

Gender differences in Knowledge, Attitude and Preparedness to Respond to COVID-19 among adult population in Bangladesh: A Cross- sectional Study

Author(s): Mst. Sadia Sultana ¹, Abid Hasan Khan ¹, Md. Raisul Islam ¹, Sahadat Hossain ¹, M. Tasdik Hasan ^{2,3}, Masaaki Kurasaki^{4,5}, Md. Tajuddin Sikder ^{1,*}

Affiliation(s):

¹ Department of Public Health and Informatics, Jahangirnagar University, Savar, Dhaka, Bangladesh.

E-mail: sadiasuhi.ju@gmail.com (M.S.S); ahkriaz.ju@gmail.com (A.H.K); raisulju@gmail.com (M.R.I); sahadat.hossain@juniv.edu (S.H); sikder@juniv.edu (M.T.S)

² Department of Primary Care and Mental Health, University of Liverpool, United Kingdom

Email: tasdikhdip@yahoo.com (M.T.H)

³ Public Health Foundation, Bangladesh (PHF, BD)

⁴ Group of Environmental Adaptation Science, Faculty of Environmental Earth Sciences, Hokkaido University, Kita 10, Nishi 5, Kita-ku, Sapporo 060-0810, Japan

Email: kura@ees.hokudai.ac.jp

⁵ Graduate School of Environmental Science, Hokkaido University, Sapporo 060-0810, Japan

**Corresponding author*

Md. Tajuddin Sikder

Department of Public Health and Informatics, Jahangirnagar University, Savar, Dhaka-1342, Bangladesh.

Email: sikder@juniv.edu

ORCID: 0000-0002-5717-2263

Abstract

Effective pandemic management requires understanding the level of community knowledge, attitude of people and preparedness towards COVID-19. This study aimed to assess the knowledge, attitude and preparedness toward COVID-2019 among Bangladeshi general people. A cross sectional survey was conducted from 20th March 2020 to 20th April 2020 among 1007 Bangladeshi adult people. A convenience sampling strategy was utilized and the

data was collected through a self-administered questionnaire. Chi-square test was used to identify the gender differences regarding knowledge, attitude and preparedness towards COVID-19. Respondents predominately used social media to inform themselves about COVID-19 (68.10%) and female used social media more than male ($p < 0.001$). Female had more correct knowledge about staying home with sickness and/or symptoms to contain the COVID-19 transmission ($p = .02$). While male had more negative attitude about staying out during the pandemic than female (< 0.001) and men were less likely to take preventative measures than female counterparts. A number of people were still believing the myths like "COVID-19 can transmit via mosquito" (9.14%) and male had more incorrect knowledge regarding this ($p < 0.001$). Moreover, 17.81% of the respondents thought that COVID-19 can spread in warm weather. Some findings are directing us to a knowledge gap among general population in Bangladesh which calls for uncovering those aspects. Adequate and effective communication are necessary so that general people can stay alert with positive attitude and hygienic practices to fight against this ongoing crisis.

Keywords: knowledge; attitude; preparedness; COVID-19; gender; Bangladesh

1. Introduction

The unprecedented global health crisis due to the COVID-19 pandemic has brought critical challenges to public health and made the world stand still with a number of 33,058,750 cases and 998,747 deaths worldwide as of 20th November 2020. This relatively higher mortality has led the global scientific community to focus on researches for development of treatments, vaccines and preventive strategies [1]. But the efficient handling of the pandemic calls for help from the vulnerable population for efforts to alleviate the transmission of the pandemic [2]. Having correct knowledge about COVID-19 symptoms, transmission and prevention is crucial because better knowledge equated with stronger implementation of precautionary practices [3]. Insufficient information and wrong attitudes contribute to delayed diagnoses, ineffective infection management and lack of personal hygiene [4]. Moreover, there is no exact cure or vaccine for COVID-19 till to date which indicates the importance of maintaining recommended guidelines to prevent COVID-19. When community people will have correct knowledge, positive attitude and better preparedness towards COVID-19, we will be able to impede COVID-19 transmission and have a safe community. It was reported by various studies that assessing knowledge and awareness regarding the disease is very important to combat any infectious disease [5, 6]. Poor knowledge about transmission affects the control measures as the spread rate of infectious disease has been found higher among the population who had poor knowledge about the disease [7].

To date, male vulnerability has been observed with 54-73% COVID-19 infection rate in men [8]. The crucial understanding of the epidemiological pattern of this epidemic and the

efficacy and effectiveness of public health interventions depends on the awareness, behavior and behaviors of the general population towards COVID-19 [9]. Though, COVID-19 affected both genders, male and female have different behaviours and perceptions towards this pandemic. Females used to be well informed and have a better attitude to the prevention measures of the disease [10]. Another study in United States showed that higher percentage of females were practicing preventive behaviours during this recent outbreak [11]. Although very few studies in Bangladesh demonstrated information about knowledge, attitude and perception [12], there is a knowledge gap about gender differences in knowledge, attitude, preparedness towards COVID-19.

Considering the importance of investigating community peoples' knowledge, attitude and preparedness, his study aimed address that knowledge gap by assessing gender differences regarding the knowledge, attitude and preparedness toward coronavirus disease-2019 among Bangladeshi adult people and evaluated gender differences which will help to effectively detect suitable types of health education programs for the community peoples.

2. Methodology

2.1 Study Design & Participants

A cross-sectional study was conducted through an online survey among the general people of Bangladesh. The study was conducted following the Checklist for Reporting Results of Internet ESURVEYS (CHERRIES) guidelines [13]. Inclusion criteria included: (i) being Bangladeshi, (ii) willing to participate; (iii) providing electronic informed consent; (iv) age ≥ 18 years; (v) able to understand Bangla language and residing in Bangladesh during the survey. An online convenience sampling technique was chosen to meet the study aims considering the lockdown situation as the face-to-face interview was risky.

