



People's Perception towards COVID-19 Delta Variant in Bangladesh

Abdullah Al Zahir ^{a*}, Camillus Abawiera Wongnaa ^b,
Tabia Binte Shan ^c, Mayesha Mosharrif Bhuiyan ^d,
Rahatul Zannat Tanha ^d, Omeya Akter ^d, Smrity Sarker ^d,
Saifun Akter Chuuti ^c and Md. Ariful Islam ^e

^a Bangladesh Agricultural Development Corporation, Dhaka, Bangladesh.

^b Department of Agricultural Economics, Agribusiness and Extension, Kwame Nkrumah University of Science and Technology (KNUST), Kumasi, Ghana.

^c Department of Agricultural Economics and Policy, Sylhet Agricultural University, Bangladesh.

^d Faculty of Agricultural Economics and Business Studies, Sylhet Agricultural University, Bangladesh.

^e Department of Pharmacology and Toxicology, Sylhet Agricultural University, Bangladesh.

Authors' contributions

This work was carried out in collaboration among all authors. Authors AAZ and CAW did the conception and designed the study. Authors OA, MMB, SS, RZT, SAC and MAI did the data collection and performed the literature review. Authors AAZ, CAW and TBS performed data analysis. All the authors' did interpretation of results and wrote the original draft of the manuscript. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJRID/2022/v11i4229

Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/93738>

Original Research Article

Received: 20/09/2022

Accepted: 25/11/2022

Published: 20/12/2022

ABSTRACT

Bangladesh has detected a newly mutated Delta variant that is getting more hazardous for the entire world. Since this variant is far more hazardous than the previous one, the purpose of this study is to determine people's reactions to this variant, how to prevent the spread of the Delta variant, and what factors can lead to government failures to control it in Bangladesh. Data were

*Corresponding author: E-mail: zabir.sylau@gmail.com;

obtained from 417 participants using convenient sampling technique. Descriptive statistics and binary logistic regression were the methods of analysis employed. The results showed that in Bangladesh, persons aged 30 to 49 were more likely than others to be aware of the COVID-19 Delta variant. Since social media and newspapers are important sources of information, it was discovered that those who did not use social media or read newspapers had low perception of the new COVID-19 Delta variant. Furthermore, individuals who had a COVID-19 infection history together with their friends and family members had a greater perception of the COVID-19 Delta variant than those who did not. The results also showed that rural people in Bangladesh had low perception of the new COVID-19 Delta variant than the urban people. The study recommends that government should force everyone to wear masks and provide alternative income-generating activities for marginalized individuals in order to limit the spread of the highly contagious Delta variant. Moreover, government should create more awareness and intensify health education in order to restrict the spread of the new COVID-19 variant.

Keywords: COVID-19; coronavirus; perception; Delta variant; Bangladesh.

1. INTRODUCTION

The novel coronavirus disease 2019 (COVID-19) is the most recent contagious respiration infectious disease [1] which has created a big disaster in human existence worldwide. Bangladesh, a South Asian country with more than 160 million people, has also suffered a lot from the trend of the COVID-19 pandemic [2]. In response to the COVID-19 pandemic, the Government of Bangladesh as a measure of reducing the spread of coronavirus disease declared special "general leave" from 26 March 2020 in the name of "lockdown" and extended it to different time slots [3]. During the lockdown in 2020, due to the creation of awareness among people, implementation of appropriate policies, and introduction of vaccination programs, the number of cases of patients with COVID-19 began to decline and it reached the lowest level of 305/day on February 06, 2021 [4]. But fresh cases continued to rise since the middle of March, 2021 as the country saw the second wave of the COVID-19 outbreak [5]. The second wave reached its peak on April 9 [6], when Bangladesh saw the highest COVID-19 infections with 7,462 new cases [7]. Dr. Tarek Alam, professor and head of medicine, department of Bangladesh Medical College said as stated by the Daily Star (14 April 2021), "During the first wave of COVID-19, many patients' lungs were severely affected between 8th and 14th day of being infected but this time the virus is damaging the lungs faster, within four to five days and almost all patients have been complaining of weakness, insomnia and diarrhea" [8]. As a result, to minimize the spread of coronavirus disease in the second wave, the government decided to put the country again under a strict lockdown from April 14 to curb the staggering Covid-19 surge.

Moreover, Bangladesh's neighboring country, India has discovered, along with the existing variant, a highly infectious Delta variant namely B.1.617. The B.1.617 variant of COVID-19 spread more rapidly and reputedly dominating over previously circulating viruses in some parts of India. But the worry is that there are two additional mutations in Indian B.1.617 (E484K and L452R) and it might have additive outcomes in making the virus less sensitive to antibodies [9]. Due to the Delta variant, India recorded more than 4,000 COVID-19 deaths in a day until May 8, 2021, and the rate is increasing every day [10]. But, what is threatening is that, like the other 44 countries [11], Bangladesh detected the Delta variant of coronavirus on May 8, 2021, prompting authorities to exercise caution to contain its spread. Bangladesh, therefore, lose its borders with its neighboring country India as reported by officials at the Institute of Epidemiology Disease Control and Research (IEDCR), Bangladesh [12]. Even though the spread of the new version of COVID-19 is a very current incidence, some research has already been done on it globally. However, to the best of our knowledge, no study has yet been carried out in Bangladeshi, especially in the context of people's perception and reaction toward the new Delta variant. It is far evidenced from previous pandemics that inadequate knowledge about the disease is related to negative emotions among humans that may similarly complicate the efforts of preventing the spread of the disease [13]. Also, studies found that a poor understanding of the disease and its infection process can increase case rates [14]. So before jumping to any decision that the government made to control the situation, even though Bangladesh has shown an impressive functionality to minimize the Covid19 spread nationwide

