


RESEARCH ARTICLE

Factors determining preventive practices of the healthcare workers regarding COVID-19 in Bangladesh

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Abstract

Purpose: Identifying the factors influencing the preventive practices of the healthcare workers (HCWs) is crucial during the ongoing coronavirus disease 2019 (COVID-19) because the HCWs are exposed to unparalleled levels of risks. Such concern is starting to be explored worldwide although there is only a single study available in Bangladesh with a limited scope of explorations of the domain. Therefore, this study aimed to identify the factors determining better preventive practices of HCWs toward COVID-19.

Materials and methods: A cross-sectional one-to-one survey was carried out using a validated questionnaire from December 15, 2020 to March 15, 2021 among a sample of 640 HCWs from Khulna, a southwestern division of Bangladesh, consisting of ten districts. The measures included socio-demographics, knowledge, attitude, and preventive practices related information. A binary logistic regression analysis was conducted to identify factors determining preventive practices of HCWs toward COVID-19.

Results: More than half of the respondents (62%) were following better preventive practices. Besides, around 70% of them had better knowledge and attitudes toward the disease. Regression analysis showed a number of major determining factors of the HCWs' better preventive practices including being a nurse or other professionals (ie, radiologists and pathologists), being graduates, working in coronavirus isolation units, managing COVID-19 patients, having previous training, and having better attitudes toward COVID-19.

Conclusion: The findings confirmed that the HCWs were generally practicing preventive manners although these trends followed were not at the standard level. So, providing guidance and information from authentic sources and organizing proper training could possibly enhance the preventive behavior in managing COVID-19 patients.

KEYWORDS

attitude, COVID-19, healthcare workers, knowledge, preventive practices

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1 | INTRODUCTION

Whatever the case, it is evident from the spike in the number of infections as well as deaths that the coronavirus disease 2019 (COVID-19) pandemic will be around for some time.¹ But, human survival will entirely rely on how better we are able to follow the mandatory health guidelines (eg, early detection, isolation, contact tracing, and treatment of COVID-19 patients using precision medicines) to reduce the COVID-19 spread.² In this ongoing battle, healthcare workers (HCWs) were on the frontline from the very beginning and prone to get infected.^{3,4} A serious occupational threat to their health has always persisted due to the frequent exposures to actively infected individuals and others (e.g., nurses had to collect clinical samples from suspected patients and deliver medicines during treatments, radiologists had to examine patients' lungs, pathologists had to perform molecular diagnosis, physicians had to treat the patients etc.).⁵ In addition, the HCWs were unable to maintain proper safety in many cases owing to extreme working pressure derived from the scarce human resources in the sectors.⁶

In Bangladesh, the situation in health-related sector is of great concern. It has been reported that several hospitalized COVID-19 affected patients did not disclose their travel or contact history, or other flu-like symptoms during the early surge of the pandemic.⁷ With the first death case of an HCW in April 2020, the condition worsened day by day.⁸ However, in terms of the HCWs, a relatively lesser mortality rate of 0.05 (per 100 000 population) was reported in Bangladesh in comparison to other nations (eg, 0.35 in Italy, 0.16 in UK etc.) which have a lower number of total population.⁹⁻¹² Nevertheless, the abovementioned number is tough to justify on account of the lack of available research data and shortages of testing capacities in Bangladesh.¹³

Poor knowledge and practice of the HCWs proved to play a significant role in the mismanagement of cross-infection in different studies.¹⁴⁻¹⁶ The disease transmission among the HCWs is usually exaggerated by the overcrowding of patients, absence of isolation facilities, contaminated environment, and is likely to be enhanced by insufficient knowledge and awareness of infection control practices among HCWs.^{2,17} Taken that, like many other countries, the government of Bangladesh also followed WHO recommendations to prevent the spread of COVID-19, and additionally, several governmental institutes/hospitals arranged the training on managing COVID-19 for HCWs across the country.¹⁸⁻²²

For a country like Bangladesh with limited healthcare settings and high population density, fighting COVID-19 is next to impossible without regulatory guidelines. Understanding the proper preventive practices toward COVID-19 infection will train the HCWs in preparing those mandatory guidelines. There is only one study available in the country to date that addressed the issue although that study was limited to personal protective equipment as the prevention strategy, had a small sample size, and provided less information on overall preventive practices.²³ Thus, the current study thoroughly investigated the ongoing preventive practices of HCWs in relation to COVID-19 and determined the incorporated factors significant to those behaviors.

2 | METHODS AND MATERIALS

2.1 | Ethical permission

The Ethical Review Committee of the Jashore University of Science and Technology approved this investigation (ERC Approval No: Ref/ERC/FBS/JUST/2021-51). All participants were informed about the study objectives and its procedure before data collection. Data collectors had collected written consents from all the respondents while maintaining a physical distance.