2.2 Data Collection

Data collected took place from 20th March 2020 to 10th April 2020. Responses came from 1050 participants (aged between 18-68 years old). An online structured questionnaire was developed using google forms which was used as a data collection tool. A pilot test was performed on 30 respondents to confirm the reliability of the questionnaire and further modifications were done in the questionnaire after that. The questionnaire link was disseminated online on different social media (i.e., Facebook). For ensuring the quality of data, rapid checking of data was done every day. An information sheet describing the aim and process, right to refuse their participation from the study was presented on the first page of the survey attaching an electronic consent form with it. Participants were informed that their information will only be used for the research purpose. Anonymity and confidentiality was fully ascertained. All the procedures of this study complied with the Code of Ethics of the World Medical Association (Declaration of Helsinki) for any experiments involving human and ethical standards of the "Biosafety, Biosecurity & Ethical Committee" the ethical review board of the Faculty of Biological Sciences, Jahangirnagar University, Savar, Dhaka-

1342, Bangladesh. After giving informed consent, participants voluntarily proceeded to the survey. It took participants about 10-15 minutes to complete the survey.

2.3 Measures

2.3.1 Socio-demographic characteristics

Demographic variables included age, gender, number of family members, name of the residing district, educational qualification and occupation. Educational qualification included three sub categories as: i) higher Secondary; ii) honors or Above; iii) up to Secondary.

2.3.2 Chronic disease, knowledge, attitude and preparedness related information

Participants were asked if they had any chronic disease such as diabetes, hypertension, renal disease, etc. Moreover, questions regarding knowledge about COVID-19 transmission, prevention were administered. Attitude towards COVID-19 were measured by close-ended questions. An example item includes "Do you consider yourself safe from the virus?". Preparedness towards COVID-19 were also assessed where an example item includes "I will self-isolation or quarantine if COVID-19 symptoms appear". All the questions had two response option either "yes" or "no".

2.4 Data analysis

Data were analyzed with STATA version 14.1 (StataCorpLP, College Station, TX, USA). Microsoft Excel was used for editing, sorting and coding of data. Descriptive statistics such as frequency, percentage were obtained to understand participants' characteristics. Chi-square test was formulated to identify the gender differences regarding knowledge, attitude and preparedness towards COVID-19. P-value less than or equal to .05 was considered to be statistically significant for all analyses.

3. Results

3.1 Socio-demographics

Respondents' socio-demographic characters were reported in table 1. It shows that 65.90% of respondents were below the age of 25 years. The majority of the respondents were male (63.43%). Most of the respondents had educational qualification equivalent to honors or above (83.52%). Respondents were mostly students (76.19%). Apart from that, there was Govt. or private service holders (14.38%) and others such as housewives, freelancers etc. (9.43%).

Table 1: Socio-demographics

Variables	n (%) (N =1050)
Age (years)	
<25	692 (65.90%)
25-35	320 (30.48%)
>35	38 (3.62%)
Gender	
Male	666 (63.43%)
Female	384 (36.57%)
Family member	
<5	524 (49.90%)
5-6	398 (37.90%)
>6	128 (12.19%)
Education	
Up to secondary	37 (3.52%)
Higher secondary	136 (12.95%)
Honors or above	877 (83.52%)
Occupation	
Student	800 (76.19%)
Govt./Pvt. Services	151 (14.38%)
Others	99 (9.43%)

3.2 Knowledge of COVID-19

3.2.1 General information

Almost all the respondents knew about the virus (98.48%) and the majority acknowledges the virus to be extremely dangerous (86.29%). It is also noticeable that most of the respondents came to know about the virus via social media (68.10%). Respondents' response to "How did you first come to know about the virus?" differed by gender, χ^2 (3, N = 1050) = 19.10, $p < 0.001$.

3.2.2 Knowledge of COVID-19 symptoms

As symptoms for COVID-19, respondents reported fever (98.57%), dry cough (96.19%), difficulty breathing (96.29%), sore throat (84.86%), diarrhea (52.10%), fatigue (43.85%), pneumonia (49.43%), muscle pain (40.76%) and vomiting (31.05%). These responses do not hold any significant association with gender of the respondents. (Table 2)

Table 2: Knowledge of COVID-19 & gender-wise difference

Variables	n (%) (N=1050)	Male (%) (N=666)	Female (%) (N=384)	χ^2 (df)	P-value
Do you know about COVID-19?					
Yes	1034 (98.48%)	657 (98.65%)	377 (98.18%)	0.36 (1)	0.55
No	16 (1.52%)	9 (1.35%)	7 (1.82%)		
How did you first come to know about the virus?					
Newspaper	73 (6.95%)	61 (9.16%)	12 (3.13%)	19.10 ** (3)	<0.001
Mass media (e.g. TV)	218 (20.76%)	137 (20.57%)	81 (21.09%)		
Social media	715 (68.10%)	448 (67.27%)	267 (69.53%)		
Doctor or family	44 (4.19%)	20 (3.00%)	24 (6.25%)		
How dangerous the virus is?					
Slightly dangerous	144 (13.71%)	92 (13.81%)	52 (13.54%)	0.02 (1)	0.90
Extremely dangerous	906 (86.29%)	574 (86.19%)	332 (86.46%)		
Knowledge of COVID-19 symptoms					
Is fever a symptom for COVID-19?					
Yes	1035 (98.57%)	655 (98.35%)	380 (98.96%)	0.64 (1)	0.42
No	15 (1.43%)	11 (1.65%)	4 (1.04%)		
Is dry cough a symptom for COVID-19?					
Yes	1010 (96.19%)	644 (96.70%)	366 (95.31%)	1.27 (1)	0.26
No	40 (3.81%)	22 (3.30%)	18 (4.69%)		
Is difficulty breathing a symptom for COVID-19?					
Yes	1011 (96.29%)	642 (96.40%)	369 (96.09%)	0.06 (1)	0.80
No	39 (3.71%)	24 (3.60%)	15 (3.91%)		
Is sore throat a symptom for COVID-19?					
Yes	891 (84.86%)	571 (85.74%)	320 (83.33%)	1.09 (1)	0.30
No	159 (15.14%)	95 (14.26%)	64 (16.67%)		
Is diarrhea a symptom for COVID-19?					
Yes	547 (52.10%)	334 (50.15%)	213 (55.47%)	2.76 (1)	0.10
No	503 (47.90%)	332 (49.85%)	171 (44.53%)		
Is fatigue a symptom for COVID-19?					