previously, it needs to know more about the people's reaction regarding the Delta variant. Although to tackle the spread of the Indian highly infectious Delta variant, the Bangladesh government at all levels has taken appropriate measures, it is not possible for the government and the associated agents alone to control the spread of the Delta variant without the active contribution of the general public. In addition, the wrong perception about Delta variants can misguide the people which could be a reason for increasing the infection & death rates. Since there are very few published documents regarding people's perception of the Delta variant in Bangladesh, this paper addresses two specific research questions, viz. (i) What do Bangladeshi people think about the Delta variant? (ii) What is the reaction of Bangladeshi people to the new Delta variant and what do they think about measures that could help control the spread of the new Delta variant?

This study contributes the following. To begin, understanding the public's opinion of COVID-19 is critical for policy formulation by the government. Second, it adds to the literature on COVID-19 research by analyzing peoples' perception of the novel COVID-19 Delta variant and their influences. Finally, it provides information on people's views on the government's tactics and the probable causes of government's failure to control the spread of the Delta variants.

2. LITERATURE REVIEW

People's reactions to diseases are heavily influenced by their experience, awareness, and behavior [15,16]. There are a vast number of written documents that measure people's understanding, behavior, and interpretation of COVID-19. There are also a significant number of research publications in Bangladesh on the people's reaction to the COVID-19 early variant, both in Bangladesh and around the world. Since people's reactions are directly linked to their knowledge, attitude, and perception (KAP), this review focused on KPA-related issues.

Individuals who are trained along with sound mental conditions exhibit healthier habits as it comes to adopting precautionary measures. Furthermore, it was discovered that female participants used precautionary measures more often than their male counterparts [17,18]. When knowledge, attitude, and perception (KAP) about the recent COVID-19 is considered, it was found

that knowledge, attitudes, and practices about the contagious COVID-19 are all closely linked to each other [19-22].

Attitude towards COVID-19 is negatively associated with risk factors while positively correlated with habits [20]. Self-protective behaviors in responses to COVID-19 exhibit a distinct relationship with greater improvements in self-protective behaviors Papageorge et al. [23]. Though the KAP are interrelated, research has shown that the COVID-19 awareness level differs significantly across groups of various ages, races, education levels, and marital statuses, while experience differs significantly across regions [24,25]. Several studies have assessed KAP in relation to Covid19 in Bangladesh. It was found that people have sufficient knowledge of COVID-19 prevention steps [26,27]. Among different people, students showed higher knowledge, attitudes, and strong practice scores but at the same time females have outperforming knowledge, attitudes, and practice behavior than male [28,29] Besides, students were found to be more knowledgeable about how the infection spreads, its effects, the use of drugs, and the precautionary steps that the larger or general population would take [30].

But in several cases, higher awareness and practice were observed in responses to COVID-19 among males [24,31,21,18].

In the case of rural and urban communities' rural communities are at an especially high risk of COVID-19 as opposed to average urban populations [25]. Furthermore, the current COVID-19 situation has raised consciousness among rural Bangladeshi females and adults [32]. Negative feelings were shown to be weaker in the elderly than in the youth and middle-aged [33]. In addition, as opposed to the other age classes, older adults were more secure in the COVID related information they received [34]. During this pandemic, the majority of Bangladeshis were experiencing COVID-19-related emotional pain, which culminated in short temper, sleep disorders, and household chaos, which corresponded to the country's recent scenario [35]. Age, ethnicity, family income, place of residence, and family size are all linked to mental health problems [36]. Furthermore, a higher risk experience of COVID-19 is linked to lower positive or more negative feelings [37]. Sings et al. [38] explored different AI applications for combating the pandemic, including as diagnosing people, tracking and monitoring their

health, developing medications, disseminating awareness, and so on.

It is evident from the discussion above that the perception research has received less attention as a result of the public's suggestions for a solution to the proliferation of delta variant. Given its significance, this study concentrated on how Bangladeshis perceived the Delta variant.

3. MATERIALS AND METHODS

3.1 Data and Study Area

The study is a cross-sectional survey that was conducted among Bangladeshi participants from the 5th to the 20th of May, 2021. This survey was carried out via a link posted on social networking sites, as well as some personal interviews. Because the country was under lockdown and had mobility limitations in place to reduce COVID-19, it was the best available option to carry out the study utilizing a comfortable web-based survey. To participate in the survey, everyone had to be a Bangladeshi aged 18 or above, and each participant was informed of the objective of the study before responding to the questionnaires, and only those who consented to the interview participated. The questionnaire had 12 questions which reflected the overall objective of the study. These questions primarily included people's awareness about the COVID-19 Delta variant that was detected in Bangladesh, participants' perceptions toward the government's various mitigation efforts, and their suggestions for limiting the spread of the Delta variant found in Bangladesh. The first section of the questionnaire asked questions on demographic characteristics of participants such as age, sex, education, and the residential area of the participants, the next section presented questions on knowledge and consciousness of Delta variants. and the final section on participants' perception on government policies aimed at minimizing the spread of the Indian COVID-19 variant.