2.2 | Study design and study subjects

A descriptive cross-sectional study was carried out within December 15, 2020 and March 15, 2021 among the healthcare workers (HCWs) from different hospitals in the Khulna region of Bangladesh. Khulna is a Southwestern Division of Bangladesh, consists of 10 districts (ie, Khulna, Jashore, Narail, Magura, Satkhira, Meherpur, Bagerhat, Chuadanga, Kushtia, and Jhainaidah). HCWs from those district hospitals including the Physicians, Nurses, and Others (ie, Radiologists and Pathologists) were asked to participate in this study. The sample size was calculated to be 351, using the Raosoft sample size calculator based on the following assumptions: 5% margin of errors, 95% confidence interval, the proportion of good knowledge (ie, 50%), and population size of ~4000 HCWs in Khulna region. Then the sample size was increased by 30% to overcome the non-responses. Fortunately, we managed to interview a total of 640 HCWs. Personal information was kept confidential for all the participants. Respondents (ie, 613 out of 640) who answered at least 80% of the questions were taken for further analyses.

2.3 | Study instrument

A well-designed questionnaire was prepared by following the interim guidance of WHO on "Risk assessment and management of exposure of health care workers in the context of COVID-19"²⁴⁻²⁶ and other previous researches.²⁴⁻²⁶ The questionnaire was prepared in English and validated by the authors. Compatibility with the present setting and comparability with the preceding surveys were emphasized in determining the questions to be included or excluded. The questionnaire was reviewed and validated by five expert faculty members (ie, two microbiologists, one licensed health-care professional, one statistician, and one public health epidemiologist) from the relevant departments of JUST (i.e., Microbiology, Nursing and Health Science, and public health); various drafts were prepared and evaluated by them for the appropriateness of response options to be applicable in the country perspective. To simplify the data collection process, the questionnaire was translated from English to Bangla and back translated into English by two responsible persons who are fluent in both dialects. The Bangla version was handed to the data collectors. All data collectors were trained in interviewing HCWs and submitting data through the

TABLE 1 Demographic characteristics of the participants

Variables	Number (N)	Frequency (%)
Sex		
Male	239	39.0
Female	374	61.0
Age groups		
<25 y	143	23.3
25-34 y	265	43.3
35-44 y	138	22.5
>44 y	67	10.9
Mean age \pm SD	32.29 \pm 8.77	
Education		
Diploma	434	70.8
Graduate (bachelor)	135	22.0
Post-graduate (masters)	44	7.2
Profession		
Physician	104	17
Nurse	303	49.4
Others (pathologists, radiologists)	206	33.6
Working experience		
<5 y	292	47.6
5-10 y	159	25.9
>10 y	162	26.4
Working sector		
Government hospital	307	50.1
Private hospital	306	49.9
Work place		
Coronavirus isolation unit	76	12.4
CCU	20	3.3
Other wards (general)	517	84.3
Training status		
Trained	135	22.0
Untrained	478	78.0
Direct contact with COVID-19 patients		
Yes	330	53.8
No	283	46.2
Got COVID-19 infected		
Never	471	76.8
Once	108	17.6
More than once	34	5.5
Stress during work		
Yes	420	68.5
No	193	31.5
Main source of information		
Social media	156	25.4
Doctor	86	14
Newspaper	11	1.8

(Continues)

TABLE 1 (Continued)

Variables	Number (N)	Frequency (%)
Television	127	20.7
Friends/family	2	0.3
Workplace	231	37.7

Google form. Besides, the questionnaire was pretested on 50 HCWs, and they were excluded finally from the study. Internal consistency and reliability were determined by calculating Chronbach's alpha value which was 0.665 for the revised and final questionnaire. A Google form was also created using the questionnaire that contained the following sections related to (a) demographic characteristics (age, sex, marital status, education, profession, experience, workplace, and working sector), (b) knowledge toward COVID-19, (c) attitude toward COVID-19, and (d) practice behaviors toward COVID-19. The knowledge section consisted of 13 questions covering the mode of transmission, symptoms, ways of treatment, and prevention. Each correct answer was scored 1, and incorrect/do not know answer was scored 0. Thus, the possible maximum knowledge score calculated was 13. Respondents with a knowledge score ≥ 10.0 were considered to have better knowledge. The attitude section consisted of 12 questions with a 4-point Likert scale (ie, strongly disagree to strongly agree) assessing HCWs' attitudes of COVID-19. Attitude score was given 1 for every positive attitude and 0 for each negative attitude. Thus, possible maximum attitude score was calculated as 12. Respondents with ≥ 10.0 score were considered to have better attitudes. Finally, the practice section consisted of 12 questions with a 3-point Likert scale (ie, always, sometimes, and never) covering HCWs COVID-19 related practices. Bad/ unacceptable practice was given 0, acceptable/moderate practice was given 1, and best/preferred practice was scored 3. Thus, the possible maximum score was calculated as 36 and a minimum of 12. Respondents with ≥ 23.0 practice score were considered to have better practices. Rounded mean values of the scores were used as the thresholds for "better" knowledge, "better" attitude, and "better" practices, respectively. Detailed questionnaire with appropriate answers to justify the "better" knowledge, "better" attitude, and "better" practices for each question can be found in the Data S1.