Yes	460 (43.85%)	298 (44.74%)	162 (42.30%)	0.59 (1)	0.44
No	589 (56.15%)	368 (55.26%)	221 (57.70%)		
Is pneumonia a symptom for COVID-19?					
Yes	519 (49.43%)	336 (50.45%)	183 (47.66%)	0.76 (1)	0.38
No	531 (50.57%)	330 (49.55%)	201 (52.34%)		
Is muscle pain a symptom for COVID-19?					
Yes	428 (40.76%)	279 (41.89%)	149 (38.80%)	0.96 (1)	0.33
No	622 (59.24%)	387 (58.11%)	235 (61.20%)		
Is vomiting a symptom for COVID-19?					
Yes	326 (31.05%)	202 (30.33%)	124 (32.29%)	0.44 (1)	0.51
No	724 (68.95%)	464 (69.67%)	260 (67.71%)		
Knowledge of COVID-19 transmission					
COVID-19 spreads through cough or sneeze					
Yes	1032 (98.29%)	656 (98.50%)	376 (97.92%)	0.49 (1)	0.48
No	18 (1.71%)	10 (1.50%)	8 (2.08%)		
COVID-19 spreads through close contact with infected person					
Yes	1036 (98.67%)	654 (98.20%)	382 (99.48%)	3.04 (1)	0.08
No	14 (1.33%)	12 (1.80%)	2 (0.52%)		
COVID-19 spreads through contaminated surface					
Yes	979 (93.24%)	621 (93.24%)	45 (6.76%)	<0.001	0.99
No	71 (6.76%)	358 (93.23%)	26 (6.77%)		
COVID-19 spreads through eating with unclean hands					
Yes	753 (71.71%)	474 (71.17%)	279 (72.66%)	0.26 (1)	0.61
No	297 (28.29%)	192 (28.83%)	102 (27.34%)		
COVID-19 spreads through touching face with unclean hands					
Yes	906 (86.29%)	569 (85.44%)	337 (87.76%)	1.11 (1)	0.29
No	144 (13.71%)	97 (14.56%)	47 (12.24%)		
COVID-19 can spread via use of public transport					
Yes	713 (67.90%)	464 (69.67%)	249 (64.84%)	2.60 (1)	0.11
No	337 (32.10%)	202 (30.33%)	135 (35.16%)		
Do you think COVID-19 can spread via mosquito?					

Yes	96 (9.14%)	78 (11.71%)	18 (4.69%)	14.47** (1)	<0.001
No	954 (90.86%)	588 (88.29%)	366 (95.31%)		
Do you think COVID-19 can't spread in warm weather?					
Yes	863 (82.19%)	555 (83.33%)	308 (80.21%)	1.63 (1)	0.20
No	187 (17.81%)	111 (16.67%)	76 (19.79%)		
Knowledge of COVID-19 prevention					
Use tissue while coughing or sneezing					
Yes	1035 (98.57%)	653 (98.05%)	382 (99.48%)	3.54 (1)	0.06
No	15 (1.43%)	13 (1.95%)	2 (0.52%)		
Wash hands with soap or using hand-sanitizers					
Yes	1034 (98.48%)	653 (98.05%)	381 (99.22%)	2.22 (1)	0.14
No	16 (1.52%)	13 (1.95%)	3 (0.78%)		
Avoiding crowd					
Yes	1023 (97.43%)	648 (97.30%)	375 (97.66%)	0.13 (1)	0.72
No	27 (2.57%)	18 (2.70%)	9 (2.34%)		
Staying home if sick					
Yes	995 (94.76%)	623 (93.54%)	372 (96.88%)	5.45* (1)	0.02
No	55 (5.24%)	43 (6.46%)	12 (3.13%)		
Is a mask enough to prevent the virus?					
Yes	21 (2.00%)	14 (2.10%)	7 (1.82%)	0.10 (1)	0.76
No	1029 (98.00%)	652 (97.90%)	377 (98.18%)		
Can antibiotics cure from COVID-19?					
Yes	109 (10.38%)	60 (9.01 %)	49 (12.79%)	3.68 (1)	0.06
No	941 (89.62%)	606 (90.99%)	335 (87.24%)		
Boiling food properly					
Yes	810 (77.14%)	502 (75.38%)	308 (80.21%)	3.23 (1)	0.07
No	240 (22.86%)	164 (24.62%)	76 (19.79%)		
Isolating infected person					
Yes	1002 (95.43%)	631 (94.74%)	371 (96.61%)	1.95 (1)	0.16
No	48 (4.57%)	35 (5.26%)	13 (3.39%)		
Avoid touching face with unclean hands					

Yes	989 (94.19%)	625 (93.84%)	364 (94.79%)	0.40 (1)	0.53
No	61 (5.81%)	41 (6.16%)	20 (5.21%)		
Safe disposal of used tissue					
Yes	951 (90.57%)	602 (90.39%)	349 (90.89%)	0.07 (1)	0.79
No	99 (9.43%)	64 (9.61%)	35 (9.11%)		

*P-value<_0.05; **P-value<_0.01; df= degree of freedom

3.2.3 Knowledge of COVID-19 transmission

As transmission of COVID-19, almost all the respondents reported coughing or sneezing (98.29%). Similarly, respondents also reported close contact with infected person (98.67%). Other transmissions include virus contaminated surface (93.24%), public transport (67.90%), eating with unclean hands (71.71%) and touching face with unclean hands (86.29%) as ways of COVID-19 transmission. These responses did not differ by gender of the respondents. (Table 2). Furthermore, the responses for “Do you think COVID-19 can spread via mosquito?” differed by gender, χ^2 (1, N=1050) =14.47, $p<0.001$.

