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Risk perception and information-seeking behavior during emergency: An exploratory study on COVID-19 pandemic in Bangladesh

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ABSTRACT

With the fluctuating condition of the pandemic, people's perception of COVID-19 is also inconstant. If people perceive a low risk of any health emergency or any other crisis, they won't look for proper information to change their attitude, which might increase their risk. Through the use of two different theories and a mixed-method approach, this study attempted to understand the current perception about COVID-19 and the relationship between risk perception and information-seeking behavior. Survey and in-depth key informant interviews were used as tools for data collection. The results indicated that COVID-19 related risk perception changes following people's demographic and socio-economic characteristics. Also, the study found out a relationship of variation in information-seeking behavior on the basis of factors like demographic characteristics, past experience of any emergency, salience, and belief. Results specified that people seek information differently when they perceive a risk to be of higher order. The study summarized that the information sought about any risk could also amplify or reduce the level of perceived risk. In the end, the study concluded that if people do not perceive the risk of any emergency and don't seek proper information, raising awareness about a pandemic like COVID-19 and managing the emergency will be challenging.

1. Introduction

In the year 1962, Coronaviruses which are shortly known as CoVs have been titled the "novel respiratory tract viruses" as the individual who gets affected by these viruses face severe respiratory tract infection [1]. In 2002 CoVs infected the Guangdong state of China in a form titled "Severe Acute Respiratory Syndrome (SARS-CoV)" [1]. The analysis of the genome sequence of SARS-CoV presumed that bat had been the natural origin to carry the virus as a host [2]. Approximately after a decade of SARS, another virus appeared from the CoV series, which was named "Middle East Respiratory Syndrome (MERS-CoV)" [1]. MERS-CoV also creates fatal respiratory tract infections. In December 2019 Chinese government identified a new trace of CoV in Wuhan state of Hubei province. This new species of CoV has a 70% similarity with its ancestor, SARS-CoV [1]. Though there were immediate actions in China to prevent its spread, cases started to appear in different countries of

Asia, North America, and Europe. On January 30, 2020, the World Health Organization (WHO) declared a Public Health Emergency with defining the outbreak as COVID-19 [1]. In March 2020, WHO declared COVID-19 as a pandemic [3]. According to WHO Coronavirus (COVID-19) Dashboard, till April 24, 2021, the total number of confirmed cases is 145,216,414, and the total number of deaths is 3,079,390 around the globe [4].

On March 08, 2020, Bangladesh reported the first cases of COVID-19 [5]. According to the Directorate General of Health Services (DGHS) of Bangladesh, till April 24, 2021, a total of 5,323,579 samples were tested, from which the number of total confirmed cases is 742,400, and the number of total deaths is 10,952. Also, 653,151 is the number of total recovered persons [6]. Bangladesh is in an unprecedented situation due to the overwhelming COVID-19 impact. General people were concerned about the socio-economic condition and the psychological impacts [7, 8]. To manage the COVID-19 situation Government of Bangladesh took

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different initiatives from the very beginning of the transmission of the virus, which include banning all international flights, declaring obligatory quarantine for 14 days for people coming from outside of the country, deploying special forces, banning all types of mass gatherings, declaring lockdown of different areas, announcing restriction on inter-city or inter-district movement, etc. [9]. It is clear from the statistics that, though Bangladesh is enforcing various initiatives, community transmission and cluster transmission are continuing. Reasons for the continuous increase of cases can be the high density of populations, lack of risk perception, limited access to valid and reliable information, lack of planning, etc.

The process through which people's beliefs and circumstances shape their thinking about any risk is defined as risk perception [10]. In different environments and circumstances, people perceive risks differently. For example, after the 9/11 attack in the USA, people perceived the risk of terrorist attacks differently than ever before [10]. For understanding how people perceive the risk, it is important to review their actions and decisions in the light of the possible risk of facing negative impacts [11]. The process to assess and understand why people take precautionary measures in the face of an imminent threat is related to the concept of risk perception [12]. Risk perception mainly supports people to decide, to what extent they want to get prepared to face any hazard [12,13]. Studies defined risk perception as persons' sense of any incident that can lead to harmful consequences [14,15]. Risk perception is one of the major components to understand how people evaluate any negative event and how they decide their strategies to manage the impacts of a negative event [14,16]. Risk perception characterizes people's attitude towards any imminent shock or hazard and what strategies should be prioritized to reduce the impact. People's perceptions about any risk get shaped by the available information to them. Thus information plays a major role in shaping perceptions.

To ensure that people are receiving processed, analyzed, and authentic information, it is also important to follow the information-seeking behavior of the disaster-affected community. In any condition, when people require any information, the actions to seek information can't be characterized by any single factor. People's information-seeking behavior depends on factors like demographic characteristics, beliefs, cultural traits, values, available resources, context, the event, and current environment, etc. [17]. In terms of any disaster, people focus on sources which they think are authentic to receive risk-related information [18]. A study showed that there is a core relationship between information-seeking behavior and uncertainty of any task, which indicates people's information-seeking behavior changes while dealing with the indeterminate condition [19], which may include the risk of getting affected by any disease. Different socio-economic conditions modify people's information-seeking behavior during emergencies [18]. It will be easier to shape people's perception of any risk through understanding their information-seeking behavior during an emergency. In the condition of the COVID-19 pandemic, to understand peoples' perception about the risk of getting affected by CoV, it is also important to follow their decisions and activities in daily lives. It is not applicable to follow all the actions; rather it is important to focus on actions related to COVID-19. If people perceive a low risk of any health emergency or any other crisis, they won't look for proper information to change their attitude, which might increase their risk [20]. Thus right perception about the risk of COVID-19 is essential to introduce positive health attitudes among the people [20]. Previous studies have assessed the importance of risk perception and information-seeking behavior, but few pieces of research are related to COVID-19 and related to Bangladesh's perspective. As the current condition around the world is still fragile due to COVID-19, it is still crucial to conduct studies on risk perception and information-seeking behavior related to COVID-19.

Following these data and pieces of literature, the objectives of this study were 1) to explore people's risk perception about COVID-19 in Bangladesh and 2) to elaborate the relationship between risk perception and information-seeking behavior during the pandemic.

2. Theoretical framework

Two models were used related to risk perception and information-seeking behavior. The rationale of using two different models is to address risk perception and information-seeking behavior of people in an emergency like COVID-19 and create a bridge among these models for showing their relationships.

