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Research Article

Preventive Behaviors to Mitigate COVID-19: Urban-Rural Disparities of Densely Populated Country like Bangladesh

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Abstract

Background: The world inclusive of Bangladesh faces a severe and acute public health emergency due to COVID-19. This study was designed to facilitate pandemic management in Bangladesh. The aim of this study was to ascertain the community people's preventive health behaviors to mitigate COVID-19 in urban and rural settings of Bangladesh.

Methods: This was a quantitative type of cross-sectional study with 800 participants drawn from rural and urban communities of Dhaka district, Bangladesh. Data were collected by using a pre-tested questionnaire through face-to-face interview method by maintaining the social distance. Analysis was done by using univariate, multivariate techniques followed by regression modeling.

Results: Approximately 71% and 78% of people had inadequate levels of COVID-19 preventive knowledge in urban and rural communities respectively.

However, people who lived in urban settings (40%) were reported more moderate/good preventive health behaviors of COVID-19 than rural counterparts (28%). In an urban setting, lower monthly income (AOR=3.74), housewife as an occupation (AOR=8.15) were significant predictors for poor knowledge; and lower-income (AOR=12.45) were significant factors for poor behavior. In rural settings, significant predictors for poor knowledge were more likely to illiterate education (AOR=7.76), lower-income (AOR=3.08), but less likely to younger aged (<30 years) individuals (AOR=0.24); and for poor behavior were illiterate education (AOR=4.22), lower-income (AOR=4.54).

Conclusions: The outcome of this will support to plan of sustainable and comprehensive health educational interventions to improve the knowledge regarding COVID-19 preventive strategies as well as good practice focusing on prior indicators to mitigate the pandemic disease.

Keywords: Preventive; Health behaviors; Mitigate; Transmission; COVID-19

List of Abbreviations

COVID-19: Corona virus disease 2019; SARSCoV-2: Severe acute respiratory syndrome-related corona virus-2;RNA: Ribonucleic acid; WHO: World Health Organization; IEDCR: Institute of Epidemiology, Disease Control and Research; rt-PCR: Reverse transcription-polymerase chain reaction; KAP: Knowledge, attitude and practice; PPS: Probability-proportional-to-size; MERS-CoV: Middle East respiratory syndrome corona virus; X2= Chi-square; SPSS: Statistical Package for Social Sciences; AOR: Adjusted odds ratio

1. Introduction

Corona viruses are a large group of viruses that are rather common throughout the community [1]. Corona viruses are enveloped viruses with a definite, sense single-stranded RNA genome (26–32 kb) [2]. Since December 2019, severe acute respiratory syndrome-related corona virus (SARSCoV-2) had caused a pandemic of Corona virus disease 2019 (COVID-19) [3, 4].

World Health Organization (WHO) reported on 18 May 2021 that, globally there had been 162 million exceeding confirmed cases of COVID-19 including 3 million more of deaths [5]. In Bangladesh, the first COVID-19 patient was detected on March 2020 which was declared by Institute of Epidemiology, Disease Control and Research (IEDCR) on next day. Currently, Bangladesh reported 780,857 COVID-19 cases confirmed by rt-PCR (Reverse transcription-polymerase chain reaction), including 12,181 deaths.

Vaccination has been started as an additional preventive measure with the WHO declared simple precautions like hygiene maintenance, social distancing and mask wearing. More than 5.8 million people were under 1st dose of vaccine and 3.6 million exceeding people were under the 2nd dose amongst the total 166 million populations in Bangladesh [6].

Mitigation strategies like preventive health behaviors (60% reduction in social contacts) and slowing but not interrupting transmission (40% reduction in social

contacts for wider population) could reduce this burden by half, saving 20 million lives [7].

The COVID-19 mitigation strategy fully depends on the knowledge and preventive health behavior of community people. Studies conducted in Bangladesh through online evidenced good knowledge, attitude and preventive practices amongst the respondents [8, 9]. Increased knowledge, attitude and practice (KAP) toward COVID-19 were also identified amongst people of other countries of the world [10, 11].

However, all of these studies were conducted through online system and having internet, higher educational level were indicators for the good level of KAP. Furthermore, lessons learned from an online study of China, rural residents were less likely had positive attitude and performed lower preventive behavior compared to urban residents. Urban community people might experience a better situation related to the COVID-19 pandemic than rural communities because of the existing health disparities of urban vs. rural [12].