3.2.4 Knowledge of COVID-19 prevention

Using tissue while coughing or sneezing was most reported prevention method for COVID-19 (98.57%). Other preventions include washing hands with soap or sanitizers (98.48%), avoiding crowd (97.43%) and staying home if sick (94.76%). Most of the respondents thought that COVID-19 cannot spread in warm weather (82.19%). On the other hand, most of the respondents denied that only mask is enough to prevent the virus (98%) and antibiotics can cure from COVID-19 (89.62%). The responses for knowledge: “Staying home if sick can prevent COVID-19” differed by gender, χ^2 (1, N=1050) =5.45, $p=0.02$. (Table 2).

3.3 Attitude towards COVID-19

More than half of the respondents were very worried about COVID-19 (51.90%). More than half of the respondents are still going out of home and they reported the duration of staying out as less than half an hour (41.81%), half an hour to 2 hours (9.05%), 2 to 4 hours (1.33%) and more than 4 hours (2.95%). The responses for “Are you worried about COVID-19” differed by gender, χ^2 (2, N=1050) =7.73, $p=0.02$. Again, the responses for “How long do you stay out lately” differed by gender, χ^2 (4, N=1050) =67.78, $p<0.001$. (Table 3)

Table 3: Attitude towards COVID-19 & gender-wise difference

Variables	n (%) (N=1050)	Male (%) (N=666)	Female (%) (N=384)	χ^2 (df)	P-value
Are you worried about COVID-19?					
Worried	477 (45.33%)	290 (43.54%)	187 (48.70%)	7.73* (2)	0.02
Very worried	545 (51.90%)	352 (52.85%)	193 (50.26%)		
Not worried	28 (2.67%)	24 (3.60%)	4 (1.04%)		
Would you be in quarantine if you have COVID-19 like symptoms?					
Yes	1031 (98.19%)	654 (98.20%)	377 (98.18%)	<0.001 (1)	0.98
No	19 (1.81%)	12 (1.80%)	7 (1.82%)		
How long do you stay out lately?					
I don't go out	471 (44.86%)	236 (35.44%)	235 (61.20%)	67.78** (4)	<0.001
<30 min	439 (41.81%)	319 (47.90%)	120 (31.25%)		
30 min- 2 hrs.	95 (9.05%)	76 (11.41%)	19 (4.95%)		
2-4 hrs.	14 (1.33%)	10 (1.50%)	4 (1.04%)		
>4 hrs.	31 (2.95%)	25 (3.75%)	6 (1.56%)		
Would you aware your relatives about the virus?					
Yes	994 (94.67%)	626 (93.99%)	368 (95.83%)	1.63 (1)	0.20
No	56 (5.33%)	40 (6.01%)	16 (4.17%)		
Would you move as before if you have COVID-19 like symptoms?					
Yes	25 (2.38%)	16 (2.40%)	9 (2.34%)	0.004 (1)	0.95
No	1025 (97.62%)	650 (97.60%)	375 (97.66%)		

*P-value<_0.05; **P-value<_0.01; df= degree of freedom

3.4 Preparedness for COVID-19

Most respondents reported they would consult a doctor if they have COVID-19 like symptoms (85.51%). The responses for "Do you wash your hands with just water?" differed by gender, χ^2 (1, N=1050) =7.41, p=0.01. Similarly, the responses for "do you wash your hands with handwash?" differed by gender, χ^2 (1, N=1050) =21.81, p<0.001. Furthermore, the responses for "Do you wash your hands with soap?" differed by gender, χ^2 (1, N=1050) =11.88, p<0.001. Responses for other statements or questions were not significantly associated with gender of the respondents. (Table 4).

Table 4: Preparedness for COVID-19 & gender-wise difference

Variables	n (%) (N=1050)	Male (%) (N=666)	Female (%) (N=384)	χ ² (df)	P-value
How frequently do you use mask?					
Never	50 (4.76%)	29 (4.35%)	21 (5.47%)	0.67 (2)	0.72
Sometimes	513 (48.86%)	327 (49.10%)	186 (48.44%)		
Always	487 (46.38%)	310 (46.38%)	177 (46.09%)		
How frequently do you wash your hands in a day?					
Not once	1 (0.10%)	1 (0.15%)	0 (0%)	1.23 (2)	0.54
1-3 times	94 (8.95%)	56 (8.41%)	38 (9.90%)		
More than 4 times	955 (90.95%)	609 (91.44%)	346 (90.10%)		
Do you wash your hands with just water?					
Yes	70 (6.67%)	55 (8.26%)	15 (3.91%)	7.41** (1)	0.01
No	980 (93.33%)	611 (91.74%)	369 (96.09%)		
Do you wash your hands with handwash?					
Yes	795 (75.71%)	473 (71.02%)	322 (83.85%)	21.81** (1)	<0.001
No	255 (24.29%)	193 (28.98%)	62 (16.15%)		
Do you wash your hands with soap?					
Yes	659 (62.76%)	444 (66.67%)	215 (55.99%)	11.88** (1)	<0.001
No	391 (37.24%)	222 (33.33%)	169 (44.01%)		
Would you consult a doctor if you have COVID-19 like symptoms?					
Yes	897 (85.51%)	569 (85.44%)	328 (85.64%)	0.01 (1)	0.93
No	152 (14.49%)	97 (14.56%)	55 (14.36%)		
Additional steps to consider to prevent COVID-19					
Creating awareness					
Yes	1046 (99.62%)	664 (99.70%)	382 (99.48%)	0.31 (1)	0.58
No	4 (0.38%)	2 (0.30%)	2 (0.52%)		
Restricting immigration					
Yes	826 (78.67%)	515 (77.33%)	311 (80.99%)	1.95 (1)	0.16