2.4 | Statistical analysis

The data from the Google forms were exported to Microsoft Excel and checked for ambiguity. Data with <80% response were removed from the final analysis. After data cleaning, raw data were imported to SPSS (vs 24.0, IBM, Chicago, IL) and analyzed. Descriptive analyses were done with percentages and proportions. Individual participant's knowledge, attitude, and practice scores were calculated. A student's *t* test, ANOVA test, and Chi-square were used to evaluate significant differences among different demographic groups and associations with different demographic factors. Spearman rank correlation was

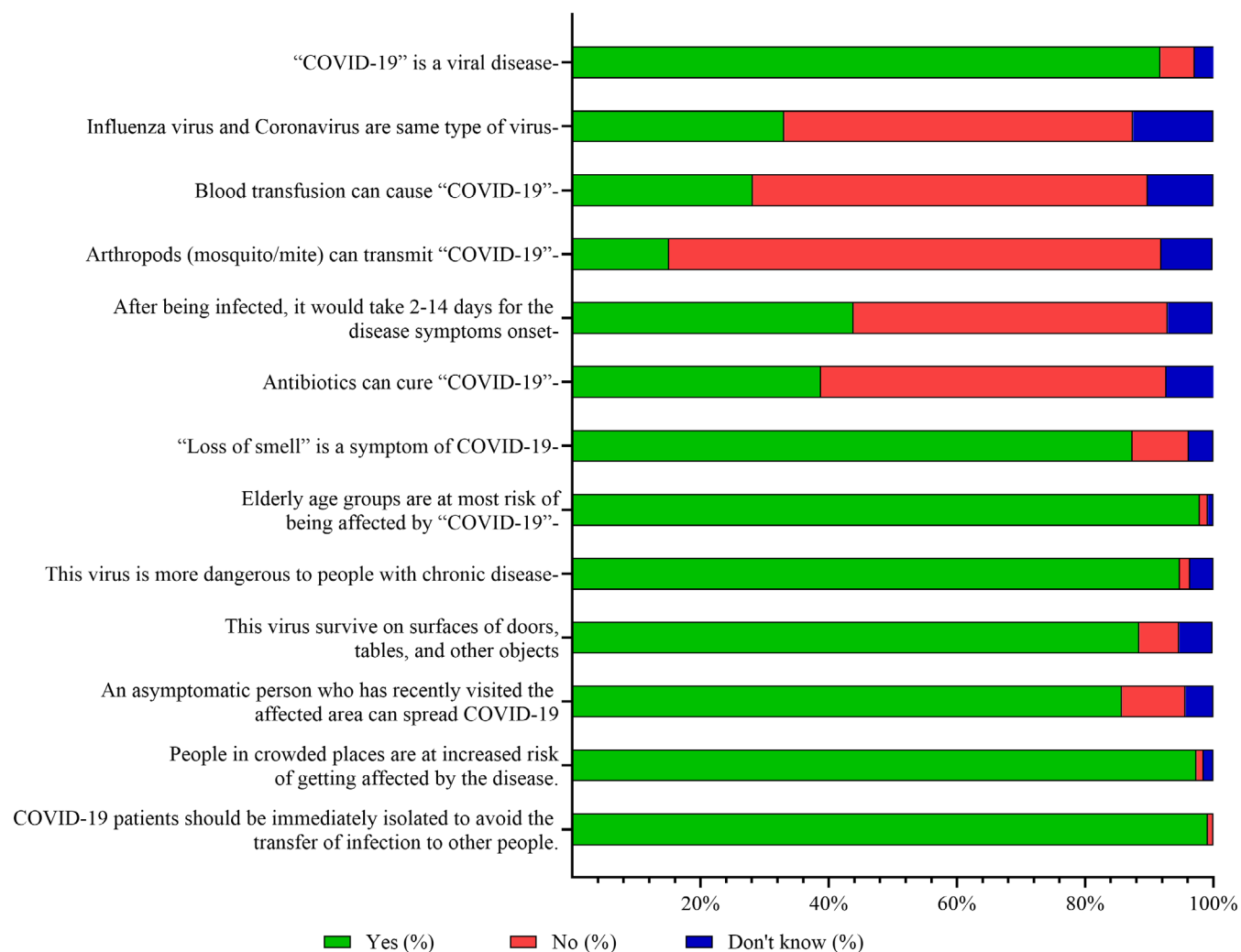


FIGURE 1 Responses to knowledge questions

done between knowledge and practice scores. As we observed a slightly skewed distribution in the mean scores, we categorized the mean scores and performed logistic rather than linear regression analyses. Binary logistic regression analyses were performed to identify the factors associated with better practices toward COVID-19. In all the tests, P -value $< .05$ was considered statistically significant. All the graphs were prepared by using GraphPad Prism 8.0 (GraphPad Software, USA).