2.1. Risk perception attitude (RPA) framework

The Risk Perception Attitude (RPA) framework is used in the study to understand how people perceive risks based on their efficacy beliefs [21]. The main idea of this model is people use their efficacy beliefs to motivate and address self-protectiveness in terms of perceiving a risk. Previous studies indicated that there is a mutually causal relationship between risk perception and people's behavior. High-risk perception about any health crisis will also induce healthy behavior [22,23]. Studies like [22,24] showed that the RPA framework is effective in understanding and assessing change in people's behavior and attitude depending on the risk perception. Efficacy belief design individuals' approaches and actions against any given condition. RPA framework shows the relationship between risk perception and efficacy belief to distinguish people's attitudes on the basis of perceived risk [24]. RPA framework is also used to understand the motivation of individuals' to follow protection measures in the face of managing their health [25]. There is a longitudinal study record of using the RPA framework to assess people's risk perception and efficacy belief [21,26]. The RPA framework is based on the strong relationship between perceiving any risk and the behavior induced due to the risk perception. Studies conducted by the RPA framework showed that people's attitudes, information-seeking behavior, and practices get influenced by risk perception [22].

There are mainly four categories or groups based on the level of risk perception and level of efficacy beliefs based on individuals. The first group is titled the *responsive attitude* group, where individuals have high-risk perceptions and a high level of efficacy belief. People from responsive attitude groups stay aware of any risk and take all the necessary steps to prevent the threat [21]. In the second category, people are found to have a high level of risk perceptions and a low level of efficacy beliefs. This group is recognized as an *avoidance attitude*. Persons in this group perceive the risks of facing any threat at a high scale, but their low self-protective behavior demotivates them to take action [21]. In the third category or group, individuals have a lower level of risk perception and high efficacy beliefs, and this group is characterized as a *protective attitude*. Individuals from these groups are highly motivated to be safe from any crisis and emergency but don't perceive the risk status [21]. In the final category, there are persons with low-risk perception and low efficacy beliefs. They are identified with an *indifferent attitude*. These people don't believe they are in a risky condition, and they also don't believe that they have any capacity to prevent the crisis [21] (Fig. 1).

As previous studies [20–22,26] showed that risk perception shapes information-seeking behavior, in this study, the RPA framework was used to understand the type of information people from four of the categories seek when faced with an emergency.

2.2. Information seeking behavior model

Also, to understand the background of these kinds of information-seeking behavior, another model was employed, which is known as Johnson's comprehensive model of information seeking [27]. According to this model, four factors affect the information-seeking behavior of individuals.

- **Demographic Factors**

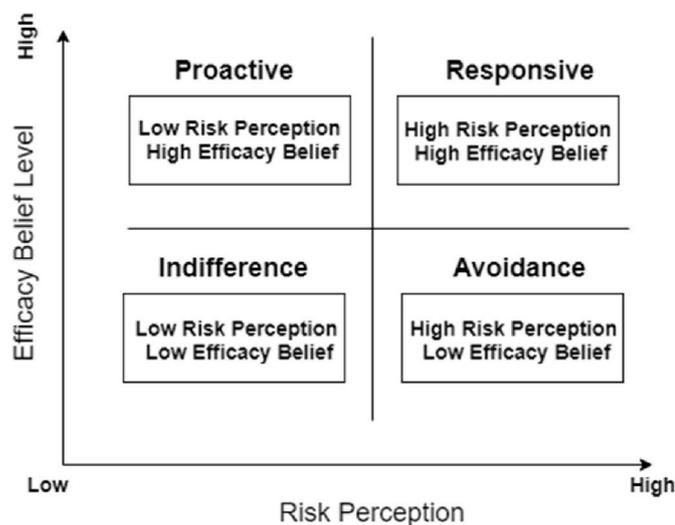


Fig. 1. RPA framework.

These include all the information related to the individuals including but not limited to age, gender, education, ethnicity, socio-economic conditions, etc.

- **Direct Experiences**

This section mainly includes the previous experiences of the information seeker. The experiences may also get established by communication among peer groups.

- **Salience**

Salience mainly refers to the condition where the information is not only needed but also it is important and applicable. People get affected by salience factors while seeking information when it is crucial for solving a problem.

- **Belief**

The last factor in shaping information-seeking behavior is people's beliefs. This is the most accurate factor related to risk perception and self-efficacy. People who believe that a possible threat can be mitigated with proper information, will look for relevant information.

These four factors are derived from the actual Johnson's model of information seeking behavior, where these factors are seen as motivations to search for information and take actions to solve any problem [28]. Johnson's information-seeking model was effective in understanding the background of human behavior in the face of any critical situation or problem. Johnson's Comprehensive Model of Information Seeking (CMIS) is used in studies to identify the basic factors that shape individuals' information-seeking behavior. More specifically, how antecedent factors like demographic characteristics, experience, belief design people's perception to seek information [29]. Previous research also indicated that factors of CMIS (Demographic factors, experience, belief, and salience) determine the perceptions of people about any health risk and motivate them to collect information and utilize them [30,31].

2.2.1. Integrating two theories

Studies like [26,31,32] already showed that there is a specific relationship between information seeking behavior, belief and efficacy. Thus it is important to review people's belief and efficacy to explore their perception about any risk and their attitude to seek information. But this study also believed, depending only on one variable like belief

won't give a comprehensive scenario of risk perception and information seeking behavior. For this reason, the study integrated two different theories to extend the research area and include more variables like demographic characteristics, experience etc.

Through using these two frameworks, the study firstly attempted to understand how people perceived the risk of COVID-19. The study focused on learning who belongs to which category through analyzing their risk perception by using RPA framework. Secondly, it also tried to understand, which group seeks what information related to COVID-19 and what factors work behind for seeking information. These were analyzed by using Johnson's comprehensive model. The RPA framework helped to explore people's COVID-19 related risk perception and the Johnson's model supported to review the relationship of risk perception and information seeking behavior from a broader aspect.

3. Material and methods

The study was conducted by focusing on a triangulation approach. Triangulation in research is known as the process of observing similar ideas from multiple perspectives to increase the accuracy of the research outcomes [33]. There are several types of triangulation, but in this study, we mainly focused on the triangulation of methods. A mix of qualitative and quantitative approaches and data have been used to conduct the study. Also, a couple of theories were used to collect data and analyze the results.