The survey was designed in Bengali, Bangladesh's native language. The self-reported questionnaire included demographic information as well as participants' responses to the Delta variant of COVID-19. The questionnaire was developed using Google Form since it is more user-friendly, and it was considered that the link to the Google Form is trustworthy by the responders. Considering rural participants were unfamiliar with Google Forms and most of them

were not educated enough to read and fill out the questionnaire, the majority of the questionnaires were printed for face-to-face data collection. To mitigate the threat of COVID-19 dissemination, face-to-face interviews were conducted while keeping social distancing (a minimum of 3 feet between interviewers and participants). The questionnaire's validity and reliability were evaluated by consulting with the specialists in this field by examining the extent to which the content of the questionnaires was relevant and could accurately estimate the reaction of the Bangladeshi people to the newly mutated 'Delta variant' of COVID-19. The question was then pre-tested in the next phase. In this study, respondents were asked questions on socioeconomic facts, their perceptions of government policies, and proposed solutions to the spread of the delta variant. Fifteen (15) participants were interviewed for this purpose and were later excluded from the research sample. The information was gathered almost equally from rural and urban regions. The sample size was 50.36 percent male and 49.64 percent female and participants were selected using a multistage sampling technique. In the first stage, two divisions namely Mymensingh and Khulna division were selected randomly among eight division of Bangladesh. In the second stage two districts namely Mymensingh (from 4 district) and Bagerhat (from 10 districts) were selected randomly. After that, Google Forms were circulated in different social media groups in the selected districts in addition to data collected through responses by face-to-face interviews. The sample size was calculated using the following equation [39]:

$$n = z^2pq/d^2 \quad (1)$$

Where,

n = number of samples
 z = 1.96 (95% confidence level)
 p = prevalence estimate (50% or .5) (as no study found)
 q = (1- p); d = precision limit or proportion of sampling error (.05)

$$\text{Then, } n = (1.96)^2 \times 0.5 \times (1-0.5)/(0.05)^2 \\ \Rightarrow n = 384.16 \approx 384.$$

As mentioned above most of the data for this study was collected from social media using Google Forms. At the end of the survey, the study received responses from 446 participants from both the Google Forms and the face-to-face interviews. After checking participants'

responses, 29 were discarded since these were incomplete. Since the large samples are preferred, data from 417 participants was used in this study. Data were analyzed using IBM SPSS Statistics for Windows, Version 24.0.

3.2 Analytical Framework

In order to analyze the socio-economic characteristics of the participants, the study used frequency tables, percentages, and arithmetic mean. Also, following Hossain et al. [31], binary logistic regression was used to examine the factors influencing people's perceptions of the COVID-19 Delta variant in Bangladesh. Measurement of relevant variables employed in the logistic regression analysis are presented in

Table 1. The dependent variable was the perception of the COVID-19 Delta variant, which is measured as whether or not a participant perceived the COVID-19 Delta variant. As a result of the binary dependent variable, the logit model was an acceptable model to use in this investigation. Given the values of explanatory variables, binary logistic regression estimates the likelihood that a characteristic exists (e.g., estimate the chance of "success"). In order to identify the independent variables that were likely to affect the perception of the people, Binary logistic regression was used for the analysis. The dependent variable was dichotomous, denoting whether participants perceived the severity of COVID-19 Delta variant, which was coded as one or zero; where:

$$Y_i = \{1 = \text{if the } i\text{-th respondent perceived about Covid 19 Delta variant,}; 0 = \text{otherwise}$$

Given that some of the independent variables were also categorical, logistic regression was used to generate the coefficients. The logistic regression model was specified as:

$$\text{logit}[\pi(Y_i)] = \log \log \left[\frac{\pi(x_i)}{1-\pi(x_i)} \right] = \delta_0 + \delta_1 x_1 + \delta_2 x_2 + \dots + \delta_n x_n \tag{2}$$

Where $\pi(x_i)$ and $1 - \pi(x_i)$ represents the probability of a participant perceived the Delta variant in Bangladesh and the probability of a participant not perceived respectively. The linear predictors of the logistic regression model are given by $\delta_0 + \delta_1 x_1 + \delta_2 x_2 + \dots + \delta_n x_n$, where the independent variables are the id of x_i . Where, $i=1, 2, 3, \dots, n$.

Table 1. Description of variables used in the logistic regression model

Variables	Descriptions/Measurement
Perception regarding the Delta variant of COVID-19	D = 1 if participants is perceived about the extent and consequence of Delta variant of COVID-19, 0 = otherwise
Age	Age of participant in number of years
Gender	D=1 if female, 0=male
Social media Use	D=1 if use social media regularly, 0=otherwise
Read Newspaper	D=1 if read newspaper regularly, 0=otherwise
FnF work for COVID-19 Prevention	D= 1 if any member of the participants' friends and family (FnF) worked for COVID-19 prevention measures directly, 0=others
FnF affected	D= 1 if any member of the participants' friends and family FnF affect6ed by COVID-19, 0=others
Living Location (Rural)	D=1 if participants lived in rural area, 0=otherwise