3 | RESULTS

3.1 | Demographic characteristics of the participants

Demographic characteristics of the study participants are presented in Table 1. Among the 613 participants, about 61% were female. The mean age of them was 32.29 ± 8.77 (ranged from 18 to 67 years) and the majority belonged to the age group of 25 to 34 years (43.4%). Nearly 80% ($n = 478$) of the participants had no institutional training on the

management of COVID-19. About 70.8% of the respondents had completed a diploma, and 22% had a bachelor's degree whereas only 7.2% had a post-graduate (masters) degree. Almost half of the participants (49.4%) were nurses, 17% were physicians and the rest belonged to other categories (ie, radiologists and pathologists). Besides, most of the participants (52.3%) had working experiences of 5 years or more. Although 53.8% of the participants had managed COVID-19 patients or had direct contact with them, only 23.1% got COVID-19 infection. More than two-thirds of the HCWs (68.5%) were under stress during working with COVID-19 patients. Maximum participants (37.7%) reported their workplace as a major source for getting information regarding COVID-19 among the others sources (ie, social media, other physicians, newspaper, television, and friends/family).

3.2 | Participants' knowledge

Responses of the participants to COVID-19 knowledge related questions are shown in Figure 1. The majority of the participants (91.8%) were aware of COVID-19 as a viral disease. However, nearly half of

TABLE 2 Relations of socio-demographic characteristics with knowledge score, attitude score, and practice score

Variables	Knowledge score		Attitude score		Practice score	
	Mean ± SD	P value	Mean ± SD	P value	Mean ± SD	P value
Sex						
Male	10.19 ± 1.69	.445	9.90 ± 1.45	.068	24.08 ± 6.92	.437
Female	10.29 ± 1.66		10.10 ± 1.21		23.64 ± 6.78	
Age groups						
<25 y	10.24 ± 1.58	.984	9.88 ± 1.41	.01	24.27 ± 6.22	.257
25-34 y	10.24 ± 1.62		9.90 ± 1.35		23.16 ± 7.06	
35-44 y	10.31 ± 1.78		10.32 ± 1.22		23.96 ± 6.80	
>44 y	10.26 ± 1.77		10.17 ± 1.06		24.65 ± 7.16	
Profession						
Nurse	10.18 ± 1.66	<.001	10.1 ± 1.24	.365	23.4 ± 6.67	.003
Physician	11.10 ± 1.24		9.91 ± 1.3		22.56 ± 6.92	
Others (radiologists, pathologists)	9.93 ± 1.74		9.97 ± 1.42		25.05 ± 6.85	
Education						
Diploma	10.06 ± 1.66	<.001	10.11 ± 1.29	.004	24.15 ± 6.74	.126
Graduate (bachelor)	10.68 ± 1.59		9.69 ± 1.35		22.78 ± 6.76	
Post-graduate (masters)	10.82 ± 1.71		10.16 ± 1.32		23.68 ± 7.70	
Working sector						
Government hospital	10.57 ± 1.59	<.001	10.13 ± 1.27	0.047	23.81 ± 6.91	.99
Private hospital	9.93 ± 1.69		9.92 ± 1.36		23.81 ± 6.75	
Work place						
Coronavirus isolation unit	11.26 ± 1.43	<.001	10.61 ± 1.2	<.001	27.93 ± 3.96	<.001
CCU	10.45 ± 2.13		10.25 ± 1.37		23.90 ± 9.02	
Other wards (general)	10.10 ± 1.63		9.93 ± 1.31		23.20 ± 6.87	
Work experience						
<5 y	10.23 ± 1.65	.743	9.87 ± 1.34	.025	23.33 ± 6.42	.245
5-10 y	10.21 ± 1.75		10.18 ± 1.34		24.33 ± 7.67	
>10 y	10.34 ± 1.64		10.14 ± 1.22		24.17 ± 6.65	
Contact with COVID-19 patients						
Yes	10.32 ± 1.72	.320	10.11 ± 1.37	.083	26.32 ± 5.16	<.001
No	10.18 ± 1.61		9.92 ± 1.247		20.88 ± 7.36	
Training status						
Trained	10.75 ± 1.54	<.001	10.12 ± 1.44	.332	26.53 ± 5.421	<.001
Untrained	10.11 ± 1.68		9.99 ± 1.28		23.04 ± 6.99	

the participants had wrong ideas over Influenza and COVID-19. Only 28.2% of the partakers believed blood transfusion could cause COVID-19, and 15.1% believed arthropods could transmit COVID-19. Almost all the participants correctly identified the elderly age group (97.9%), people with chronic disease (94.8%), and people in a crowded area (97.4%) as a high-risk group for COVID-19. Nearly, all the participants (99.2%) had proper knowledge about isolating COVID-19 patients. However, 38.8% of the respondents believed antibiotics could cure COVID-19. Only 43% of the partakers (270 out of 614) could correctly tell the incubation period of the virus in the human body.

