the infection. Such a high perception of low risk coupled with the fairly average COVID-

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19 knowledge scores is extremely important because clear knowledge predicts a positive attitude and appropriate attitude against COVID-19 [22].

In this study, males who were worried about contracting 2019-nCoV, were more likely to perceive themselves as being at high risk of contracting the infection as well as those who did not quarantine themselves or only did so at the request of the public health officers. These findings were similar to those reported in studies conducted in India, China and Jordan. Where adults having a higher level of knowledge about COVID-19 and being in quarantine are more concerned about the infection and became frustrated as they didn't know how long the impact of the pandemic may last [26]. Moreover, in India, the knowledge level of the people was sufficient enough to identify the huge risk of contracting the infection during the consistent lockdown period [27]. Even in a similar kind of study conducted in Jordan [14], it was found that with adequate knowledge people can perceive the importance of lockdown and the risk of contracting the infection caused by 2019-nCoV.

Experience from previous similar virus attack (SARS) in China highlighted the fact that during such a crisis, people's knowledge, attitude, and perception about the situation affects their response to the crisis. In order to effectively manage a health emergency, citizens need to be conscious of the problem, to be alert, and acknowledge their responsibilities to preserve their steadiness because circumstances culminating in fear in the public can escalate the situation into misery [22]. A similar survey conducted to test the knowledge, attitude, and perception of people in Hubei province, China about the COVID-19 outbreak found that higher knowledge attitude and perception scores among residents was related to the age and socioeconomic status of the respondents [22]. It was surprising to find an average score of knowledge against COVID-19 among Bangladesh residents considering that this epidemiological survey was performed at the very early stage of the pandemic in Bangladesh. We believe this to be partially attributed to the survey being skewed by people with a bachelor's degree or higher, the large percentage of respondents being 86 per cent. The magnitude of this pandemic and the unprecedented media attention of this public health disaster will have an important effect on people's awareness about this epidemic. Television channels, Bangladesh health ministry official websites, and all corporation websites had details about this infectious disease during this time. Adults with higher levels of *education* are *more likely to seek information* which enhances a sense of personal control through mastering content and acquiring stronger skills [28].

Similar to previous findings [29; 30; 31; 22] which suggested that men and young adults are more inclined to engage in risk-taking behaviours, the present study found a significant association between male gender and perceived high-risk of COVID-19 among respondents after adjusting for other cofounders. Adults who were employed at the time of this study were 0.6 times more likely to show adequate knowledge scores compared to those who were unemployed but this association was significant only when it interacted with other demographic variables in the model. The slightly higher chances of sufficient information among citizens who did not quarantine themselves relative to those who did so willingly can be due to the less severe situation of the COVID-19 outbreak in Bangladesh and the prevalence of younger adults in this sample, resulting in respondents feeling that they have a lower probability of contamination with the 2019-nCoV virus.

It is worth noting that, in this analysis, higher COVID-19 awareness scores are strongly correlated with not becoming a practising Muslim. It is understood that the negative mentality shown by certain religious manipulators is one of the toughest obstacles in attempts to tackle the dissemination of COVID-19 awareness. While the government has called for the public to keep social distances to stop the gathering of crowds (physical distance), certain so-called religious leaders might also be preparing to host meetings involving hundreds. Resistance from religious communities to physical isolating appeals has been observed across several predominantly Muslim countries like Indonesia, and the trend exacerbates local government attempts to negotiate with COVID-19 propagation. Research in Turkey [32] echoed the significance of religious figures throughout this disease outbreak in positively motivating the populations. Although some practitioners preferred to seek counsel from their municipal officials, others adopted the religious leaders' instructions when it came to debatable

questions such as COVID-19. Therefore, the influence of Bangladesh's responses of the religious leaders to COVID-19 is unalienable.

The finding of this study indicates the value of strengthening public health knowledge for Bangladeshi citizens towards COVID-19. This, in effect, would change behaviours and activities towards COVID-19. Research findings of the demographic variables correlated with knowledge towards 2019-nCoV are broadly compatible with previous research on SARS in 2003 [22; 16] further indicating that the intervention in health education towards COVID-19 in Bangladesh would become more successful if it had been primarily structured for mass people and those with low educational thresholds.