Table 2. Socioeconomic status of the survey participants

Variables	Subcategory	Frequency	Percent
Age	18-29	277	66.43
	30-39	47	11.27
	40-49	41	9.83
	50-59	31	7.43
	≥60	21	5.04
Gender	Male	210	50.36
	Female	207	49.64

Variables	Subcategory	Frequency	Percent
Education	Can't read and write	13	3.12
	Can read and write	24	5.76
	Primary	27	6.47
	Secondary	84	20.14
	Higher secondary	110	26.38
	Graduate	115	27.58
	Postgraduate	44	10.55
Living area	Rural	233	55.88
	Urban	184	44.12

4. RESULTS AND DISCUSSION

4.1 Socioeconomic Characteristics of Participants

Table 2 depicts a scenario of participants' demographic status, in which age, gender, educational qualification, and area of residence are considered demographic characteristics. As presented in Table 2, 11.27 percent, 9.83 percent, and 7.43 percent of participants are between the ages of 30 to 39, 40 to 49, and 50 to 59, respectively. As seen in the table, only 5.04 percent of participants were 60 years or older. The proportions of male and female participants were nearly equal, with 50.36 percent and 49.64 percent, respectively.

In terms of educational qualification, 27.58 percent of participants were graduates, while 10.55 percent were postgraduates. Nearly one-fourth have finished upper secondary education, one-fifth have finished secondary school and 6.47 percent have finished primary school. Although most of the participants have no formal education, some of them can read and write on their own. In terms of living area reported in Table 2, 55.88 percent reside in rural areas and 44.12 percent reside in urban areas.

4.2 Factors Influencing the Perception of COVID-19 Delta Variant

This section discusses the factors influencing people's perceptions of the new Indian variety of COVID-19. The dependent variable in this study was the general public's perception of the Delta variant and the explanatory variables were the participant's age, gender, use of social media by the participant, the habit of reading newspapers, having any friends and family work for COVID-19 prevention, anyone affected by COVID-19 in the participant's family, neighbor, or relatives and the

participant's living location. Age, social media use, newspaper reading habit, past COVID-19 impacted experience, and living area were shown to be substantially influential variables in the impression of the recently arrived Indian variety in Bangladesh. A study by Srichan et al. [40] reported that marital status, education, occupation and annual income were significant factors associated with knowledge of COVID-19. Similarly, sex, age group, marital status, education, employment and being a student were identified as significant factors influencing knowledge and perception [41]. According to the findings of this study, people between the ages of 30 and 49 are more likely to be aware of the COVID-19 Delta variant, while people aged 30-39 are perceived to be 5.34 times more than those aged 19-29. These findings are significant at the 5% level of significance. Similarly, those between the ages of 40 and 49 were regarded as 4.676 times more than those between the ages of 18 and 29. This finding is likewise significant at the 5% level of significance. The middle age group people are more likely to leave their house for different purposes, as a result, they have more information regarding this pandemic, and thus people in their middle ages are more aware than others.

Furthermore, this age group has more opportunities to discuss the current trend of the COVID-19 with their friends and coworkers, which makes them more conspicuous.

In Bangladesh, social media use is also significantly associated with perceptions about the COVID-19 Delta variant. The results shown in Table 3 reveal that persons who do not use social media are 0.353 times more likely to perceive the Delta variant, which is significant at the 5% level of significance. This can be due to the fact that social media is a good platform that allows individuals to post or discuss any

Table 3. Binary logistic outcome of factor affecting the perception of participants towards COVID-19 Delta variant

Variables	B	S.E.	Wald	p-value	Exp (B)
Constant	2.037	0.910	5.006	0.025	7.666
Age (18-29)			6.406	0.171	
Age (30-39)	1.675	0.752	4.966	0.026	5.341
Age (40-49)	1.542	0.731	4.447	0.035	4.676
Age (50-59)	1.188	0.745	2.546	0.111	3.282
Age >60	0.814	0.793	1.053	0.305	2.256
Gender (Female)	-0.153	0.294	0.270	0.604	0.858
Social media Use (No)	-1.041	0.432	5.817	0.016	0.353
Read Newspaper (No)	-1.115	0.331	11.333	0.001	0.328
FnF work for COVID-19 Prevention (No)	-0.474	0.484	0.957	0.328	0.623
FnF affected (No)	-0.861	0.353	5.954	0.015	0.423
Living Location (Rural)	-0.696	0.394	3.124	0.077	0.498
R-square value	0.469				
Log likelihood	317.519				
Hosmer and Lemeshow Test	Chi-square=12.656, p-value=0.124				

*FnF= Friends and family

particular topic, resulting in a lower information gap among its users. On top of that, immediately following the incidence of a news event, it emerges in social media as news or in any other form. If someone does not utilize social media, it stands to reason that they will know less. This is the reason why individuals on social media have a more positive opinion of the recently arriving variants in Bangladesh. The habit of reading the newspaper on a regular basis is also significant at the 5% level which implies that people who do not read newspapers on a daily basis are 0.328 times less aware of a Delta variant than regular readers. Since the majority of news is transmitted to print media just as it is to social media users, people are more likely to perceive the Delta variant if he or she has a practice of reading the news on a daily basis. These findings are consistent with a similar cross-sectional survey over a 10-month period on public risk perception of COVID-19 in the UK. The study revealed that information on the number of confirmed COVID-19 cases had been disseminated via using different social and print media throughout the pandemic period and they found that confirmed COVID-19 cases reported via different media were positively related to the risk perception of the general public [42].