3.1. Sampling and data management

A purposive sampling technique was followed in this study. The purposive sampling process is part of the non-probability sampling technique, which helps to select all possible cases that are difficult to reach [33]. In this COVID-19 situation, it is the ideal sampling technique due to the difficulty of reaching all possible cases. The purposive sampling process help to reach as much samples as possible to increase the validity and reliability of data. As an online platform (Google form) was used to collect data remotely, anyone who is eligible to respond as per the requirement of the research, around Bangladesh could participate in the study. The targeted sample for the study was anyone who is aged 18 or above and a resident of Bangladesh. The study period was October to December 2020.

For the quantitative part, a structured and self-administered survey questionnaire was developed based on the variables related to the study [33]. The questions and variables were developed through extensive literature review. The study was also adjusted, modified and adopted based on the local context. The questionnaire included dichotomous questions, multiple-choice questions, and statement-based questions with the response in the Likert Scale. The quantitative part mainly focused on the RPA framework. Also, a section of questions was included following Johnson's comprehensive model of information seeking (Table 1). Different experts reviewed the questionnaire anonymously to increase the acceptance of measurement scale. A pilot testing of the questionnaire was conducted to ensure validity of the variables. The participants of the pilot testing were randomly selected to remove biasness. Based on the pilot testing the study conducted Cronbach's Alpha reliability test to measure the internal consistency of both risk perception and information-seeking sections. The calculated values were 0.80 for the risk perception section and 0.69 for the information-seeking section. The acceptable level of value is > 0.60 [34, 35].

As part of the qualitative data collection, interview tool was used. For an in-depth review of information-seeking behavior and risk perception, the study conducted five extensive Key Informant Interviews (KII) with experts in the field of communication and risk research. A checklist was developed to conduct the KIIs with a major focus on Johnson's comprehensive model of information seeking. Also, RPA framework-based key points were partially included in the checklist. These KII

Table 1
Quantitative questions and measurement scales.

Questions/Statements	Variables	Scale
Pandemic Experience and Risk Perception		
Have you faced any pandemic before COVID-19?	No	0
	Yes	1
Did you get infected by COVID-19?	No	0
	Yes	1
Did any one of your family members get infected by COVID-19?	No	0
	Yes	1
How worried are you that you might get infected by COVID-19?	Not worried at all	1
	Not too worried	2
	Somehow worried	3
	Very Worried	4
How worried are you that any member of your family might get infected by COVID-19?	Not worried at all	1
	Not too worried	2
	Somehow worried	3
	Very Worried	4
People in urban areas are at a higher risk to get infected by COVID-19 than people in rural areas.	Strongly disagree	1
	Disagree	2
	Neutral	3
	Agree	4
	Strongly agree	5
I think I have high possibility to get infected by COVID-19 and that's why I follow high precaution strategies.	Strongly disagree	1
	Disagree	2
	Neutral	3
	Agree	4
	Strongly agree	5
I think I have high possibility to get infected by COVID-19 but I don't think there is need of following any precaution strategies.	Strongly disagree	1
	Disagree	2
	Neutral	3
	Agree	4
	Strongly agree	5
I don't think I will get infected by COVID-19 but still I follow guidelines and strategies to stay safe.	Strongly disagree	1
	Disagree	2
	Neutral	3
	Agree	4
	Strongly agree	5
I don't think I will get infected by COVID-19 and that's why I don't think there is any need of following precaution strategies.	Strongly disagree	1
	Disagree	2
	Neutral	3
	Agree	4
	Strongly agree	5
Information Seeking during the Pandemic		
How frequently do you check the updates about COVID-19 condition?	Never	1
	Rarely	2
	Occasionally	3
	Frequently	4
	Very frequently	5
Which source do you prefer most to seek information regarding updates of COVID-19 condition?	Television	1
	Newspaper	2
	Facebook	3
	Twitter	4
	Online news portal	5
	Government website	6
	Peer group discussion	7
	WHO website	8
	International research center websites	9
	Others	99
How satisfied are/were you with the information received from the source?	Not at all	1
	Slightly satisfied	2
	Neutral	3
	Very satisfied	4
	Extremely satisfied	5
Did you require any Covid-19 medical information support?	No	0
	Yes	1
From which source did you get medical information support mostly?	Government mobile call based support	1
	Government website based support	2
	Government hospitals	3
	Private hospitals	4
	Other websites	5
	Personal doctor	6
	Facebook	7

Table 1 (continued)

Questions/Statements	Variables	Scale
I believe the information provided by government agencies related to COVID-19 is correct.	Newspaper	8
	Others	99
	Strongly disagree	1
	Disagree	2
	Neutral	3
I regularly update myself with information to reduce the risk of getting infected by COVID-19	Agree	4
	Strongly agree	5
	Strongly disagree	1
	Disagree	2
	Neutral	3
What type of information do you seek the most during the pandemic period?	Agree	4
	Strongly agree	5
	Pandemic safety guidelines	1
	Infection related statistics	2
	Food or cash support	3
I check the sources of information regarding COVID-19 before acting on it.	Job related information	4
	Vaccine related information	5
	Medical information	6
	Others	99
	Strongly disagree	1
	Disagree	2
	Neutral	3
	Agree	4
	Strongly agree	5

respondents included a government representative from the health sector, a public health specialist, a disaster management specialist, a communication specialist from an NGO who is working in COVID-19 response, and a journalist from a reputed media platform. Due to personal identity privacy, none of the informants are addressed by their names or organizations. The major focus was to select at least five personnel from five different areas of expertise. The reason behind selecting someone from the government sector was to obtain proper information about people's risk perception and information-seeking behavior from the government's perspective. From the very beginning of the COVID-19 pandemic, personnel from the Ministry of Health and Family Welfare (MoHFW) have been working relentlessly to ensure the dissemination of correct and authentic information. Under MoHFW, the Directorate General of Health Services (DGHS) and the Institute of Epidemiology, Disease Control and Research (IEDCR) were working with COVID-19 related information. Therefore, an expert from the government sector was thought to be a great resource for the study. Secondly, a public health specialist who has prior research knowledge and expertise on human behavior during a pandemic was considered to be of great assistance to this study. Due to his/her expertise and previous experience, a public health expert can describe the way people perceive any health risk and the type of information they seek during a health emergency. Thirdly, a disaster management expert was expected to possess the necessary knowledge to define human behavior from a social perspective. Defining risk perception from the health perspective only, would not have been sufficient to portray the full picture. As per Johnson's CMIS, it is clear that factors like demography, experience, and belief play a major role in constructing information seeking behavior. In this regard, opinions from a disaster management expert with a social science background had helped to understand the social perspectives of information seeking behavior. When COVID-19 started to infect mass people around Bangladesh, different national and international non-government organizations (NGOs) came forward to ensure reliable and valid information for all. As the spread of rumors and misinformation can be more chaotic than the actual crisis, NGOs started to share valid and reliable information through different media platforms. That's why the research the felt the necessity of incorporating a communication specialist who could provide insights on the type of information people were looking for, the way people perceived the risk of Covid-19