The mean knowledge score of the participants was 10.25 ± 1.673 (ranged from 4 to 13) in this study (Table 2). The knowledge score significantly differed within the profession, education, working sector, workplace, and training status of the participants (Table 2). Both males and females had similar knowledge scores that is, 10.19 ± 1.69 and 10.29 ± 1.66 , respectively ($P = .445$). Trained participants had higher knowledge scores regarding COVID-19 than the untrained participants ($P < .001$). Physicians had higher mean knowledge scores than nurses and others, that is, radiologists and pathologists ($P < .001$). The mean knowledge score of the partakers with a post-graduate degree was higher ($P < .001$) than a partaker with a graduate or diploma degree.

TABLE 3 Differences in KAP categories of HCWs by demographics

Variables	Knowledge ^a			Attitude ^b			Practice ^c		
	Not better N (%)	Better N (%)	P value	Not better N (%)	Better N (%)	P value	Not better N (%)	Better N (%)	P value
Sex									
Male	73 (30.5)	166 (69.5)	.089	80 (33.5)	159 (66.5)	.117	89 (37.2)	150 (62.8)	.804
Female	110 (29.4)	264 (70.6)		103 (27.5)	271 (72.5)		143 (38.2)	231 (61.8)	
Age group									
<25 y	38 (27.0)	103 (73.0)	1.329	45 (31.9)	96 (68.1)	.6755	53 (37.6)	88 (62.4)	1.1
25-34 y	84 (31.9)	179 (68.1)		89 (33.8)	174 (66.2)		106 (40.3)	157 (59.7)	
35-44 years	41 (30.1)	95 (69.9)		30 (22.1)	106 (77.9)		49 (36.0)	87 (64.0)	
>44 y	18 (27.3)	48 (72.7)		17 (25.8)	49 (74.2)		23 (34.8)	43 (65.2)	
Education									
Diploma	145 (33.4)	289 (66.6)	9.042	115 (26.5)	319 (73.5)	.011	152 (35.0)	282 (65.0)	.067
Graduate (bachelor)	28 (20.7)	107 (79.3)		54 (40.0)	81 (60.0)		62 (45.9)	73 (54.1)	
Post-graduate (masters)	10 (22.7)	34 (77.3)		14 (31.8)	30 (68.2)		18 (40.9)	26 (59.1)	
Profession									
Physician	14 (13.5)	90 (86.5)	16.334	39 (37.5)	65 (62.5)	.164	54 (51.9)	50 (48.1)	<.01
Nurse	98 (32.3)	205 (67.7)		84 (27.7)	219 (72.3)		117 (38.6)	186 (61.4)	
Others (pathologists, radiologists)	71 (34.5)	135 (65.5)		60 (29.1)	146 (70.9)		61 (29.6)	145 (70.4)	
Working experience									
<5 y	87 (29.8)	205 (70.2)	0.709	100 (34.2)	192 (65.8)	.514	120 (41.1)	172 (58.9)	.065
5-10 y	51 (32.1)	108 (67.9)		41 (25.8)	118 (74.2)		48 (30.2)	111 (69.8)	
>10 y	45 (27.8)	117 (72.2)		42 (25.9)	120 (74.1)		64 (39.5)	98 (60.5)	
Working sector									
Government hospital	79 (25.7)	228 (74.3)	4.986	86 (28.0)	221 (72.0)	.0994	109 (35.5)	198 (64.5)	.231
Private hospital	104 (34.0)	202 (66.0)		97 (31.7)	209 (68.3)		123 (40.2)	183 (59.8)	
Workplace									
Coronavirus isolation unit	8 (10.5)	68 (89.5)	16.046	16 (21.1)	60 (78.9)	.3578	6 (7.9)	70 (92.1)	<.01
CCU	5 (25.0)	15 (75.0)		5 (25)	15 (75)		9 (45.0)	11 (55.0)	
Other wards (general)	170 (32.9)	347 (67.1)		162 (31.3)	355 (68.7)		217 (42.0)	300 (58.0)	
Training status									
Trained	29 (21.5)	106 (78.5)	5.794	39 (28.9)	96 (71.1)	.0077	27 (20.0)	108 (80.0)	<.01
Untrained	154 (32.2)	324 (67.8)		144 (30.1)	334 (69.9)		205 (42.9)	273 (57.1)	

TABLE 3 (Continued)

Variables	Knowledge ^a			Attitude ^b			Practice ^c		
	Not better N (%)	Better N (%)	P value	Not better N (%)	Better N (%)	P value	Not better N (%)	Better N (%)	P value
Managed COVID-19 patients									
Yes	105 (31.8)	225 (68.2)	.251	99 (30.0)	231 (70.0)	.932	73 (22.1)	257 (77.9)	<.01
No	78 (27.6)	205 (72.4)	1.318	84 (29.7)	199 (70.3)	0.007	159 (56.2)	124 (43.8)	75.145
Stress									
Yes	134 (31.9)	286 (68.1)	.102	123 (29.3)	297 (70.7)	.651	158 (37.6)	262 (62.4)	.684
No	49 (25.4)	144 (74.6)	2.681	60 (31.1)	133 (68.9)	0.205	74 (38.3)	119 (61.7)	0.029

Abbreviations: CCU, critical control unit; COVID, coronavirus disease; HCW, healthcare workers; KAP, Knowledge, attitude, and practice.