No	224 (21.33%)	151 (22.67%)	73 (19.01%)		
Encouraging infected persons to be in quarantine or isolation					
Yes	975 (92.86%)	618 (92.79%)	357 (92.97%)	0.01 (1)	0.92
No	75 (7.14%)	48 (7.21%)	27 (7.03%)		

*P-value<_0.05; **P-value<_0.01; df= degree of freedom

4. Discussion

As COVID-19 vaccine has not been unfolded yet, preventative and control measures regarding the virus are most crucial now. The appropriate knowledge, attitude and preparedness towards COVID-19 among general public are backbone for ensuring any preventative or control measures. This study unveils the overall picture of a subset of Bangladeshi adult populations' knowledge, attitude and preparedness towards COVID-19.

Our results indicate that 86.29% respondents reported COVID-19 as extremely dangerous (Table 2). It was claimed before that higher perceived threat of fatal infection resulted in higher rates of precautionary practices [14]. A substantial proportion of respondents from current study gave incorrect answer about the symptoms of COVID-19 as respondents didn't know diarrhea (47.90%), fatigue (56.15%), pneumonia (50.57%), muscle pain (59.24%), vomiting (68.95%) as symptoms of COVID-19. Those incorrect answers indicate the poor knowledge which may affect in control measures greatly as public knowledge is crucial in dealing with pandemics [15]. A possible reason for this poor knowledge can be the source of information because social media (68.10%) was the main source of COVID-19 information while only 4.19% respondent sought information from doctor or family in the present study. Misleading and false information can spread in social media which might misguide general population regarding knowledge of COVID-19. With the global pandemic, pandemic of misinformation has also been reported that might lead to the concern of xenophobia globally as reported by scientists and WHO official personnels [16, 17]. Previous studies also showed a significant association between sources of information and knowledge [6]. The result is in line with studies conducted in Bangladesh, Vietnam, and China in which the main source of knowledge was social media [6, 18, 19]. This finding has significant gender difference showing male used social media more than the female counterparts to gather knowledge on COVID-19. (Table 2). This situation demands careful evaluation of sources and ensuring of authentic information regarding COVID-19.

Corresponding to the present study, a previous study reported that 67% respondents believed COVID-19 can transmit through close contact with infected person [19] and another study showed almost half of the respondents were unaware about person-to-person transmission of COVID-19 [20]. Furthermore, present study showed that 17.81% and 9.14% respondents had incorrect knowledge saying that COVID-19 can't spread in warm weather and can spread through mosquito, respectively (Figure 2). It was documented before that

COVID-19 can be transmitted in hot and humid weather and mosquito bites can't transmit COVID-19 [21]. Possible explanation for this higher rate of incorrect knowledge can be the initial survey of this study when people were confused with different myths spreading on social media. Communication between health care providers and the public at frequent intervals is recommended in order to overcome myths and to inform the public about health education [22].

Moreover, 94.76% respondents gave the correct answer saying that sick person should stay at home to prevent COVID-19 (figure 3) which is comparable to a previous study where 96.4% believed lockdown as an effective measure of transmission control [23]. Of note that, 10.38% respondents had incorrect knowledge reporting antibiotics can cure from COVID-19 which is comparable to a study which showed 41.6% participants believed antibiotics as the first line treatment [19].

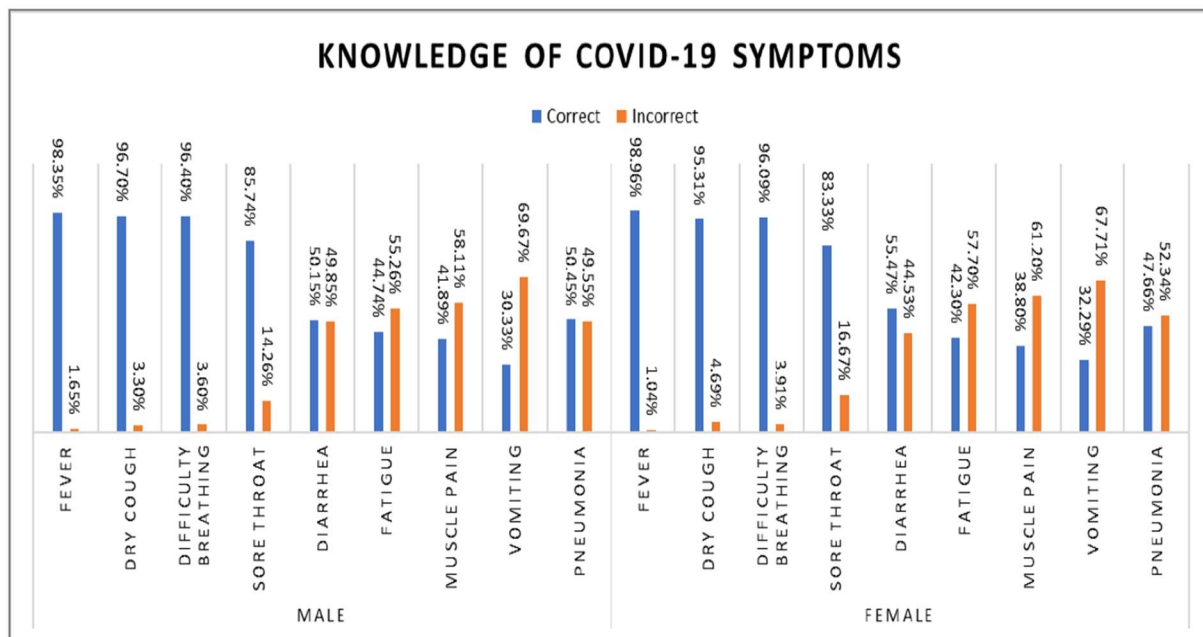


Figure 1: Distribution of knowledge of COVID-19 symptoms by gender.