The perception of the new Delta variant is also linked to past infection with COVID-19 (friends, family, relatives, or neighbors, etc). Table 3 shows that persons who have never had a family member, neighbor, or acquaintance afflicted by COVID-19 are 0.423 times more likely to be concerned about the recently arriving COVID-

19 variants. People who have had a COVID-19 infection are aware of the seriousness of the infection. So, if someone has previous knowledge of COVID-19 infection from his/her friends and family, she/he will strive to keep him up to speed with the COVID-19 facts in order to keep him and his family protected. The result is also in line with similar findings reported in recent similar studies [42].

So, in this way, people will be more aware of the COVID-19 Delta variant. The participant's living place may also have an impact on their perception. The findings revealed that those who lived in rural areas were found to be 0.498 times perceive the Delta variant more than those who lived in urban areas, which is likewise significant at the 10% level. This is because most rural people in Bangladesh were not exposed to the dangers of COVID-19, causing individuals to continue to underestimate the lethality of COVID-19. Because of this, they are less interested in learning more about it. As a result, rural people in Bangladesh have a negative perception of the new COVID-19 Delta variant. This finding corroborates the findings of an earlier similar study by Cromartie et al. (2020) where they found that rural people are less likely than urban people to participate in COVID-19 prevention behaviors because the rural participants' had a lower level of concern about the COVID-19 virus.

4.3 Public Recommendations towards Government Policy

Public opinion is always essential in developing effective policy [43]. This section provides the

general public's recommendations to government policy for the efficient handling of newly arriving COVID-19 Delta variants. Participants were asked to choose up to five choices from a list of fourteen. Fig. 1 reveals that two-thirds of participants suggested that the government requires everyone, especially those who travel outside the house, to wear masks.

Approximately 60% of participants believe that the government must ensure alternative income-generating sources for marginalized individuals in order to effectively limit the spread of newly arriving COVID-19 strains, especially for those who rely on their day-to-day income. This is because those on a limited income will be unable to provide for their families and would be compelled to work outside the house. However, if the government does not follow this measure, it will be difficult for them to implement an effective lockdown to limit the spread of Delta variants. Our findings are in line with those of Shammi, et al. [3] that found that 73% of people agreed that a strong lockdown with relief support to the poor and vulnerable was required for proper management of the pandemic situation. In this study, it was found that 58.51 percent of participants advised ensuring adequate oxygen and Intensive Care Unit (ICU) for those who have already been impacted by the COVID-19 or would be affected. Based on prior experience, the globe was suffering from a chronic shortage of oxygen and ICU facilities during the past waves of the pandemic, forcing people to give more emphasis on this aspect. A similar situation was observed by Doza, et al. [44] which reported the need for health care facilities in Bangladesh to be improved to help control the COVID-19 situation. Furthermore, 45.80 percent of participants advocated for the government to compel people to stay at home in the absence of an emergency. As the Delta variant of COVID-19 is highly contagious, restricting individuals to stay at home may be a smart way to limit the

spread of this Delta variant. Another significant proposal made by survey participants is to ensure that everyone receives a vaccination. The figure reveals that 43.65 percent of those surveyed suggested to the government to ensure that everyone receives a vaccination. Furthermore, participants recommended increasing the level and extent of lockdown (39.33%), expanding health care facilities (37.65%), requiring people to follow health hygiene norms (32.37%), maintaining social distancing(29.26%), adequate execution of government policies (21.10%), prohibiting all types of public gathering (20.62%), and imposing a curfew (2.40%). Only 0.48 percent of participants did not make any recommendations for COVID-19 Delta variant prevention.

4.4 Potential Reasons for the Government's Inability to Handle the Delta Variant

The primary goal of any governance system is to lead, direct, and control individuals' activities in order to maximize public interest through the power of various institutions and relationships [45]. Obtaining people's perceptions is crucial for this since it allows policymakers to alter their present policies. This section discusses people's perceptions of the probable causes of the government's failure to prevent the spread of the COVID-19 new strain in Bangladesh. According to the results shown in Fig. 2, 64.99 percent of participants believed that dissociation from the fear of COVID-19 may be a reason for the failure. If people are not aware of the gruesomeness of the disease, they will not agree to take the necessary steps to prevent it. If they are not well aware, it is possible to tend to disobey the rules which are given by the government. On the other side, 64.51 percent of participants thought that not providing an alternate source of income for the poor was another burning reason.