To facilitate pandemic management in Bangladesh, there is an urgent need to identify the public's awareness of COVID-19 based on urban and rural context. There was scare of comparative study related to this issue. This study investigated the preventive health behavior towards COVID-19 and its influencing predictors for urban and rural community.

The findings would help health authorities and policymakers to organize and design necessary health communication programs and to deliver the best practices for mitigation the COVID-19 and future pandemic.

2. Methods

2.1 Study design and sites

The study was population-based cross-sectional design and conducted in the Dhaka division of the central part of Bangladesh, including two rural sub-districts and two urban sub-districts due to the highest rate of COVID-19 infection population in Bangladesh [13].

2.2 Study period

The study was conducted from January 2021 to June 2021.

2.3 Study population

The study population comprised of the dwellers of Darussalam and Notun Bazar of Dhaka North City Corporation considered as the urban settings and the dwellers of Alipur and Etavara villages under Hazratpur union of Keraniganj Upazila considered as the rural settings.

2.4 Inclusion criteria

- One economic contributor (or household head or key informant of household) from each selected household; participants who lived at the high risk selected locations in Dhaka.
- Clients aged 18-65 years.
- Clients who has willingness to participate in the study.

2.5 Exclusion criteria

- Clients who were not willing to participate in the study
- Participants who were severely ill (Physically unfit/severely injured to participate in the study, mentally retarded etc.)

2.6 Sample size

The sample size was calculated based on scientific method using the procedure "$n=z^2pq/d2$" [14]. Where, n = required sample, z = the statistic corresponding to level of confidence = 1.96, p = the expected prevalence of COVID-19 infection =50% (there was no scientific evidence regarding the prevalence), q = 1-p, and d = precision corresponding to effect size = 0.05. Assuming a 4% non-response, the required sample size was 800 participants, whereas 400 participants from rural areas and 400 participants from urban are as to scrutinize the effective comparison.

2.7 Sampling

The samples were selected using systematic random sampling through the household list employing the probability-proportional-to-size (PPS) technique. The households from the urban settings were selected from the areas (Darussalam and Notun Bazar) of Dhaka North City Corporation. Similarly, rural households were randomly selected from the Alipur and Etavara villages under Hazratpur union of Keraniganj Upazila.

2.8 Data-collection instruments

Socio-demographic variables such as age, sex, marital status, educational background, occupational status, and household income were collected from the potential respondents. Knowledge and practices of different components of preventive health behaviors to mitigate COVID-19 were recorded. The survey questions were adapted and modified from previously published literature regarding viral epidemics related to the Middle East respiratory syndrome corona virus (MERS-CoV) disease [15, 16], infection prevention measures for COVID-19 by WHO [17], and guidelines suggested by the country's IEDCR [18]. The questionnaire comprised of several sections: socio-demographic information: age, sex, religion, educational background, marital status, occupational status, monthly family income; history of COVID-19 exposure; knowledge on different preventive behavior, including mode of transmission, symptoms, preventive health behaviors, techniques to wear and dispose masks properly, personal hygiene, proper times to wash hands, appropriate techniques to wash/ hygiene hands, chronic co-morbid conditions, health status to seek treatment; quarantine; practice on preventive health behavior, availability of preventive materials to mitigate COVID-19.

2.9 Data-collection procedure

Data were collected through face-to-face interviews using a semi-structured and pre-tested questionnaire.

2.10 Measures

A scoring system was developed to categorize the participant's knowledge level and health behaviors of preventive health behavior due to COVID-19. All the components related to knowledge and behaviors were included in the score calculation. Only the correct answers to each knowledge question were listed. Each

correct response was assigned a score of 1; each incorrect response was assigned a score of 0. For multiple answers; the score of 1 was divided by total numbers of answers. Afterwards, total score was converted into percentage and classified into two categories. Poor knowledge corresponded to a score of (<50%) and moderate/ good knowledge corresponded to a score of (>50%) [19].