Since 2019-nCoV is a new type of coronavirus and no pharmacologic therapies at this time are available, increased public awareness and caution seem to be the best approach to preventing community spread. The travel bans and lockdowns placed in many countries including Bangladesh may have worked but they also raised the level of panic among residents. This was evident in this study where approximately 31% of the respondents were very worried, and others were somewhat worried about the situation. In this situation, Lai and others showed that educating the public is a very helpful and effective resource [33]. For countries with fragile health care system who have dense population such as the sub-Saharan African countries, lack of awareness about the virus and corrupt policies can combine to create a disaster that is impossible to contain [34]. In the case of COVID-19, issues with the current response, lack of transparency, travel restriction delay, quarantine delay, public misinformation, and emergency announcement delay contributed to the outbreak.

5. Conclusion

The findings of this study showed that many of the respondents in Bangladesh were very worried about the spread of COVID-19 coupled with their significant inadequacies in the knowledge of the disease. This suggests the need for more awareness to increase public knowledge and reduce the worries of the Bangladeshi people regarding 2019-nCoV virus. In addition to adhering to the government recommendations of routine hand washing, home quarantine, older males of the Muslim faith could be targeted to further improve the knowledge and avoid further transmission of this novel coronavirus even as the lockdown continues. The current study provided first evidence on knowledge and perception of people using an appropriately sampled population during a critical period, the early stage of the COVID-19 outbreak. However, the online nature of data collection meant that respondents who had internet connection were more likely to participate which may lead to bias including selection bias because of the over-representation of well-educated people, in Bangladesh compared to the background population [35] and as such the findings may not represent the opinion of the less educated persons. Hence, findings from this study cannot be generalizable to the entire Bangladeshi population and lack causal inference because it was an online cross-sectional design. Despite this limitation, this was the only feasible way of data collection at the time of this study. Also, since the virus is novel and already widespread, there is little possibility to undertake extensive social studies in Bangladesh. Another limitation of this study was the cross-sectional study design making it impossible to determine causation. Further studies across randomly selected population across the country are needed to confirm these findings. Such studies should also assess the social aspects of the condition. Despite these limitations, the present study provides relevant information to fill research gaps in the fight for COVID-19.

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Supplementary Tables

1. **Coefficients** for factors associated with the perceived risk of COVID-19 among the respondents in Bangladesh during the early lockdown period. *Confidence intervals CI including zero are not significant.*

Demography	Coefficient	95 %CI	Adjusted Odds Ratio	95%CI
Gender				
Male	Ref		Ref	
Female	-1.12	-1.80, -0.43	-0.97	-1.64, -0.30
Age stratification (years)				
18-28	Ref			-
29-38	0.29	-0.69, 1.26		
39-48	0.48	-0.48, 1.45		
49+years	-0.46	-1.77, 0.84		
Education level				
Master's Degree or Equivalent	Ref		- -	
Bachelor's Degree	0.02	-0.74, 0.77	- -	
Primary/Secondary	0.03	-1.05, 1.12	- -	
Marital Status				
Not married	Ref		- -	
Married	0.1	-0.60, 0.79	- -	
Employment Status				
Unemployed	Ref		- -	
Employed	0.52	-0.17, 1.21	- -	
Religious status				
Muslim	Ref		- -	
Others (Christian/Hindu)	-0.7	-1.77, 0.38	- -	
Perceived risk of COVID-19				
Practice on quarantine				
low Practice quarantine	Ref		Ref	
High Practice quarantine	1.11	0.41, 1.80	1.11	0.44, 1.79
Current, previously Quarantined for COVid-19				
Yes, voluntarily	Ref		Ref	
Yes, public health officers request	1.06	0.16, 1.96	1.37	0.50, 2.25
No	1.54	0.71, 2.37	1.68	0.86, 2.51
COVID-19 worries				
Somehow worried	Ref		Ref	
Very worried	-0.81	-1.55, -0.06	-1.19	-1.92, -0.46

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1. **Coefficients** for factors associated with the knowledge of COVID-19 among the respondents in Bangladesh during the early lockdown period. *Confidence intervals CI including zero are not significant.*