and changes found in the information seeking behavior during the pandemic, if any. The last and the most important key informant for this study was a journalist. The journalists have a clear understanding about the people’s risk perception and information seeking behavior as they interact with people directly. To select key informants, a list was first developed, which included names and designations of experts who have extensive knowledge related to health risk research and who were working with COVID-19 related areas. The study team approached the key informants to participate in the interviews. From there, five distinct key informants gave their consent and time to participate in the study (Table 2).

3.2. Data analysis

IBM SPSS 25v was used for digitizing and analyzing quantitative data. Frequency analysis, percentile analysis, Pearson’s Chi-squared test, Spearman’s rank correlation coefficient test were carried out on quantitative data. Mainly responses from all questions were analyzed under frequency and percentile analysis with presenting results in frequency, percentage, mean and standard deviation. Further, cross-tabulation among variables was performed to understand the relationship among variables under Pearson’s Chi-squared test and Spearman’s rank correlation coefficient test. Quantitative data fully supported the classification of the respondents into groups of the RPA framework and partially assisted in verifying the relationship between risk perception and information-seeking behavior. To analyze qualitative data, the study focused on descriptive analysis. Both commonality and differences in responses were articulated to develop the qualitative description. Responses followed the theoretical framework pattern and showed the relationship between risk perception and information-seeking behavior.

3.3. Research ethics

The study followed strong ethical guidelines to complete the whole research. All the tools and procedures were reviewed and approved by the Ethical Review Committee of the Institute of Disaster Management and Vulnerability Studies, University of Dhaka, Dhaka-1000, Bangladesh. All data and results are classified and won’t be shared with anyone outside of the study group.

4. Results

In this section of the paper, analyzed data have been presented through different statistics, tables, and graphs to preview the results. A total of 171 respondents participated in the study from 45 different districts of Bangladesh. The results have been discussed following the sections of the quantitative questionnaire. Also, the qualitative data is added along with these sections. There is also a separate section for qualitative findings in the discussion section.

4.1. Demographic and socio-economic context

More than 87% of the respondents are residing in urban areas presently. On the other hand, 12.3% of the respondents are currently living in rural areas. Table 3 presented comprehensive data regarding the demographic and socio-economic conditions of the respondents.

Table 2
List of KII participants.

Participant number	Background
KII Participant-1	Public health specialist
KII Participant-2	Government representative
KII Participant-3	Disaster management specialist
KII Participant-4	Communication specialist from NGO
KII Participant-5	Journalist

Table 3
Demographic and socio-economic data.

Variables (n = 171)	Values	Percent	\bar{x}	σ
Age	18–24	49.7	2.05	1.301
	25–34	20.5		
	35–44	11.7		
	45–54	12.9		
	55–64	4.1		
	65–74	1.2		
Gender	Female	56.1	1.45	0.522
	Male	42.7		
	Don’t want to specify	1.2		
Educational status	Don’t have any institutional education	0.6	7.98	7.139
	Below primary level	0.6		
	Passed JSC/JDC	1.8		
	Passed SSC/others	7		
	Passed HSC/others	4.7		
	Entered undergraduate/honors level	37.4		
	Passed undergraduate level	20.5		
	Passed graduate level	26.9		
	Others	0.6		
	Household monthly expenditure (in BDT)	Below 5000		
5001 to 10,000	4.7			
10,001 to 15,000	4.7			
15,001 to 20,000	7.6			
20,001 to 25,000	11.7			
More than 25,001	70.8			
Household monthly income (in BDT)	Below 5000	0.6	5.6	0.986
	5001 to 10,000	2.3		
	10,001 to 15,000	3.5		
	15,001 to 20,000	5.8		
	20,001 to 25,000	5.8		
	More than 25,001	81.9		
Housing condition	Kacha	1.2	2.87	0.375
	Semi-pakka	11.1		
	Pakka	87.7		
Being the main income person	No	80.7	0.21	0.463
	Yes	18.7		
	No Response	0.6		

Only 4.7% of the respondents belong to any religious or indigenous minority group. Though the percentage is very low, the study tried to be inclusive while collecting data. Almost 51% of the respondents were students. Other respondents are from diversified occupational backgrounds, including government employee, NGO employee, private company employee, farmer, educationist, researcher, homemaker, etc.

4.2. Current health condition

As the research is related to a pandemic, it was essential to know the current health condition of the respondents. Table 4 showed the response from the respondents regarding their health condition. Also, 21.6% of the respondents indicated that they have chronic diseases, including high blood pressure, diabetics, kidney problems, liver infection, asthma, hypertension, etc.

4.3. Pandemic and risk perception

COVID-19 can be distinguished as one of the severe biological

Table 4
Respondents’ current health condition on a scale.

Variable (n = 171)	Values	Percent	\bar{x}	σ
The current condition of health	Very Bad	0.6	3.85	0.797
	Bad	2.3		
	Moderate	29.8		
	Good	46.2		
	Very Good	21.1		

hazards ever faced by the people of Bangladesh. There are and were cases of other virus-related diseases in Bangladesh, but none of them had affected people on such a scale. Thus, the perception of risks related to COVID-19 was different than any previous diseases. More than 21% of respondents agreed that they had faced a pandemic before COVID-19. Respondents listed attack of Dengue, Zika virus, Bird flu, Swine flu, Anthrax, Malaria, and Chikungunya as pandemics. Though the number of cases of this infection wasn't as high as COVID-19, people perceived them as pandemics. Only 2.9% of the respondents got infected by COVID-19. Also, the family members of 5 respondents were infected by COVID-19. Generally, the level of wordiness shows if any person perceives a risk to be high or low. In Table 5, results of the level of worriedness to get infected by COVID-19 are described. The results showed that respondents were more worried about family members than themselves in terms of getting infected by COVID-19.