^aKnowledge score ranged from 4 to 13, ≥ 10 is considered having better knowledge.

^bAttitude score ranged from 4 to 12, ≥ 10 is considered having better attitude.

^cPractice score ranged from 6 to 36, ≥ 23 is considered having better practice.

Participants working in the coronavirus isolation unit (11.26 ± 1.43) and government hospital (10.57 ± 1.59) had the highest knowledge scores in the respective category (Table 2). Moreover, Table 3 showed significant association in the level of knowledge with education ($\chi^2 = 9.042$; $P = .011$), profession ($\chi^2 = 16.334$; $P < .001$), training status ($\chi^2 = 5.794$; $P = .016$), working sector ($\chi^2 = 4.986$; $P = .026$), and work-place ($\chi^2 = 16.046$, $P < .001$) (Table 3).

3.3 | Participants' attitude

Figure 2 represents the responses of the participants on attitude questions regarding preventing and fighting COVID-19. Almost 86.6% of participants had properly identified COVID-19 as a severe disease. About 93.6% of partakers believed appropriate measures could prevent COVID-19. However, many of them (56.7%) somehow believed a decrease in COVID-19 cases in the upcoming summer. About 70% had a positive attitude of controlling COVID-19 with the help provided by the Bangladesh government. Surprisingly, about 21.6% of participants were willing to carry out duty even if they had signs and symptoms of COVID-19. The majority of the participants (92%) agreed that HCWs need special treatments/facilities in combating COVID-19. About 20% of partakers had a negative attitude of using single-use gloves for always. Almost all the participants showed positive attitudes of preventing COVID-19 transmission by regular washing hands with sanitizers and soaps (96.7%), by wearing face masks regularly (94.4%), and by promptly isolating COVID-19 patients (96.7%).

The mean attitude score of the participants was 10.02 ± 1.319 (ranged from 4 to 12) (Table 2). Likewise the knowledge score, mean attitude score significantly differed within different age groups, education levels, working sectors, work-place, and work experience categories. However, trained partakers had better attitude scores than untrained, although this comparison is not statistically significant. Higher attitude score was found for the HCWs working in a government hospital (10.13 ± 1.27) and coronavirus isolation unit (10.61 ± 1.2). Besides, HCWs with a diploma degree had better attitude toward COVID-19 than HCWs with a graduation or post-graduation degrees (73.5% vs 60.0% and 68.2%, respectively; $\chi^2 = 9.052$; $P = .011$) (Table 3).

3.4 | Participants' preventive practices

Participants' responses to practice questions are shown in Figure 3. Maximum HCWs practiced hand hygiene after handling a patient (90.3%) and encouraged patients to wash their hands regularly (91.6%). Although most of the HCWs were concerned about carrying infections to their households, about 18% of the HCWs had never used personal protective equipments (PPE). Moreover, only 30.1% of the HCWs reported always wearing N-95 masks during patient contact. It was unexpected that 17.2% always had to use one facemask more than once, and nearly half of the partakers (45.3%) did so occasionally. However, about 72.7% HCWs correctly discarded their PPEs, and about 89.8% HCWs completed 14 days of quarantine after working in each shift.