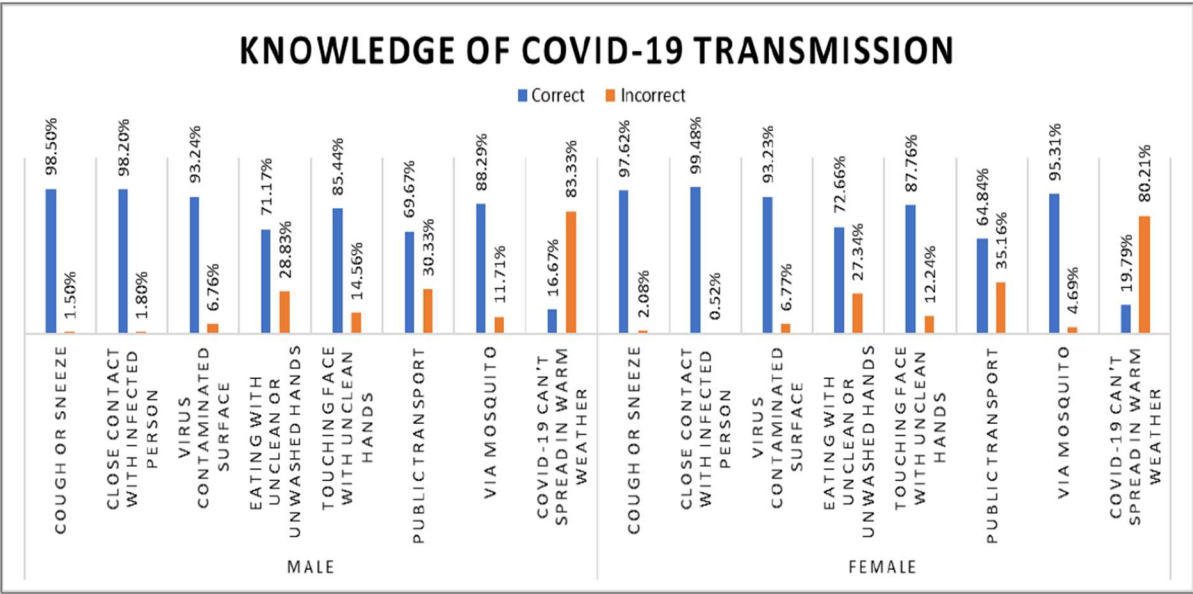


Figure 2: Distribution of knowledge of COVID-19 Transmission by gender.

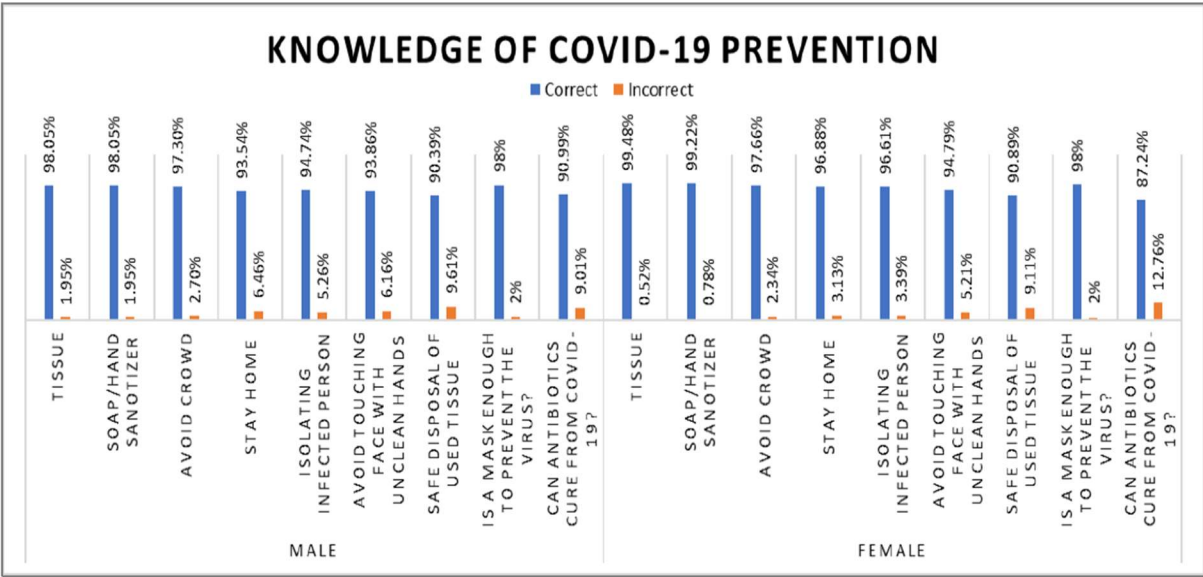


Figure 3: Distribution of knowledge of COVID-19 prevention by gender.

In regards to attitude towards COVID-19, 98.19% of the respondents agreed that they would like to stay in quarantine if any COVID-19 symptoms appear which is comparable to a study where 97.9% participants agreed to isolation if needed [19]. This positive attitude can be the result of correct knowledge among the participants [19]. In our study, 44.86% participants did not go out which is comparable to previous studies where 87% didn't go to any crowded place and 95% participants didn't attend any social events [20, 24]. Of note, 11.41% male respondents stayed out for 30 min to 2 hours which is more when compared to female

counterparts (4.95%). Data from other countries are in accordance with our findings which showed females were 3.6 times more likely to avoid going out than males [24] and women were found to have a more responsible attitude than male and males tend to show risky behaviors [6]. It is worthy to mention that psychological facts (i.e., behavior induced by fear, misleading information) and concerns related to economy can act behind the limited agreement to obey governmental initiatives (i.e., lockdown) by posing serious pressure [25]. This major finding highlights the importance of encouraging people in maintaining social distancing to prevent the transmission of COVID-19.