It was surprising to find out from the interviews conducted by the local reporters of different channels that, many people believe, this virus would infect the city dwellers only. Also, some people believe, this is an urban disease, and rural people will not get infected by it. Results of the study showed that 46.8% of respondents strongly agreed that people living in urban areas are at a higher risk of getting infected by COVID-19 than people in rural areas. Also, 32.2% of respondents agreed with the same statement. This mentality has a crucial impact on shaping the risk perception of the population studied.

According to one of the theories followed by this study, there are four groups according to the risk perception attitude which is shaped by their belief. This study tried to group the respondents according to the framework of the Risk Perception Attitude (RPA) framework. Table 6 showed the results of the grouping based on the RPA framework.

The results based on the RPA framework showed most of the respondents prefer to follow high precaution strategies. A large number of respondents belong to the *Responsive* group from the RPA framework. Also, some respondents belong to the *Proactive* group. This result indicated that risk perception is not a static issue, and people do not continue to perceive a risk in a similar fashion. From time to time, people will shift into different groups in the RPA framework. If people become aware of any risk, they may change their perception of the risk and increase their level of precaution. Previous studies showed that high-risk perception motivates people to take action and to start positive practices [20]. One of the significant tools to make people aware of any risk and change their perception about the risk is to ensure information availability. Information plays a major role in motivating people to change their perceptions. The study believes variables like demographic and socio-economic characteristics, belief, necessity, and experience have a major role in constructing risk perception.

Below, some of the variables are tested to find the relationship among themes and learn if the relationship is significant. Pearson Chi-square test and Spearman rank correlation coefficient tests are performed here.

The results of Table 7 showed that none of the variables has a significant relationship with the age of the respondent. Age as a demographic factor played a significant role in perceiving the risk of COVID-19. Also, respondents' perception that people in urban areas are at higher risk than people in rural areas to get infected by COVID-19 and age group are highly correlated (Table 7). Also, there are variables with negative correlations.

The results of the test between gender and other variables are

Table 5
Level of worriedness to get infected by COVID-19.

Variables	Values and Percent				\bar{x}	σ
	Not worried at all	Not too worried	Somehow worried	Very worried		
Self-infection worriedness	5.3	27.5	38	29.2	2.91	0.880
Family member infection worriedness	2.9	12.9	27.5	56.7	3.38	0.820

presented in Table 8. There is a significant relationship ($p < 0.05$) between gender and low-risk perception, low precaution. These two variables are also highly correlated. Data showed that male respondents had a low risk perception and preferred to take limited precautionary measures than female respondents. Gender was found to be a significant factor in risk perception and risk reduction strategies. The relationship between gender and other variables isn't highly significant and also there are negative correlations between them.

Further analysis showed that there is a significant relationship between educational status, and low-risk perception, and low precaution at $p < 0.05$ level ($p = 0.000$). Descriptive analysis showed that the majority of the respondents who had higher educational backgrounds showed high-risk perception and high precaution. On the other hand, respondents with a lower level of educational status showed low-risk perception and a lower level of precaution. Also, the relationship between educational status and believing that there is a high risk of infection among urban residents than rural people is also significant at $p < 0.05$ level ($p = 0.006$). Data analysis indicated that people with a higher level of education agreed that urban residents are more at risk due to living in densely populated areas. This means people with higher educational status could perceive the risk based on objective-based conditions. Educational status also emerged as an important component to shape risk perception. According to the Spearman rank correlation coefficient test, the relationship between educational status and perception of high risk for an urban resident is highly positive (0.066).

Table 9 is showing the relationship between current area of residence of the respondents' and other variables. From the analysis of Table 9, people in urban areas are at a higher risk to get infected by COVID-19 than people in rural areas was significant (0.014) at 5% level of significance. The quantitative analysis provided evidence that respondents who are currently living in urban areas believed residents of urban areas are more at risk of getting infected by COVID-19. Due to this reason, respondents who are living in urban areas showed a higher level of risk perception and precaution. Among all of the variables of Table 9, low-risk perception of COVID-19 and no need of following precaution strategies were highly correlated (0.116) with the type of residence of the respondents rather than other variables.

Understanding the relationship between perception and strategies to reduce risk is also important. Table 10 is showing that relationship. The relationship between the perceptions that people in an urban area are at a high risk of infection than people in rural areas with risk perception and strategies showed some significant results. People in urban areas are more at risk than people in rural areas to get infected by COVID-19; this belief played a significant role in shaping respondents' risk perception. The relationship between the variables indicated that people perceive risk and take action to reduce the risk depending on their beliefs. This result is a piece of evidence that if someone believes that COVID-19 is only an urban disease, then his or her risk perception and precautionary measures will be low. Also, the correlation test showed that high-risk perception, high precaution, and the perception that people living in areas have a higher risk of getting infected than rural areas are highly correlated.

4.4. Information seeking during emergency

During any emergency, information becomes a vital resource. Information can be about warnings, available supports, and general news

Table 6
Results of data based on the RPA framework.

Variables	Values and Percent					\bar{x}	σ
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree		
High risk perception, high precaution	1.8	7.0	19.3	29.2	42.7	4.041	1.031
High risk perception, low precaution	65.5	15.8	8.2	5.3	5.3	1.690	1.154
Low risk perception, high precaution	14.6	7.0	21.6	26.9	29.8	3.503	1.369
Low risk perception, low precaution	74.9	10.5	7.0	4.7	2.9	1.503	1.014

Table 7
Age vs. experience and risk perception.

Variables	Pearson Chi-square test			Spearman rank correlation coefficient
	Value	df	p	
Self-infection worriedness	24.690	15	0.054	0.018
Family member infection worriedness	20.586	15	0.151	-0.180
People in urban areas being at high risk of infection than people in rural areas	16.742	20	0.670	0.135
High risk perception, high precaution	16.417	20	0.690	-0.021
High risk perception, low precaution	11.080	20	0.944	0.55
Low risk perception, high precaution	16.408	20	0.691	-0.015
Low risk perception, low precaution	26.623	20	0.146	0.035

Table 8
Gender vs. experience and risk perception.