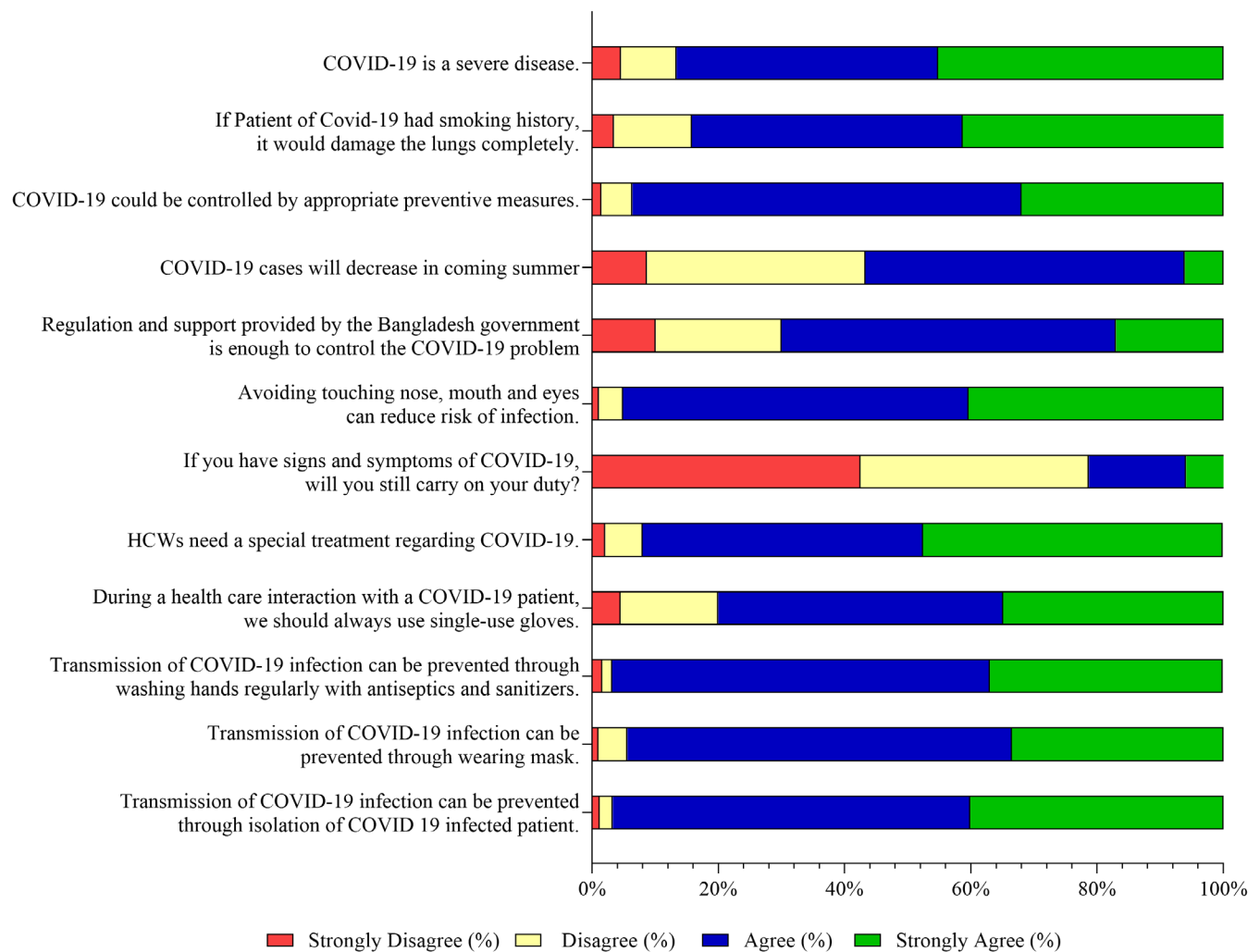


FIGURE 2 Responses to attitude questions

The mean practice score of the participants was 23.81 ± 6.83 (ranged from 6 to 36). A total of 381 HCWs (62.2%) had better preventive practices. The practice scores differed significantly among the different professions ($P = .003$), workplace ($P < .001$), and training status ($P < .001$) categories. Trained HCWs had significantly higher practice scores (26.53 ± 5.421) than untrained HCWs (23.04 ± 6.99). Interestingly, radiologists and pathologists had significantly higher practice scores (25.05 ± 6.85) than physicians (22.56 ± 6.92) and nurses (23.4 ± 6.67). HCWs, who managed or had contact with COVID-19 patient, scored higher (26.32 ± 5.16) than those who had no contact (20.88 ± 7.36). Furthermore, the practice level had a significant association with several socio-demographic factors such as profession ($\chi^2 = 14.775$; $P = .001$), workplace ($\chi^2 = 36.162$, $P < .001$), and training status ($\chi^2 = 23.442$, $P < .001$) (Table 3).

3.5 | Predictors of better practice

The Spearman rank correlation analyses revealed a positive correlation ($P < .01$) between knowledge, attitude, and practice scores

(Table S1). However, none of the pairs had a strong positive correlation. On the other hand, there was no significant association between the practice level with the knowledge level ($\chi^2 = 0.249$; $P = .618$). But the attitude level was significantly associated with the practice level of HCWs ($\chi^2 = 10.423$; $P = .001$). So, only attitude level was considered in predictor analyses for measuring better practices. Binary logistic regression analysis was done with independent variables (profession, education, workplace, managed COVID-19 patients, training status, and attitude level), which had significant association with practice level in Chi-square tests. ORs of having a better practice are presented in Table 4. Based on the logistic regression model, radiologists/pathologists were four and a half times higher to have better practice than the physicians (OR: 4.54; 95% CI: 2.22-9.29). HCWs working in general wards were 77% less likely to have better practice than HCWs working in Coronavirus Isolation wards (OR: 0.23; 95% CI: 0.09-0.571). Similarly, the odds of having better practice among the HCWs who had contacted/managed COVID-19 patients were 4.69 times more than the counterpart (OR: 4.69; 95% CI: 3.11-7.08). Trained HCWs had almost twice the better practice than the untrained HCWs (OR: 1.72; 95% CI: 1.01-2.94). Similarly, the odds of