2.11 Data processing and data analysis

The collected data were checked, verified, categorized, coded, and then entered into the computer for analysis with the help of SPSS (Statistical Package for Social Sciences) version 21 software. All independent variables were tested individually by Chi-square (X^2) and entered into the first model since they were associated with adherence <0.05 level of significance. Unadjusted and adjusted logistic regression models were used to identify predictors affecting to the participant's knowledge and practice to preventive health behavior due to COVID-19. The model was tested for sensitivity by the forward selection procedure (e.g., including and excluding specific variables) with the robust standard error. The predictor variables were included in the adjusted model only if any label of the predictor was significant at ≤5% risk level in the unadjusted logistic regression model which was used to adjust for the effects of other potential confounders. The statistically significant level was considered a probability value (p-value) of ≤0.05. All data analyses were performed using statistical software SPSS (Statistical Package for Social Sciences) 20 version.

2.12 Ethical consideration

The study complied with the Declaration of Helsinki and was approved by the respective Ethical Review Committee. Participation of the respondents was anonymous and voluntary. Informed consent was sought from the respondents at the beginning point of survey and participants could withdraw from the survey at any time.

3. Results

This study was conducted among urban/ rural community residents of Dhaka, Bangladesh to identify the comparative situation of knowledge and preventive behavior to mitigate COVID-19.

3.1 Participants' characteristics

A total of 800 participants were enrolled in this study of which both urban and rural communities respectively cover 50% (400) of total participant. (Table 1) Among the respondents, majority of the participants were with >40 years of age and male gender in both urban (52.5% & 53% respectively) and rural (64.5% & 60.8% respectively) communities. The highest proportion of respondents had illiterate education (64%) with business as occupation (34.3%) from rural community however large proportion of urban respondents completed up to secondary level of education (47.8%) with service holder as occupation (68.5%). Greater part of the respondents of both communities were married (urban: 89.8%; rural: 87.3%) and belongs to lower monthly family income (urban: 89.5%; rural: 73.8%).

3.2 Distribution of preventive knowledge and behavior of COVID-19 infection

In this present study total average knowledge score found to be poor among both residents, but it was not surprising to observe the highest poor knowledge among rural respondents (78.3%) significantly compared to urban settings (70.8%). The mean knowledge score among rural and urban resident was 17.99±7.7 and 19.08±8.1 respectively. More than tierce of respondents (41.5%) could correctly identify mode of transmission of COVID-19 from rural community compared to urban residents. Urban communities (70.8%) had significantly poor knowledge regarding symptoms of COVID-19 compared to rural (35.8%). Regarding overall knowledge scores on methods of wearing mask, both communities had poor knowledge (urban: 78%; rural: 85%) significantly differed ($p < 0.01$). Most importantly, knowledge reported very poor among both communities on two rules of wearing mask i.e. "while wearing mask our mouth, nose and chin should be covered" (urban: 18%; rural: 19%) and "we should avoid touching mouth and nose during mask on our face" (urban: 5%; rural 4%). On the other hand, concerning to methods of disposing mask, only 5% respondents among rural community had good knowledge and again comparatively the highest knowledge (11.8%) was observed among urban residents ($p<0.01$). The majority of the respondents from rural communities (73.3%) reported poor knowledge on personal hygiene maintenance compared to urban (54.5%). Washing vegetables before cooking was least reported by both communities (urban: 6%; rural: 2%). Regarding knowledge on time to seek health care during COVID-19, the highest poor knowledge was observed from rural respondents (69.3%) which were significantly ($p<0.01$) varied from urban respondents (34.5%). Another two important components of knowledge related to COVID-19 precautions i.e. proper times to wash hands and quarantine observed very poor among the both communities. Although more than half of the respondents from both communities had poor preventive health behavior on COVID-19 mitigation, significantly the highest level of poor behavior was observed among urban residents (71.8%) compared to rural (59.5%). (Table 1).