Variables	Pearson Chi-square test			Spearman rank correlation coefficient
	Value	df	p	
Self-infection worriedness	2.802	6	0.833	-0.040
Family member infection worriedness	1.619	6	0.951	0.017
People in urban areas being at high risk of infection than people in rural areas	3.542	8	0.896	0.067
High risk perception, high precaution	12.289	8	0.139	-0.065
High risk perception, low precaution	12.550	8	0.128	0.142
Low risk perception, high precaution	2.633	8	0.955	-0.021
Low risk perception, low precaution	18.360	8	0.019**	0.266

**Values are significant at a 5% level of significance.

about the emergency, etc. But it is important to understand who needs which information and what their characteristics are. For example, at the time of a disaster there will be differences between the need for information based on age. So, people's information-seeking behavior should be analyzed before working with information development, dissemination, and sharing. In the COVID-19 condition, people here in Bangladesh showed diversified information-seeking behavior. Also, qualitative data showed the diversification and reason behind the diversification. It is to be noted that, that the theory used for understanding the information-seeking behavior during the COVID-19 period was highly supportive to understand the diversification.

It was surprising to find that people currently are not very much interested in checking updates about the COVID-19 condition. Fig. 2 shows the results of data related to the frequency of respondents to

Table 9
Present area of residence vs. experience and risk perception.

Variables	Pearson Chi-square test			Spearman rank correlation coefficient
	Value	df	p	
People in urban areas being at high risk of infection than people in rural areas	12.426	4	0.014**	-0.013
High risk perception, high precaution	7.802	4	0.099	-0.148
High risk perception, low precaution	4.802	4	0.308	0.022
Low risk perception, high precaution	3.137	4	0.535	0.030
Low risk perception, low precaution	2.550	4	0.636	0.116

** Values are significant at a 5% level of significance.

Table 10
People in urban areas are at a higher risk to get infected by COVID-19 than people in rural areas vs. risk perception and strategies.

Variables	Pearson Chi-square test			Spearman rank correlation coefficient
	Value	df	p	
High risk perception, high precaution	68.743	16	0.000***	0.170
High risk perception, low precaution	16.248	16	0.436	0.010
Low risk perception, high precaution	10.613	16	0.833	0.23
Low risk perception, low precaution	36.295	16	0.003**	-0.62

** Values are significant at a 5% level of significance.

*** Values are significant at a 1% level of significance.

check for updates about the COVID-19 condition. The majority of the respondents belong to the occasional scale. This indicated that people are perceiving the risk of COVID-19 to be lower and aren't interested to learn about updates. There is a significant relationship between frequency of checking updates about COVID-19 condition and high-risk perception, high precaution at $p < 0.05$ level ($p = 0.008$, $df = 16$, Spearman rank correlation = 0.342), which indicates people who highly perceive the risk of COVID-19 and take high precaution look for regular updates about COVID-19 related information.

Data analysis is showing that the highly preferred medium for seeking COVID-19 related updates. Most of the respondents are still preferring conventional media like television (35.7%). But there is a sign of preference for social media (19.3%) and online-based news portals (14.6%). Testing showed that there is a significant relationship between age and preference of medium to seek information at ($p < 0.1$ level). Mainly the significant relationship is about the source for seeking information and the age of the respondents. Data showed that older people prefer traditional media like television and newspaper for seeking information related to COVID-19. On the other hand, young people depend more on social media like Facebook and website for similar

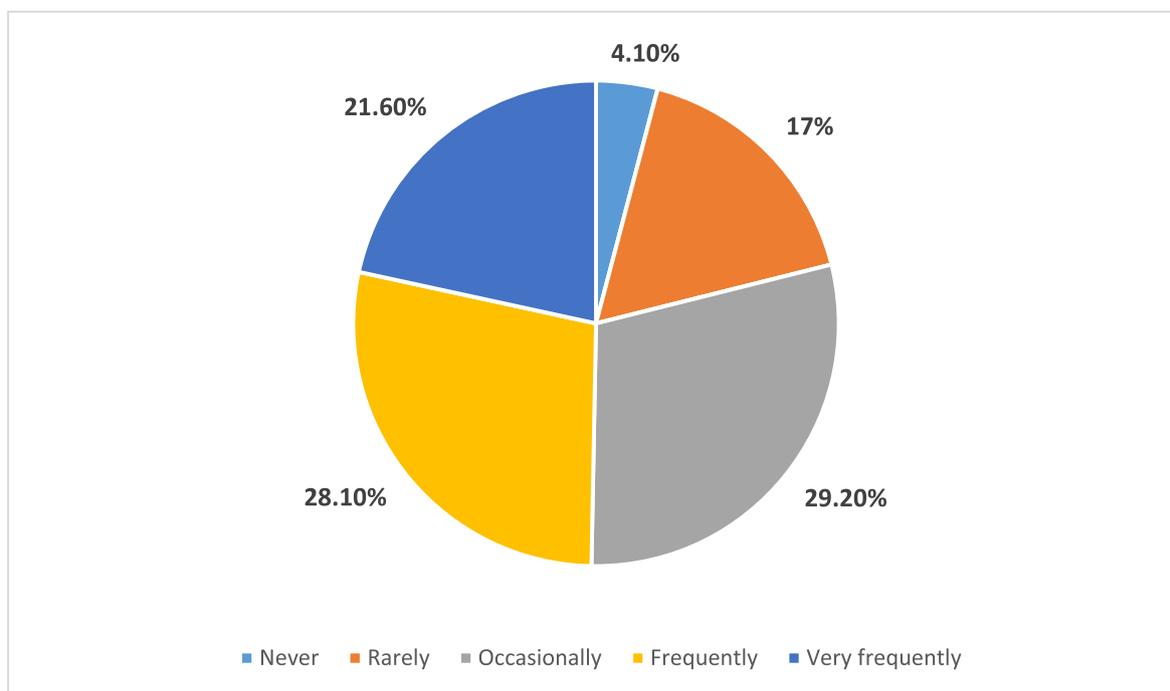


Fig. 2. Percentage of the frequency of checking for updates about COVID-19 condition by the respondents.

information (Table 11).

More than 37% of respondents are very satisfied with the information they receive from the preferred sources. Also, 31% of respondents are in a neutral position regarding the level of satisfaction. More than 37% of respondents required medical information-related support during this COVID-19 period. The majority of these respondents who required medical information obtained that information from personal doctors. Also, some of the respondents depended on social media like Facebook to seek medical information.