Highest (90.95%) positive preparedness was observed in washing hands more than 4 times in a day with soap which is similar to the findings of Maheshwari et al. who reported 96.6% participants increased their frequency of washing hands [26]. In the present study, females (83.85%) washed hands with handwash more than male (71.02%). This finding is consistent with other previous findings showing that men were less likely to take preventative measures than female counterparts [27]. 4.76% of the respondents never used masks (Table 4). If avoidance of mask usage is not managed, this could impede the progression of COVID-19 transmission control in future [28]. According to experts' opinion, there prevails a lack of harmony towards the management of COVID-19 despite of having enough time [29] which should be taken into account when adopting any intervention strategies.

4.1 Strengths & Limitations

The findings are congruent for policy makers and other concerned authorities to address the gaps in public health knowledge, attitude and preparedness towards a pandemic like the COVID-19 by ensuring prompt yet adequate policy, effective health education programs, short and long term interventions for improving COVID-19 response, prevention and control. The findings can also work as a baseline to understand public perception to contain any future outbreak.

The study has some limitations to consider when interpreting the results. Firstly, the study was only able to include participants who had access to internet and were mostly educated due to the online nature of the survey. Educated people are more likely to have good knowledge and positive attitude towards COVID-19. Thus, this may overestimate the overall result and can't be generalized to whole population. This problem might be overcome by replicating the study including all types of groups in the population. Secondly, self-reported data and convenience sampling technique might affect the result as some biases (reporting bias, selection bias, social desirability bias) couldn't be ignored. Thirdly, determination of cause-effect mechanisms was not possible for the cross-sectional nature of the study. Future longitudinal study including focus group discussion and in-depth interview are recommended.

5. Conclusion

To conclude, our findings suggest that public health education services with special emphasis on disseminating correct knowledge is vital in order to encourage initiating

healthy behavior during such a pandemic. A number of people are still believing the myths about COVID-19 which is really alarming. Awareness programs should be emphasized focusing on gender specific proper information to ensure effective preventative measures. Furthermore, community-based health education programs and other interventions should be strengthened by ensuring appropriate knowledge about symptoms, transmission & prevention and improve the rate of positive attitude to safeguard general population.

Acknowledgments

We would like to thank all the participants who voluntarily offered their time, conscientiously documented their lives, and provided honest and thoughtful responses during this untoward COVID-19 situation. We also thank the research assistants (volunteers) who supported online data collection of this study.

Author contribution

Conceptualization, Mst. Sadia Sultana, Md. Raisul Islam, Sahadat Hossain; Methodology, Sahadat Hossain; Validation, M. Tasdik Hasan, Md. Tajuddin Sikder; Formal Analysis, Abid Hasan Khan; Investigation, Md. Raisul Islam, Mst. Sadia Sultana; Data Curation, Abid Hasan Khan, Mst. Sadia Sultana; Writing – Mst. Sadia Sultana, Abid Hasan Khan; Writing – Review & Editing, Sahadat Hossain, Md. Tajuddin Sikder, M. Tasdik Hasan; Visualization, Mst. Sadia Sultana; Supervision, Sahadat Hossain.

Funding

Self-funded.

Declaration of Competing Interest

The authors declare that they have no complicit of interest.

Ethics and consent to participate

Ethical standards were maintained to the highest possible extent whilst the study was conducted. All participants read, understood a consent form and agreed to participate in the study. Furthermore, this research is supported by the Department of Public Health and Informatics, Jahangirnagar University, Bangladesh.

References

- [1] E. M. Bloch *et al.*, "Deployment of convalescent plasma for the prevention and treatment of COVID-19," (in eng), *J Clin Invest*, vol. 130, no. 6, pp. 2757-2765, Jun 1 2020.
- [2] J. Yap, V. J. Lee, T. Y. Yau, T. P. Ng, and P. C. Tor, "Knowledge, attitudes and practices towards pandemic influenza among cases, close contacts, and healthcare workers in tropical Singapore: a cross-sectional survey," (in eng), *BMC Public Health*, vol. 10, p. 442, Jul 28 2010.