Characteristics	Urban, n (%)	Rural, n (%)	p-value (≤0.05)
Age (years)			
<30	16 (4)	48 (12)	0.01*
30-40	174 (43.5)	94 (23.5)	
>40	210 (52.5)	258 (64.5)	
Gender			
Male	212 (53)	243 (60.8)	0.03*
Female	188 (47)	157 (39.3)	
Education			
Illiterate	154 (38.5)	256 (64)	0.01*
Primary to secondary	191 (47.8)	107 (26.8)	
Higher secondary and above	55 (13.8)	37 (9.3)	
Marital Status			
Married/separated/divorced/ widowed	359 (89.8)	349 (87.3)	0.27
Unmarried	41 (10.3)	51 (12.8)	
Monthly Family Income (BDT)			
<20000	358 (89.5)	295 (73.8)	0.01*
20000-30000	32 (8)	82 (20.5)	
>30000	10 (2.5)	23 (5.8)	
Occupation			
Service holder	274 (68.5)	73 (18.3)	0.01*
Business	55 (13.8)	137 (34.3)	
Housewife	50 (12.5)	123 (30.8)	
Others	21 (5.3)	67 (16.8)	
Knowledge			
Mode of transmission			
Moderate/Good	189(47.3)	166(41.5)	0.12

Poor	211(52.8)	234(58.5)	
Symptoms of COVID-19			
Moderate/Good	117(29.3)	257(64.3)	0.01*
Poor	283(70.8)	143(35.8)	
Proper methods to wear mask			
Moderate/Good	88(22.0)	60(15.0)	0.01*
Poor	312(78.0)	340(85.0)	
Proper methods to dispose mask			
Moderate/Good	47(11.8)	20(5.0)	0.01*
Poor	353(88.3)	380(95.0)	
Personal hygiene maintenance			
Moderate/Good	182(45.5)	107(26.8)	0.01*
Poor	218(54.5)	293(73.3)	
Timing of hand washing			
Moderate/Good	104(26.0)	89(22.3)	2.74
Poor	296(74.0)	311(77.8)	
Time to seek health care during COVID-19 infection			
Moderate/Good	262(65.5)	123(30.8)	0.01*
Poor	138(34.5)	277(69.3)	
Quarantine			
Moderate/Good	55(13.8)	63(16.8)	2.79
Poor	345(86.3)	333(83.3)	
Total Knowledge			
Moderate/Good	117(29.3)	87(21.8)	0.01*
Poor	283(70.8)	313(78.3)	
Behavior			
Preventive health behavior			
Moderate/Good	113(28.3)	162(40.5)	0.01*
Poor	287(71.8)	238(59.5)	
Data are presented as frequency (n), percentage; P value was generated by Chi-square test. *Statistical significance at p value ≤0.05.			

Table 1: Comparative characteristics of socio-demographic, knowledge and behavior on COVID-19 mitigation among the respondents (n=800).

Good knowledge responses about preventive health was found in rural respondents regarding maintaining social distance (61%) & washing hand when necessary (25%) compared to urban. Only most important component like cover your nose and mouth with mask while going outside (81%) was reported the highest by urban community compared to rural. (Figure 1).

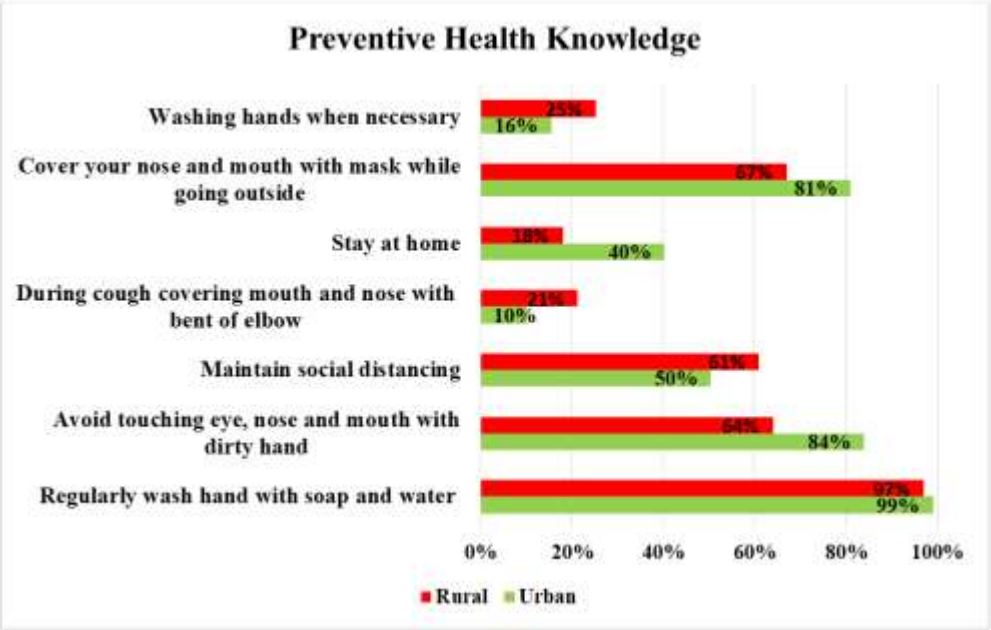

Figure 1: Preventive health knowledge among the respondents (n=800) analyzed by multiple responses.