Demography	Coefficients	95 %CI	Adjusted Odds Ratio	95%CI
Gender				
Male	Ref		Ref	
Female	-0.14	-0.54, 0.26		
Age stratification (years)				
18-28	Ref		-	-
29-38	0.30	-0.26, 0.86		
39-48	0.64	0.09,1.20		
49+years	0.24	-0.51, 0.99		
Education level				
Master's Degree or Equivalent	Ref		Ref	
Bachelor's Degree	0.63	-1.05, -0.20	-0.59	-1.01, -0.17
Primary/Secondary	-1.18	-1.80, -0.57	-1.09	-1.70, -0.49
Marital Status				
Not married	Ref		-	-
Married	-0.03	-0.44, 0.37	-	-
Employment Status				
Unemployed	Ref		-	-
Employed	0.28	-0.12, 0.68	-	-
Religious status				
Muslim	Ref		-	-
Others (Christian/Hindu)	0.97	0.36, 1.58	0.84	0.24, 1.45
Perceived risk of COVID-19				
Practice on quarantine				
low Practice quarantine	Ref		-	-
High Practice quarantine	-0.11	-0.52, 0.30		
Current, previously Quarantined for COVid-19				
Yes, voluntarily	Ref			
Yes, public health officers request	0.52	-0.01, 1.05		
No	0.3	-0.19, 0.79		
COVID-19 worries				
Somehow worried	Ref			
Very worried	0.13	-0.30, 0.57		

2. **Coefficients** for factors associated with the perceived risk of COVID-19 among the respondents in Bangladesh during the late lockdown period. *Confidence intervals CI including zero are not significant.*

Demography	Coefficients	95 %CI	Adjusted coefficients	95%CI
Gender				
Male	Ref		Ref	
Female	-0.64	-1.08, -0.20	-0.52	-0.93, -0.11
Age stratification (years)				
18-28	Ref		-	-
29-38	-0.72	-1.30, -0.14	-0.63	-1.17, -0.09
39-48	-0.7	-1.32, -0.09	-0.62	-1.20, -0.05
49+years	-0.85	-1.55, -0.14	-0.38	-1.05, 0.30
Education level				
Master's Degree or Equivalent	Ref		Ref	
Bachelor's Degree	-0.15	-0.65, 0.35	-0.26	-0.51, -0.01
Primary/Secondary	-0.2	-0.85, 0.44	-0.5	-0.83, -0.16
Marital Status				
Not married	Ref			
Married	-0.42	-0.88, 0.03	-	-
Employment Status				
Unemployed	Ref		-	-
Employed	-0.42	-0.87, 0.04	-	-
Religious status				
Muslim	Ref		Ref	
Others (Christian/Hindu)	-0.57	-1.28, 0.14	0.38	0.02, 0.74
Perceived risk of COVID-19				
Practice on quarantine				
low Practice quarantine	Ref		Ref	-
High Practice quarantine	1.28	0.82, 1.74	0.9	0.46, 1.33
Current, previously Quarantined for COVid-19				
Yes, voluntarily	Ref		Ref	
Yes, public health officers request	1.78	1.15, 2.41	1.69	1.08, 2.30
No	1.93	1.36, 2.50	1.67	1.11, 2.24
COVID-19 worries				
Somehow worried	Ref		Ref	
Very worried	1.93	1.29, 2.56	2.07	1.47, 2.68

1. **Coefficients** for factors associated with the knowledge of COVID-19 among the respondents in Bangladesh during the late lockdown period. *Confidence intervals CI including zero are not significant.*

Demography	Coefficients	95 %CI	Adjusted Coefficients	95%CI
Gender				
Male	Ref			
Female	0.04	-0.23, 0.32		
Age stratification (years)				
18-28	Ref			
29-38	-0.01	-0.37, 0.35		
39-48	0.28	-0.11, 0.66		
49+years	0.26	-0.19, 0.70		
Education level				
Master's Degree or Equivalent	Ref			
Bachelor's Degree	-0.13	-0.44, 0.18		
Primary/Secondary	-0.33	-0.74, 0.07		
Marital Status				
Not married	Ref			
Married	0.12	-0.17, 0.40		
Employment Status				
Unemployed	Ref			
Employed	0.26	-0.02, 0.55		
Religious status				
Muslim	Ref			
Others (Christian/Hindu)	0.18	-0.26, 0.63		
Perceived risk of COVID-19				
Practice on quarantine				
low Practice quarantine	Ref			
High Practice quarantine	-0.16	-0.45, 0.13		
Current, previously Quarantined for COVid-19				
Yes, voluntarily	Ref			
Yes, public health officers request	0.44	0.02, 0.85	0.44	0.02, 0.85
No	0.08	-0.29, 0.46	0.08	-0.29,0.46
COVID-19 worries				
Somehow worried	Ref			
Very worried	-0.11	-0.52, 0.31		