- [3] G. M. Leung *et al.*, "A tale of two cities: community psychobehavioral surveillance and related impact on outbreak control in Hong Kong and Singapore during the severe acute respiratory syndrome epidemic," *Infection control and hospital epidemiology*, vol. 25, no. 12, pp. 1033-41, 1/8/pubmed3/9/medline1/8/entrez 2005.
- [4] W. Y. Abdel Wahed, E. M. Hefzy, M. I. Ahmed, and N. S. Hamed, "Assessment of Knowledge, Attitudes, and Perception of Health Care Workers Regarding COVID-19, A Cross-Sectional Study from Egypt," (in eng), *Journal of community health*, vol. 45, no. 6, pp. 1242-1251, 2020.
- [5] M. A. Ahmed *et al.*, "Fear and Practice Modifications among Dentists to Combat Novel Coronavirus Disease (COVID-19) Outbreak," (in eng), *Int J Environ Res Public Health*, vol. 17, no. 8, Apr 19 2020.
- [6] B.-L. Zhong *et al.*, "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," (in eng), *International journal of biological sciences*, vol. 16, no. 10, pp. 1745-1752, 2020.
- [7] M. Dauda Goni *et al.*, "Assessment of Knowledge, Attitude and Practice towards Prevention of Respiratory Tract Infections among Hajj and Umrah Pilgrims from Malaysia in 2018," (in eng), *International journal of environmental research and public health*, vol. 16, no. 22, p. 4569, 2019.
- [8] J. Nikolich-Zugich, K. S. Knox, C. T. Rios, B. Natt, D. Bhattacharya, and M. J. Fain, "SARS-CoV-2 and COVID-19 in older adults: what we may expect regarding pathogenesis, immune responses, and outcomes," (in eng), *GeroScience*, vol. 42, no. 2, pp. 505-514, 2020.
- [9] R. C. Reuben, M. M. A. Danladi, D. A. Saleh, and P. E. Ejembi, "Knowledge, Attitudes and Practices Towards COVID-19: An Epidemiological Survey in North-Central Nigeria," (in eng), *Journal of community health*, pp. 1-14, 2020.
- [10] Z. Alnakli, "Saudi Arabian'S Health Beliefs Pertaining to MERS-CoV: Knowledge, Attitudes, and Practices (KAP) Assessment.," *Scholarswork@Arcadia.*, vol. 1, 2016.
- [11] S. Li, B. Feng, W. Liao, and W. Pan, "Internet Use, Risk Awareness, and Demographic Characteristics Associated With Engagement in Preventive Behaviors and Testing: Cross-Sectional Survey on COVID-19 in the United States," *J Med Internet Res*, vol. 22, no. 6, p. e19782, 2020/6/16 2020.
- [12] M. Z. Ferdous, M. S. Islam, D. M. Sikder, A. Syed, A. Zegarra, and D. Gozal, "Knowledge, attitude, and practice regarding COVID-19 outbreak in Bangladesh: An online-based cross-sectional study," *PLoS ONE*, vol. 15, p. e0239254, 10/09 2020.
- [13] G. Eysenbach, "Improving the quality of Web surveys: the Checklist for Reporting Results of Internet E-Surveys (CHERRIES)," (in eng), *Journal of medical Internet research*, vol. 6, no. 3, pp. e34-e34, 2004.
- [14] W. M. Alobuia, C. Missikpode, M. Aung, and P. E. Jolly, "Knowledge, Attitude, and Practices Regarding Vector-borne Diseases in Western Jamaica," (in eng), *Ann Glob Health*, vol. 81, no. 5, pp. 654-63, Sep-Oct 2015.
- [15] G. C. Chirwa, "'Who knows more, and why?'" Explaining socioeconomic-related inequality in knowledge about HIV in Malawi," *Scientific African*, vol. 7, p. e00213, 2020/03/01/ 2020.
- [16] C. C. Lai, T. P. Shih, W. C. Ko, H. J. Tang, and P. R. Hsueh, "Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and coronavirus disease-2019 (COVID-19): The epidemic and the challenges," (in eng), *Int J Antimicrob Agents*, vol. 55, no. 3, p. 105924, Mar 2020.
- [17] K. Shimizu, "2019-nCoV, fake news, and racism," (in eng), *Lancet (London, England)*, vol. 395, no. 10225, pp. 685-686, 2020.
- [18] K. M. M. Farhana, K. A., "Knowledge and perception towards Novel Coronavirus (COVID 19) in Bangladesh," *International Research Journal of Business and Social Science*, vol. 6, no. 2, 2020.

- [19] G. Huynh, T. Nguyen, V. Tran, K. Vo, V. Vo, and L. Pham, "Knowledge and attitude toward COVID-19 among healthcare workers at District 2 Hospital, Ho Chi Minh City," Original Article vol. 13, no. 6, pp. 260-265, June 1, 2020 2020.
- [20] M. K. Al-Hanawi *et al.*, "Knowledge, Attitude and Practice Toward COVID-19 Among the Public in the Kingdom of Saudi Arabia: A Cross-Sectional Study," (in eng), *Frontiers in public health*, vol. 8, pp. 217-217, 2020.
- [21] WHO. (2020, July 1, 2020). *Advice on the use of masks in the context of COVID-19: interim guidance*. Available: <https://apps.who.int/iris/handle/10665/331693>
- [22] M. Nour, A. Babilghith, H. Natto, F. Elamin, and S. Alawneh, "Knowledge, attitude and practices of healthcare providers towards MERS-CoV infection at Makkah hospitals, KSA," *International Research Journal of Medicine and Medical Sciences*, vol. 3, pp. 103-112, 10/01 2015.
- [23] H. Asraf, Garima, T., Singh, B. M., Ram, R., & Tripti, R. P. , " Knowledge, attitudes, and practices towards COVID-19 among Nepalese Residents: A quick online cross-sectional survey.," *Asian Journal of Medical Sciences*, vol. 11, no. 3, 2020.
- [24] M. S. Hamza, O. A. Badary, and M. M. Elmazar, "Cross-Sectional Study on Awareness and Knowledge of COVID-19 Among Senior pharmacy Students," *Journal of Community Health*, 2020/06/15 2020.
- [25] S. Bali, K. A. Stewart, and M. A. Pate, "Long shadow of fear in an epidemic: fearonomic effects of Ebola on the private sector in Nigeria," vol. 1, no. 3, p. e000111, 2016.
- [26] S. Maheshwari, P. Gupta, R. Sinha, and P. Rawat, "Knowledge, attitude, and practice towards coronavirus disease 2019 (COVID-19) among medical students: A cross-sectional study," Original Article vol. 9, no. 3, pp. 100-104, May 1, 2020 2020.
- [27] N. ALdowyan, A. S. Abdallah, and R. El-Gharabawy, "Knowledge, Attitude and Practice (KAP) Study about Middle East Respiratory Syndrome Coronavirus (MERS-CoV) among Population in Saudi Arabia," vol. 10, 2017-10-02 2017.
- [28] WHO. (2020, July 1, 2020). *Coronavirus disease (COVID-19) advice for the public: Myth busters*. . Available: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public/myth-busters>
- [29] BBC. (2020 July 1, 2020). *Coronavirus: One month of identifying the first case, what is the current situation of Bangladesh?* . Available: <https://www.bbc.com/bengali/news-52207223>