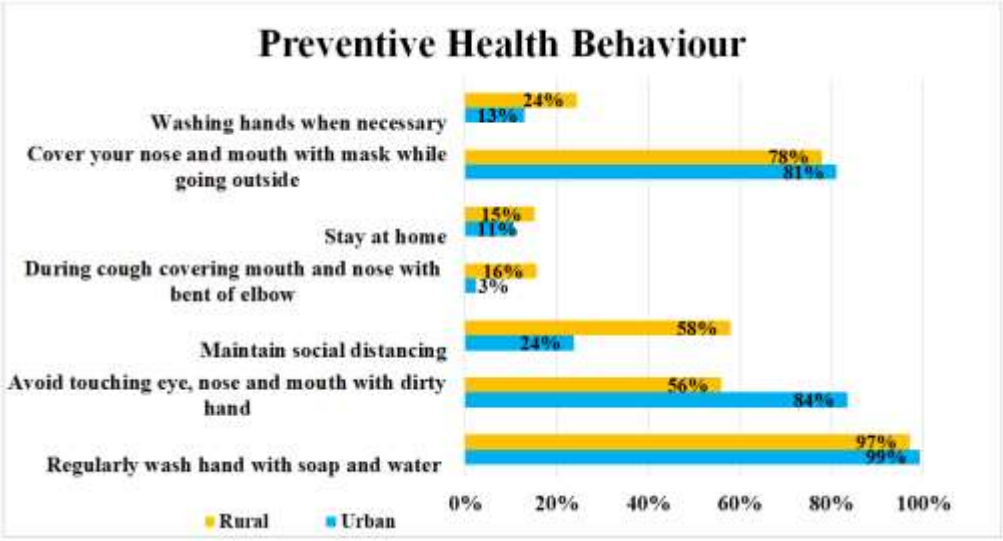

Figure 2: Preventive health behavior among the respondents (n=800) analyzed by multiple responses.

Likewise, the level of knowledge this study showed similar scenario of preventive health behavior. Like practicing social distancing (58%) along with wishing hand when necessary (24%) were maximum reported by the rural people compared to urban. On the other hand, covering mouth and nose with mask while going outside (81%) found well practiced by urban community compared to rural. (Figure 2).

3.3 Associations of preventive knowledge and behavior against COVID-19 infection and participant's characteristics

In terms of predicting the cause of poor knowledge table 2 shows that lower income group (<20,000 BDT) from both urban (AOR= 3.74, 95% CI= 0.96-14.54, p= 0.05) & rural (AOR= 3.08, 95% CI= 1.16-8.17, p= 0.02) communities are more likely to have poor knowledge on COVID-19 mitigation compared to higher income group. Besides to lower income group, from urban community housewife respondents found to have poor knowledge (AOR= 8.15, 95% CI= 2.08-31.85, p= 0.01) about COVID-19 mitigation compared to other professionals like service holder, business, students and unemployed. Additionally, in rural community beside to lower income group, older persons (>40 years) were more likely to have poor knowledge compared to younger aged group. Moreover, illiterate education group also had poor knowledge (AOR= 7.76, 95% CI= 3.38-17.79, p= 0.01) on COVID-19 mitigation compared to another educational group from rural community.

Table 2 reflected that likewise poor knowledge, preventive health behavior was also reported poor among lower income group (<20,000 BDT) in both communities (urban: AOR= 12.45, 95% CI= 2.35-65.77, p= 0.01; rural: AOR= 4.54, 95% CI= 1.75-11.79, p= 0.01) compared to higher income group. Illiterate group (AOR= 4.22, 95% CI= 1.97-9.00, p= 0.01) was found more likely associated with poor practice of rural community, however urban community people with higher secondary education revealed more with poor practice. Furthermore, urban male (AOR=0.33, 95% CI= 0.19-0.54, p= 0.01) respondents were less prone to have poor practice to mitigate COVID-19 compared to female respondents.