The government of Bangladesh (GoB), from the very beginning of the COVID-19 situation, used several platforms to support people with information. The responsible department of the health ministry and other ministries worked jointly to provide access to COVID-19 information as easily as possible. These platforms include social media, special websites, call centers, printed documents, newspapers, radio, television, etc. It was important to learn about the effectiveness those platforms. According to the data, only 10.5% of respondents strongly agreed that information provided by the government agencies is correct. On the other hand, 16.4% strongly disagreed, and 22.2% disagreed with the statement. This indicates that there are significant rooms of improvement in the information development and dissemination process.

The majority of the respondents responded that they seek pandemic safety-related guidelines mostly as part of the information-seeking process (38.6). Also, 25.7% of respondents mostly seek infection-related statistics, and 17.5% of respondents mostly seek vaccine-related information. Total 52% of respondents strongly agreed that they check the sources of information regarding COVID-19 before acting on it. More than 21% of respondents agreed with the same statement

that they check the sources of information before taking any action regarding COVID-19. There is a significant relationship between the age of the respondents and checking the source of information before acting on it at $p < 0.1$ level ($p = 0.062$, $df = 20$). Data indicated that older people are more reluctant to check and recheck the sources of information before taking any action. On the other hand, younger respondents cross check the information and recheck the sources before acting on them.

4.5. Key informant interviews (KIIs)

Experts' opinions play a major role in summarizing the results of any study and also check the validity and reliability of the results. This study also utilized the KII tool to collect qualitative data regarding the objectives of the study and analyzed the opinion to support quantitative outputs. As the experts had prior knowledge and expertise related to COVID-19 researches and field-level work experience, the qualitative data from KIIs helped to elaborate the quantitative findings. The key informants shared their experiences and perspectives depending on their experiences which they gathered while working with mass people during the pandemic. The methodology part already included details about the informants.

The results from KIIs are shared here following two perspective strategies. The study tried to divide the results into commonality and different perspectives. Results that were common among the informants are combined as one, and different answers have also been interpreted. . Most of the respondents have basic knowledge about risk perception and information-seeking behavior. According to the informants, the common definition regarding risk perception includes a person's assessing level of hazard, cognitive thinking about any risk, and the understanding the dimensions of the risk. Also, the informant referred to feelings of personal vulnerabilities to get affected by any event as risk perception. As the definition of information-seeking behavior, informants summarized, awareness to collect information, the practices and attitudes to look for suitable sources for appropriate information. During COVID-19 in Bangladesh, people are looking for different information from different sources. According to the informants, people sought information about the number of deaths, the number of affected persons,

Table 11

Age vs. preference of media to seek information regarding COVID-19.

Variable	Pearson Chi-square test			Spearman rank correlation coefficient
	Value	df	p	
Preference to seek information about COVID-19 updates	60.705	45	0.059*	0.170

* Values are significant at a 10% level of significance.

vaccine, emergency assistance, financial and logistical supports, etc. However, from the experience of their fields, informants addressed that a large portion of the population hasn't sought any information during COVID-19. And if this portion sought any information, they were more attracted to rumors, fake news, and baseless information. According to the informants, social media and websites have become two of the major sources of information during this COVID-19 period. But all the respondents shared their concern about the credibility of information from social media and websites. On the other hand, conventional media like television, newspaper, and radio were some credible sources. The informants addressed the relationship between risk perception and information-seeking behavior with significant importance. According to them, information creates motivation to perceive risk and develop risk awareness. Some informants emphasized that credible repetitive information construct risk perception. Also, peer-based information has a significant impact on risk perception.

All the respondents strongly agreed that demographic factors have a vital relationship with information-seeking behavior. During COVID-19, demographic features like age, gender, economic condition, income level, social class, educational status, internet connectivity, and area of residence, etc., constructed the information-seeking behavior.

“Demographic factors like the economic condition of the households, geographical location, and educational status play a significant role in structuring information-seeking behavior. Currently, urban lower-middle-income households look more into social media for information than traditional media like TV and newspaper.” – (KII Participant-1)

Direct experience referred to the previous experience of any pandemic or emergency incidents. Informants agreed that people who have faced similar incidents or any disaster-related events seek information differently from people without previous experience. Direct experience changes the inherited behavior and reconstructs the information-seeking behavior. An informant added that experience could shape information-seeking behavior but the period between experience and current incident can influence that.

Urgency and necessity change information-seeking behavior. As part of the salience of the theoretical framework, informants briefed that perceiving a risk has a psychological impact, and the psychological condition can change information-seeking behavior. When people seek information for sharing and knowledge development purposes, they seek it differently from emergencies. Stress and the need to support family members in any emergency change information-seeking behavior.

COVID-19 in Bangladesh showed a major concern related to information dissemination and increasing public awareness. People's beliefs and self-efficacy affected information-related activities. Informant brought different issues related to belief and information-seeking behavior. Religious belief played a major role during COVID-19 to construct information-seeking behavior in Bangladesh. According to the informants, cultural beliefs, ideology, ethnic beliefs, values, and social practices have both positive and negative impacts on information-seeking behavior. Science and belief played a contradictory role during this COVID-19 situation in Bangladesh. Belief also gets shaped by available information, and belief shape information-seeking behavior. It is a vice-versa condition.

“In the beginning religious beliefs made it really difficult to make people aware of the risk of COVID-19. Especially people in the rural areas believed that it is a disease for Non-Muslim people. Believing in different rumors and superstitions also created negative impacts. People didn't look for the right information to reduce their risk.” – (KII Participant-3)

5. Discussion

This research is based on two different theories to get an overview of

people's COVID-19 risk perception and information-seeking behavior during the pandemic period. The quantitative data mainly supported with results to approve the Risk Perception Assessment (RPA) framework and a small area of Johnson's comprehensive model of information seeking. On the other hand, qualitative data was fully focused on supporting Johnson's comprehensive model of information seeking and the RPA framework, to some extent. In light of these two theoretical models, the results have discussed here.