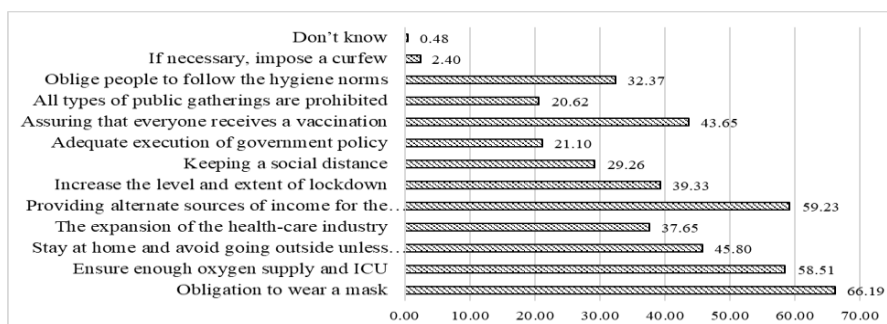


Fig. 1. Policy recommendations on government management of Delta variants

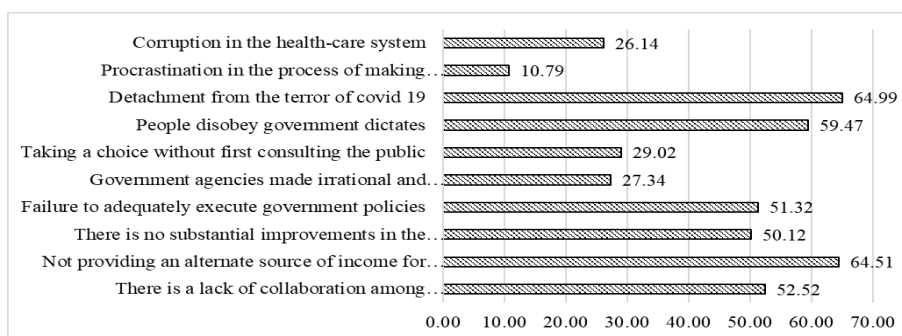


Fig. 2. Potential causes for the inability to control the recently arriving COVID-19 variant

Economically, the informal sector dominates in Bangladesh, but due to COVID-19 pandemic, most of the informal sources of income is in threat including health hazard. So, if there's no source of alternate income to feed their family they will be forced to go outside in search of a living. Alternate safe employment sector including both formal and informal may control the fastest spread of COVID-19. This finding is in line with similar ones reported by Shammi, et al. [3]. Shammi, et al. [3] had a similar observation where they suggested that lack of coordination among the different government sectors to combat emergency healthcare and crisis management in the field also tend to make ineffective the spread of COVID-19 infection.

Some participants also opine that making policies without consulting with the public, irrational and inconsistent government decisions, corruption in the health care sector, and procrastination in taking decisions by government and other stakeholders would be the potential causes for the inability to control the spread of the COVID-19 Delta variant. Decentralization effort of governance may help solve these problems. When public opinion quickly reaches the central government, other problems like procrastination in the decision-making process and inconsistent decisions can easily be solved. Last but not least a good governance system can help solve the corruption problems [46].

5. CONCLUSION AND RECOMMENDATIONS

The Delta variant of COVID-19 adds to the world's stress. This Delta variant's highly contagious behavior expanded throughout several nations, resulting in increasing morbidity. Nations were attempting to limit the spread of COVID-19 through vaccination efforts, but the

development of Delta variants slowed that endeavor. Social distancing policies and inadequate health-care facilities are putting strain on developing-country economies, particularly Bangladesh's. The prevalence of the COVID-19 Delta variant in Bangladesh keeps rising every day. To contain the spread of the Delta variant, it is critical to understand public's perception of the Delta variant. In this study, we analyse people's reactions to this variant, how to prevent the spread of the Delta variant, and what factors can lead to government failures to control it in Bangladesh. To make the government policies and efforts fruitful it is necessary to evaluate the people's perceptions and thinking.

It was found that age, social media use, the habit of reading newspapers, and previous record of COVID-19 infection of friends and family members were the factors that significantly influenced public's perception of the Delta variant in Bangladesh. Aside from identifying the causes, this study highlighted people's recommendations for preventing the spread of COVID-19 infection. The obligation to wear a mask and to engage in alternate income-generating activities is critical to limiting the spread of this new Delta variant. However, these attempts may fail if the general public is unaware of the dangers of this Delta variant and fails to follow government laws and restrictions. Another issue of not limiting the spread is government's failure to effectively execute its policies regarding COVID-19 spread. The study suggests that in order to limit the spread of the Delta variant and the upcoming variants both in now and the near future, the government and participating agencies should ensure that everyone wears a mask, provide the best health care facilities, create alternate income-generating activities for the marginalized community, and promote awareness about the severity of the existing variant and the upcoming variant in Bangladesh.

CONSENT

As per international standard or university standard, Participants' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

It is not applicable.