Characteristics	Urban				Rural			
	Knowledge (Poor VS Good/Moderate knowledge counter)							
	Un-adjusted OR (95% CI)	P	Adjusted OR (95% CI)	P	Un-adjusted OR (95% CI)	P	Adjusted OR (95% CI)	P
Age (years)								
<30	0.80 (0.26-2.40)	0.69	-	-	0.16(0.09-0.32)	0.01	0.24 (0.11-0.53)	0.01
30-40	0.76 (0.49-1.19)	0.27	-	-	0.55(0.31-0.98)	0.04	0.90 (0.46-1.75)	0.76
>40	Reference							
Gender								
Male	0.61 (0.39-0.94)	0.28	-	-	1.34 (0.83-2.17)	0.22	-	-
Female	Reference							
Education								
Illiterate	1.79 (0.92-3.51)	0.08	-	-	9.91(4.68-21.0)	0.01	7.76 (3.38-17.79)	0.01
Primary to secondary	1.07 (0.57-2.01)	0.83	-	-	3.44(1.58-7.47)	0.01	4.75 (2.02-2.02)	0.01
Higher secondary and above	Reference							
Marital Status								
Married/separated/divorced/widowed	1.14 (0.55-2.36)	0.71	-		0.22 (0.12-0.41)	0.01	-	-
Unmarried	Reference							
Monthly Family Income (BDT)								
<20000	4.09(1.13-14.82)	0.03	3.74(0.96-14.54)	0.05	3.39 (1.38-829	0.01	3.08(1.16-8.17)	0.24
20000-30000	1.70(0.40-7.19)	0.47	1.93(0.42-8.74)	0.39	1.05 (0.41-2.73)	0.90	0.97(0.34-2.74)	0.95
>30000	Reference							
Occupation								
Service holder	2.24 (0.91-5.49)	0.07	1.69(0.66-4.35)	0.27	1.82 (0.87-3.84)	0.10	-	-
Business	1.17 (0.42-3.22)	0.75	0.99(0.35-2.80)	0.98	3.26 (1.64-6.50)	0.01	-	-
Housewife	10.45 (2.75-39.65)	0.01	8.15(2.08-31.85)	0.01	2.08 (1.07-4.03)	0.03	-	-
Others (Students & unemployed)	Reference							
Behavior (Poor VS Good/Moderate behavior counter)								
Age (Years)								
<30	0.43 (0.15- 1.22)	0.11	-	-	0.20 (0.10-0.41)	0.01	-	-
30-40	0.77 (0.49-1.20)	0.25	-	-	0.65 (0.40-1.06)	0.08	-	-
Gender								

Male	0.27 (0.17-0.45)	0.01	0.33(0.19-0.54)	0.01	1.50 (1.0-2.26)	0.05	-	-
Female	Reference							
Education								
Illiterate	2.55 (1.30-5.01)	0.01	0.65(0.28-1.56)	0.34	4.37(2.12-9.04)	0.01	4.22(1.97-9.00)	0.01
Primary to secondary	1.29 (0.69-2.39)	0.43	0.45(0.21-1)	0.05	1.34(0.62-2.91)	0.46	1.48(0.66-3.34)	0.34
Higher secondary and above	Reference							
Marital Status								
Married/separated/divorced/ widowed	0.65 (0.33-1.28)	0.21	-	-	0.32 (0.17-0.59)	0.01	-	-
Unmarried	Reference							
Monthly Family Income (BDT)								
<20000	12.46 (2.59-59.78)	0.01	12.45(2.35-65.77)	0.01	5.12(2.04-12.88)	0.01	4.54(1.75-11.79)	0.01
20000-30000	3.11 (0.56-17.02)	0.19	3.29(0.58-18.48)	0.17	1.12(0.41-3.05)	0.82	1.08(0.38-3.05)	0.88
>30000	Reference							
Occupation								
Service holder	3.10 (1.26-7.66)	0.01	-	-	1.86 (0.94-3.66)	0.07	-	-
Business	0.70 (0.25-1.93)	0.49	-	-	2.23 (1.23-4.06)	0.01	-	-
Housewife	3.63 (1.20-10.94)	0.02	-	-	1.35 (0.74-2.45)	0.32	-	-
Others	Reference							

Table 2: Predictors influencing preventive health knowledge & behavior on COVID-19 among the urban and rural respondents.