The results of the analysis presented a complex scenario. Though the majority of the respondents hadn't been infected by COVID-19, they were more reluctant in terms of perceiving the risk for themselves. But the increased level of worriedness for family members to get infected by the COVID-19 indicated that they highly perceived the risk of COVID-19 when the study talked about family. People weren't worried about themselves but their family members [36], representing a complex risk perception scenario. Furthermore, risk perception has a solid relationship with belief. A previous study similar to this showed that some people in Bangladesh preferred to follow the instructions of their religious leader due to their firm belief in them [20]. This study showed that most people believe persons living in urban areas are at higher risk of getting infected by COVID-19 than persons living in rural areas. One explanation behind this belief can be that people in urban areas live in very low proximity and public spaces are highly crowded. In this sense, it can be addressed that urban people have a higher risk. But this belief can increase the risk of people who are living in semi-urban and rural areas. COVID-19 doesn't differentiate between urban or rural people, an infection can take place anywhere. Believing that, urban people have a higher risk, and reducing safety measures will increase the risk. This belief represents a lower risk perception. According to the RPA model, there are four categories of attitude based on risk perception and efficacy. Those are responsive, proactive, avoidance, and indifferent [21]. Results implied that people showed a responsive and proactive attitude in terms of the perceived risk of COVID-19. The RPA model fully supported the process to understand people's level of risk perception in a specific and effective way. The study also tried to link the criteria of Johnson's comprehensive model of information-seeking to see if there is any relationship between risk perception and information-seeking behavior. Demographic characteristics, previous experience, salience, and belief are the factors to shape information-seeking behavior. Results indicated that demographic conditions like gender, age, educational status, and present residing area have a strong relationship with risk perception. It can be summarized that, as there is a relationship between risk perception and criteria of information-seeking behavior, there is a relationship between risk perception and information-seeking behavior. KII data also showed that all of the interviewees strongly agreed that there is a strong relationship between information-seeking behavior and risk perception. Interviewees shared that; the relationship is vice-versa. If people highly perceive any risk, they seek information differently and if they effectively sought the information, they perceive the risk differently.

Quantitative results showed relatively limited interest in COVID-19 related information by the respondents. Information-seeking behavior related to the collection of pandemic related information was surprising. A limited satisfaction about information received can be a reason behind such behavior. But the observed information-seeking behavior include more interest towards accessing safety guidelines. To investigate information-seeking behavior, the main focus was provided on data from Key Informant Interviews (KIIs). Demographic characteristics shaped information-seeking behavior from the very beginning of the pandemic. For example, young people were more focused on information related to their education, job, areas with a high level of infection, etc. But older people were more concerned about the death rate, safety guidelines, information about medical support, etc. Again, people with high educational status looked for credible sources to seek pandemic-related information. But people from lower educational backgrounds depended on peer-based information, social media, and random sources.

Previous experience related to facing any pandemic and disaster had an impact on the overall information-seeking behavior. The comparison was addressed with examples from international incidents and Bangladesh's condition. According to the informants, people from countries that have previously faced the impact of Severe Acute Respiratory Syndrome (SARS-CoV) and Middle East Respiratory Syndrome (MERS-CoV) sought information differently as they had previous experience of a similar pandemic than the people of Bangladesh. Direct experience changes attitude, behavior, and practice to seek information. Saliency is one of the factors from the theory which was also addressed during the KIIs. Informants agreed that when anyone got infected by COVID-19, he or she mainly looked for treatment-related information. But during the normal period, the same person looked for safety guidelines only. So, attempting to solve any problem vastly affects the behavior to seek information. Though demographic factors, previous experience, and saliency had a major role in shaping information-seeking behavior, belief was the major factor influencing the behavior in Bangladesh. Religious beliefs like Muslims won't get affected by COVID-19, so Muslims should not be worried—was also observed in Bangladesh. Also, some people believed COVID-19 is an urban disease, so rural people shouldn't be worried about it. These beliefs massively influenced people's information-seeking behavior and in some cases, negatively affected the COVID-19 related information sharing process.

6. Conclusion and recommendations

The results and discussion indicates that there is an intimate relationship between risk perception and information-seeking behavior. People who are more aware of any risk, seek information differently than less aware people. The results following the first model showed that people in Bangladesh belong to responsive and proactive groups. However, it would have been easier for the government to tackle the COVID-19 condition, if more people belonged to the responsive group. High perception of risk and high efficacy to take precautions will always help to reduce any risk. The RPA framework supported the whole study to understand the condition of risk perception among the studied population regarding COVID-19. On the other hand, Johnson's comprehensive information-seeking model helped the study learn about people's information-seeking behavior during the pandemic. Factors like demographic characteristics and belief had the most impact on information-seeking behavior. Specialists indicated that people who perceived the risk of COVID-19 to be high were more interested in seeking information. This means risk perception can shape information-seeking behavior. Also, appropriate information influences the construction of risk perception. According to the specialists, people faced several challenges during this COVID-19 period in Bangladesh to seek information and perceive the risk. An extensive level of rumors, fake news, baseless information, and fabricated information, etc., affected the information-seeking process. Social media is one of the major platforms to share rumors and fake information. Also, peer group-based information without credibility affected the risk perception of the people. Another challenge addressed by specialists was the high number of sources to receive information. Different directions from different sources created confusion among mass people, which resulted in an alternation in the risk perception.

Following the outputs, the study would like to share some recommendations as a part of the risk perception and information-seeking behavior during any emergency like COVID-19. These recommendations also include statements provided by experts. With an extensive and rigorous level of knowledge related to COVID-19 and human behavior during the pandemic, the opinions of the key informants were pivotal to be placed as recommendations.

6.1 A comprehensive plan should be developed before the next pandemic to ensure effective generation, development, and dissemination of information.

- 6.2 Context, audience, belief, and need-based information sharing process should be prioritized to ensure proper understanding of the information and construction of risk perception.
- 6.3 There should be only one designated authority to manage all information. Information from multiple information hubs creates confusion.
- 6.4 There should be a mechanism to study people's information-seeking behavior to serve them with valid, reliable, and transparent information regarding the emergency condition.
- 6.5 The government should strictly control the spread of rumors, fake news, fabricated information, and baseless information.
- 6.6 Non-government organizations (NGOs), community-based organizations (CBOs), traditional and modern media hubs, international agencies, local leaders, religious leaders, researchers, public health specialists, and educationists, etc. should only use the designated hub-based information while talking about the emergency to reduce the possibility of confusion and effective outlining of risk perception.

6.1. Limitations

Due to the COVID-19 situation, the study could not conduct a face-to-face survey to collect data. Also, finding suitable secondary resources and pieces of literature was a challenge. The sample number might not be enough to reflect the whole population. However, this exploratory study could assist the relevant organizations in controlling the ongoing and future pandemic. The study will also work as a base for future studies.

Research data will be made available on request.

Declaration of competing interest

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

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ijdr.2021.102580>.

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