ACKNOWLEDGEMENT

The authors are grateful to Fakibaz Gobeshok for supporting the study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Spagnuolo G, De Vito D, Rengo S, Tatullo M. COVID-19 outbreak: An overview on dentistry. *International Journal of Environmental Research and Public Health*. 2020;17(6):2094.
2. Tabassum T, Farzana M, Ullah M, Araf Y, Prottoy M, Islam N, Hosen MJ. The first wave of COVID-19 pandemic: Experiences from Bangladesh. *Nazmul Islam and Hosen, Mohammad Jakir, The First Wave of COVID-19 Pandemic: Experiences from Bangladesh*; 2020.
3. Shammi M, Bodrud-Doza M, Islam ARMT, Rahman MM. Strategic assessment of COVID-19 pandemic in Bangladesh: Comparative lockdown scenario analysis, public perception, and management for sustainability. *Environment, Development and Sustainability*. 2021;23(4), 6148-6191.
4. The Financial Express. Is it another Covid wave?; 2021. Available: <https://www.google.com/amp/s/thefinancialexpress.com.bd/views/opinions/is-it-another-covid-wave-1615480122%3famp=true>.
5. XN. Bangladesh sees 2nd wave of COVID-19 with over 3,500 new cases; 2021. Available: http://www.xinhuanet.com/english/2021-03/25/c_139835640.htm.
6. The Dhaka Tribune. Experts: Bangladesh's second Covid wave has peaked, situation likely to improve in May; 2021. Available: <https://www.dhakatribune.com/bangladesh/2021/04/17/experts-bangladesh-s-second-covid-wave-has-peaked-situation-likely-to-improve-in-may>.
7. Worldometer. Bangladesh; 2021. Available: <https://www.worldometers.info/coronavirus/country/bangladesh/>.
8. The Daily Star. Delta variant of COVID-19 found in Bangladesh; 2021. Available: <https://www.google.com/amp/s/www.thedailystar.net/coronavirus-deadly-new-threat/news/indian-variant-COVID-19-found-bangladesh-2090309%3famp>.
9. Thiagarajan K. Why is India having a COVID-19 surge? *BMJ*. 2021;373. DOI:n1124doi:10.1136/bmj.n1124
10. Aljazeera. India records more than 4,000 COVID-19 deaths in a day. *Aljazeera*. 2021;5(8). Available: <https://www.aljazeera.com/news/2021/5/8/india-records-more-than-4000-COVID-19-deaths-in-a-day>
11. Aljazeera. COVID variant first detected in India found in 44 countries: WHO. *Aljazeera*. 2021;5(12). Available: <https://www.aljazeera.com/news/2021/5/12/covid-variant-first-detected-in-india-found-in-44-countries-who>.
12. The Daily Star. Second wave of COVID-19: New symptoms now pronounced; 2021b. Available: <https://www.google.com/amp/s/www.thedailystar.net/frontpage/news/second-wave-COVID-19-new-symptoms-now-pronounced-2077305%3famp>.
13. Person B, Sy F, Holton K, Govert B, Liang A. Fear and stigma: the epidemic within the SARS outbreak. *Emerging Infectious Diseases*. 2004;10(2):358.
14. Ilesanmi O, Alele FO. Knowledge, attitude and perception of Ebola virus disease among secondary school students in Ondo State, Nigeria, October, 2014. *Plos Currents*. 2016;8.
15. Zhang J. People's responses to the COVID-19 pandemic during its early stages and factors affecting those responses. *Humanities and Social Sciences Communications*. 2021;8(1): 1-13.
16. Seale H, Heywood AE, Leask J, Sheel M, Thomas S, Durrheim DN, Kaur R. COVID-19 is rapidly changing: Examining public perceptions and behaviors in response to this evolving pandemic. *Plos One*. 2020;15(6):e0235112.
17. Imtiaz A, Khan NM, Hossain MA. COVID-19 in Bangladesh: Measuring differences in individual precautionary behaviors among young adults. *Journal of Public Health*. 2021;1-12.

18. Hosen I, Pakpour AH, Sakib N, Hussain N, Al Mamun F, Mamun MA. Knowledge and preventive behaviors regarding COVID-19 in Bangladesh: A nationwide distribution. *Plos One*. 2021;16(5): e0251151.
19. Lee M, Kang BA, You M. Knowledge, attitudes and practices (KAP) toward COVID-19: A cross-sectional study in South Korea. *BMC Public Health*. 2021;21(1):1-10.
20. Afzal MS, Khan A, Qureshi UUR, Saleem S, Saqib MAN, Shabbir RMK, Ahmed H. Community-based assessment of knowledge, attitude, practices and risk factors regarding COVID-19 among Pakistanis residents during a recent outbreak: a cross-sectional survey. *Journal of Community Health*. 2021;46(3):476-486.
21. Rahman MM, Khan SJ, Sakib MS, Halim MA, Rahman MM, Asikunnaby, Jhinuk JM. COVID-19 responses among university students of Bangladesh: Assessment of status and individual view toward COVID-19. *Journal of Human Behavior in the Social Environment*. 2021;31(1-4): 512-531.
22. Islam S, Emran GI, Rahman E, Banik R, Sikder T, Smith L, Hossain S. Knowledge, attitudes and practices associated with the COVID-19 among slum dwellers resided in Dhaka City: A Bangladeshi interview-based survey. *Journal of Public Health*. 2021;43(1):13-25.
23. Papageorge NW, Zahn MV, Belot M, Van den Broek-Altenburg E, Choi S, Jamison, J. C., & Tripodi, E. Socio-demographic factors associated with self-protecting behavior during the COVID-19 pandemic. *Journal of Population Economics*. 2021; 34(2):691-738.
24. Yue S, Zhang J, Cao M, Chen B. Knowledge, attitudes and practices of COVID-19 among urban and rural residents in China: A cross-sectional study. *Journal of Community Health*. 2021;46(2):286-291.
25. Rahman M, Karamahic-Muratovic A, Amrin M, Chowdhury AH, Mondol M, Haque U, Ali P. COVID-19 epidemic in Bangladesh among rural and urban residents: An online cross-sectional survey of knowledge, attitudes, and practices. *Epidemiologia*. 2021;2(1): 1-13.
26. Paul A, Sikdar D, Hossain MM, Amin MR, Deeba F, Mahanta J, Nath TK. Knowledge, attitudes, and practices toward the novel coronavirus among Bangladeshis: Implications for mitigation measures. *Plos One*. 2020;15(9): e0238492.
27. Rana MM, Karim MR, Wadood MA, Kabir MM, Alam MM, Yeasmin F, Islam MR. Knowledge of prevention of COVID-19 among the general people in Bangladesh: A cross-sectional study in Rajshahi district. *Plos One*. 2020;15(12): e0243410.
28. Rahman MM, Jhinuk JM, Nabila NH, Yeasmin MTM, Shobuj IA, Sayma TH, Shah SH. Knowledge, attitude and practices towards COVID-19 during the rapid rise period: a cross-sectional survey among public university students of Bangladesh. *Sci Medicine Journal*. 2020;3(2):116-128.
29. Baloran ET. Knowledge, attitudes, anxiety, and coping strategies of students during COVID-19 pandemic. *Journal of Loss and Trauma*. 2020;25(8):635-642. Available:<https://doi.org/10.1080/15325024.2020.1769300>
30. Marzan M, Islam DZ, Lugova H, Krishnapillai A, Haque M, Islam S. Knowledge, attitudes and practices of antimicrobial uses and resistance among public university students in Bangladesh. *Infection and Drug Resistance*. 2021;14:519.
31. Hossain MA, Jahid MIK, Hossain KMA, Walton LM, Uddin Z, Haque MO, Hossain Z. Knowledge, attitudes, and fear of COVID-19 during the Rapid Rise Period in Bangladesh. *Plos One*. 2020;15(9): e0239646.
32. Hasan MM, Talukder A, Alam MK, Hossain MK. Does worriedness among the rural adults promote COVID-19 related awareness in Bangladesh?. *Heliyon*. 2021;7(3):e06556.
33. Ceccato I, Palumbo R, Di Crosta A, La Malva P, Marchetti D, Maiella R, Di Domenico A. Age-related differences in the perception of COVID-19 emergency during the Italian outbreak. *Aging & Mental Health*. 2020;1-9.
34. Schmidt SJ, Barblan LP, Lory I, Landolt MA. Age-related effects of the COVID-19 pandemic on mental health of children and adolescents. *European Journal of Psychotraumatology*. 2021;12(1):1901407.