4. Discussion

This study revealed that most rural respondents had poor knowledge of COVID-19 compared to the urban (Rural 78.3% & Urban 70.8%). This is due to the different demography of the sample as 64% were illiterate in rural and 38.5% were illiterate in urban which indicates nearly double respondents were illiterate in a rural area compared to urban. Findings from a study in China just resemble this current study. Likewise, compared with urban residents, rural residents were less likely to perform preventive behaviors, more likely to hold a negative attitude toward the effectiveness of performing preventive behaviors, and more likely to have lower levels of information appraisal skills [12]. Opposite findings stated by the studies conducted in Bangladesh and Saudi Arabia, that about half (48.3%) of the Bangladeshi population and a majority (81.64%) of the Saudi population reported accurate knowledge concerning COVID-19 infection [8, 11]. Both studies collected their information online, indicating that respondents of the studies had online access to gain knowledge regarding COVID-19 prevention. Furthermore, Saudi Arabian respondents had previous experiences with MERS-CoV epidemics [16].

More than half (58.5%) of the rural subjects had poor knowledge on the mode of transmission of COVID-19 while about half (47.3%) of the urban had good knowledge and the study did not find any significant difference regarding this issue. Similarly, another study in China did not found any significant differences regarding subjective norms and knowledge about preventive behaviors between urban and rural inhabitants [12]. However, another study in Bangladesh [9] reported except minimal (0.02%) almost all subjects could identify the mode of transmission of COVID-19 properly as the subjects had online access through which they might gain such knowledge. The majority (73.3%) of the respondents from the rural sector had comparatively poor knowledge of personal hygiene maintenance than urban while in 97% cases they responded that regular washing hand with soap and water can prevent COVID-19, and they practiced well. The scenario for both knowledge and practice more favorable (99%) in urban community. Preventive health knowledge and behavior revealed that maximum (81%) urban respondents agreed that using mask when go outside can prevent the infection, and they also practiced personally. However, response regarding social distancing in both knowledge and practice aspect found more in rural than the urban. These findings are supported by another study in Bangladesh where it is revealed that maximum respondents had good conception that frequent hand washing can prevent COVID-19 [9]. Similarly, the overall attitude towards actions such as ‘wash hands and face after coming from outside’ and ‘health education can play an important role for COVID-19 prevention’ was universally positive towards COVID-19 mitigation which arose from a good level of knowledge. A Pakistani study reported that more than 80% of participants strongly agreed that transmission of COVID-19 could be prevented by the universal precautions recommended by WHO or CDC [20]. Similar information was observed in another study conducted among the university students of Pakistan [21].

In most of the cases, this study found rural respondents had significantly poor knowledge of mask-wearing techniques compared to urban respondents ($p<0.01$). Concern to this point a study in Bangladesh observed reluctance to use masks, and the reluctance of complying with not being able to stop going out of the house as the participants indicated negligence about the severity of the disease though they had a positive attitude on the issue wearing a face mask before going to a crowded place. Both outcomes indicate less opportunity to participate in the preventive measures and other actions taken by the government [8]. However, other studies of Pakistan [22, 23] showed that the majority of Pakistani urban people had good knowledge of wearing masks. Therefore, it is essential to empower every individual with the knowledge about the preventive actions regarding COVID-19 infection.

On the other hand, considering methods of disposing mask study found significantly higher knowledge among urban respondents ($p<0.01$). Regarding the timing of seeking health care during COVID-19 infection, the poor response was observed again from rural respondents (69.3%) with significantly higher correct responses from the urban sector ($p<0.01$). A finding related to quarantine shows that both urban and rural people had poor knowledge, and the urban-rural comparison was not found as statistically significant. A reverse scenario was found among the university students in Bangladesh [24] which revealed that the majority had 75% had good knowledge about Home Quarantine.

In the urban community, respondents who had low monthly income BDT <20000 and were house wives, reflected as having poor knowledge regarding the prevention of COVID-19. On the contrary, from the rural community poor knowledge was significantly identified among the older respondents (>40 years) and the respondents who had up to secondary education including non-formal educated subjects. Similarly, population-level estimation in Bangladesh revealed that male gender, higher education, living in a town/urban area, good financial condition, and use of the internet were positively associated with having good knowledge [9]. Another study from China showed that a more positive attitude arose from good knowledge regarding COVID-19 was significantly associated with older age, having higher education, being employed, having a joint family, having a higher monthly family income, and implementing more frequent practices [25]. However, in and Malaysia [10], the lower monthly income group had the lowest knowledge score.

Among rural subjects, illiteracy imposed an adverse effect along with the lower-income status to reveal the poor COVID-19 preventive behaviors. However, in urban scenarios, higher educational status and female subjects were significant predictors for the poor practice. Globally from several studies, it is clear that women were significantly more likely to adopt preventive behaviors than men. Thus, intervention-based education regarding COVID-19 prevention among the housewives can be implemented which might be more effective to the aware general population as well as establishing good knowledge and behavior. The findings of another survey in Bangladesh support these observations. Likewise, good COVID-19 preventive practice was

significantly associated with the factors of being female, older age, having higher education, higher income, urban area residence, and having more positive attitudes [8].

In contrast to other studies, our study revealed completely a depressing scenario on knowledge and behavior towards COVID-19 [8, 25, 23, 20], especially in the rural community. The reason behind that might be the less awareness due to having less information disseminated among them and particularly a significant amount was of older adults and lower educational status thus they had less opportunity of reaching various information sources regarding COVID-19 [8, 9]. A quick online-based survey in China identified some demographics like marital status, education, occupation, and income as significant factors which were associated with having good knowledge [23], similarly another study in Pakistan showed that male sex, age-group of 16–29 years, marital status, education, employment and being a student were significantly associated with knowledge [25].

As remarkably poor knowledge and practice are found in rural areas comparative to urban, likely, population sectors in both urban and rural areas that have no access to the internet or live and uniform education and dissemination initiatives are promulgated and implemented. In addition, this study guided that large clusters of people have become less informed and reluctant on prevention practices on COVID-19 [26]. Therefore, opportunities for comprehensive education, dissemination of preventive behaviors, and personal hygiene education are essential, especially in rural areas, among old and lower educated people, females especially who are homemakers, since they are more deprived in getting access to novel information or encounter financial or resource barriers to maintain preventive measures effectively [27].

5. Conclusions

This study reported that knowledge and practice on preventive behaviors of COVID-19 are poor among the lower-income population in both urban and rural areas. In addition, as the study showed educational status significantly influence the knowledge as well as the practice level, in both sector people need to provide effective and demonstrative preventive education to mitigate COVID-19. Furthermore, in the rural continent, it is essential to support the population especially the older by delivering them essential personal hygiene materials, protective equipment along proper demonstrative education. On the other hand, in urban community the female population needs to be empowered regarding the enrichment of their knowledge and preventive practices along with active family members. In a nutshell, our observations finally recommend that according to the priority in both rural and urban sector the effective and comprehensive health education programs are needed to pilot and generalized which aimed at improving knowledge against COVID-19, thereby leading to implementation and maintenance of safe practices.

6. Limitations of the Study

This study has several limitations. First, this study followed a cross-sectional study design. Therefore,

causal inferences might not be established. Secondly, we used a limited number of inquiries to measure the knowledge and preventive behaviors of the study subjects. Thus, additional assessments would be important, using all aspects of information and behaviors towards COVID-19.

Footnote

Ethics Approval

Ethical approval of this study was taken from the Bangladesh Medical Research Council (BMRC), Dhaka, Bangladesh.

Availability of Data and Material

Data and materials would be available on request.

Competing Interests

The authors declare that they have no competing interests.

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Authors' Contributions

Bilkis Banu: Conceived and designed the study; tools development; analyzed and interpreted the data; drafted and revised the article.

Sujana Haque Chawdhury: Conceived and designed the study; analyzed and interpreted the data; drafted the article.

Nasrin Akter: Conceived and designed the study; analyzed and interpreted the data; drafted the article.

Kazi Rakibul Islam: Conceived and designed the study; analyzed and interpreted the data; drafted the article.

Sarder Mahmud Hossain: Drafted and revised the article.

Md. Ruhul Amin: Drafted and revised the article.

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