35. Amit S, Barua L, Kafy AA. A perception-based study to explore COVID-19 pandemic stress and its factors in Bangladesh. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*; 2021.
DOI:<https://doi.org/10.1016/j.dsx.2021.05.002>
36. Sayeed A, Kundu S, Al Banna MH, Hasan MT, Begum MR, Khan MSI. Mental health outcomes during the COVID-19 and perceptions towards the pandemic: Findings from a cross sectional study among Bangladeshi students. *Children and Youth Services Review*. 2020;119:105658.
37. Han Q, Zheng B, Agostini M, Bélanger JJ, Gützkow B, Kreienkamp J. Psy corona collaboration. Associations of risk perception of COVID-19 with emotion and mental health during the pandemic. *Journal of Affective Disorders*. 2021;284:247-255.
38. Singh T, Khan R, Srivastava S. A review on ai-based techniques for tackling COVID-19. *Cyber Security in Intelligent Computing and Communications*. 2022; 325-336.
39. Bayeb AM, Ababu A, Bayisa R, Abdella M, Diriba E, Wale M, Selam MN. Alcohol-based handrub utilization practice for COVID-19 prevention among pharmacy professionals in Ethiopian public hospitals: A cross-sectional study. *Drug, Healthcare and Patient Safety*. 2021; 13:37.
Available:<https://doi.org/10.2147/DHPS.S295599>
40. Srichan P, Apidechkul T, Tamornpark R, Yeemard F, Khunthason S, Kitchanapaiboon S, Upala P. Knowledge, attitudes and preparedness to respond to COVID-19 among the border population of northern Thailand in the early period of the pandemic: A cross-sectional study. *WHO South-East Asia Journal of Public Health*. 2020;9(2):118-125.
41. Zhong BL, Luo W, Li HM, Zhang QQ, Liu XG, Li WT, Li Y. Knowledge, attitudes, and practices towards COVID-19 among Chinese residents during the rapid rise period of the COVID-19 outbreak: a quick online cross-sectional survey. *International Journal of Biological Sciences*. 2020;16(10):1745.
42. Schneider CR, Dryhurst S, Kerr J, Freeman AL, Recchia G, Spiegelhalter D, van der Linden S. COVID-19 risk perception: A longitudinal analysis of its predictors and associations with health protective behaviours in the United Kingdom. *Journal of Risk Research*. 2021; 24(3-4):294-313.
43. Burstein P. The impact of public opinion on public policy: A review and an agenda. *Political Research Quarterly*. 2003;56(1):29-40.
44. Doza MB, Shammi M, Bahlman L, Islam ARMT, Rahman MM. Psychosocial and socio-economic crisis in Bangladesh due to COVID-19 pandemic: A perception-based assessment. *Frontiers in Public Health*. 2020;8(341).
45. Keping Y. Governance and good governance: A new framework for political analysis. *Fudan J. Hum. Soc. Sci*. 2018; 11:1-8.
Available:<https://doi.org/10.1007/s40647-017-0197-4>
46. Probst JC, Crouch EL, Eberth JM. COVID-19 risk mitigation behaviors among rural and urban community-dwelling older adults in summer, 2020. *The Journal of Rural Health*; 2021.

© 2022 Al Zabir et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

The peer review history for this paper can be accessed here:
<https://www.sdiarticle5.com/review-history/93738>