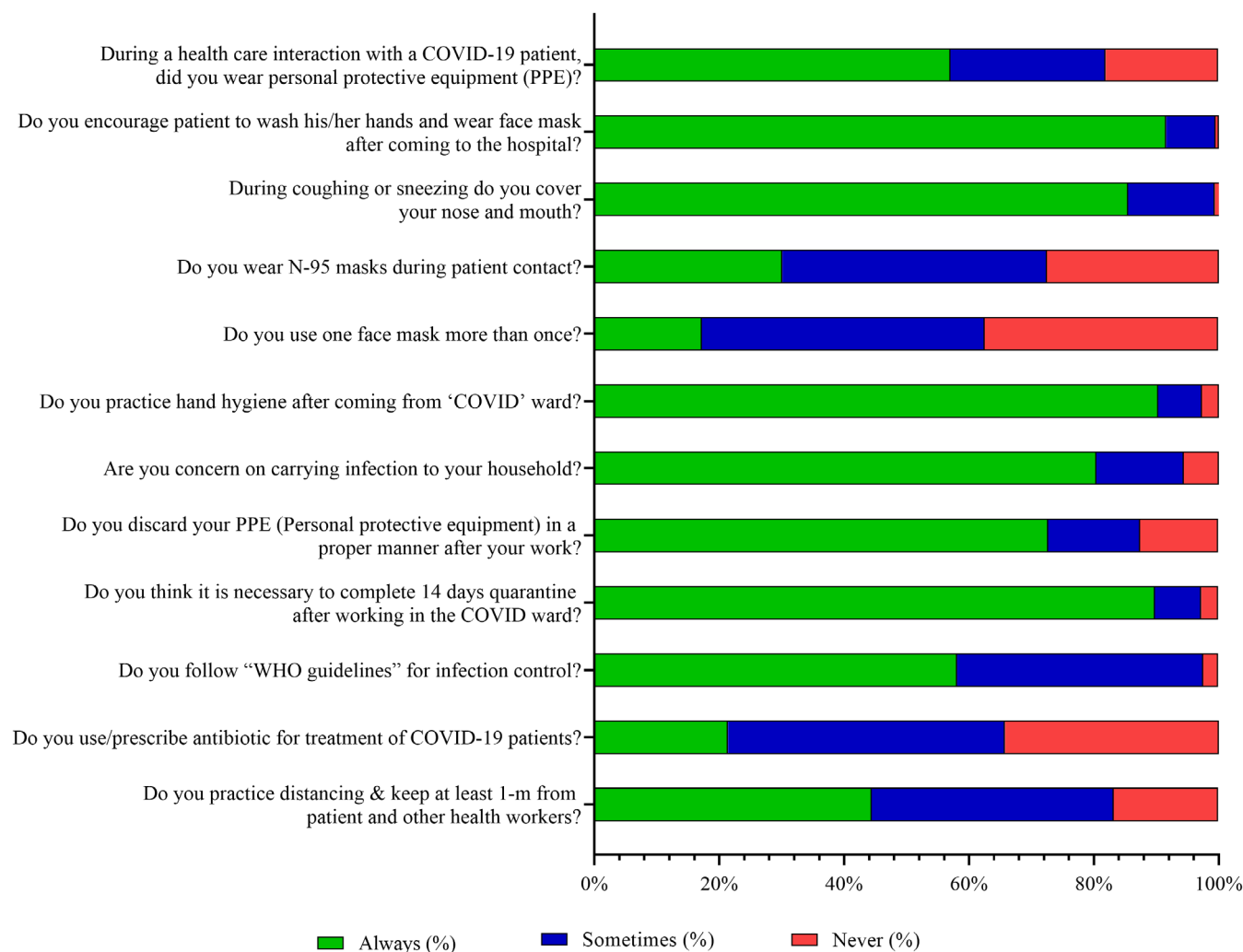


FIGURE 3 Responses to practice questions

having better practice were two times higher for the HCWs with a better attitude than the counterpart (OR: 1.90; 95% CI: 1.27-2.84) (Table 4).

4 | DISCUSSION

The current work portrays the preventive practices of the healthcare workers (HCWs) toward COVID-19 in the Bangladeshi context. Being only the second study approached on the topic linked to the occupational section during the pandemic in Bangladesh,²³ the findings reveal a notable number of factors. In addition, the identified causes may affect the performance of the HCWs and should provide more scopes when managing COVID-19 affected patients.

In this study, maximum partakers had better knowledge of COVID-19, which is similar to a previously published work by Asemahagn.²⁷ However, the current finding (ie, 70%) is not up to the mark compared to Saqlain et al,¹⁵ Wahed et al,²⁶ and Clements,²⁸ who reported 93.2%, 80.4%, and 80% of the HCWs possessing good knowledge,

respectively. Misconceptions such as "COVID-19 and influenza virus are the same type of virus," "blood transfusion can cause COVID-19," and "antibiotics can cure COVID-19" might have negatively contributed to the overall knowledge scores to some extent. Moreover, the information sourcing by the HCWs was not convincing: although a good portion of the HCWs were able to gather knowledge about COVID-19 from their workplaces, a number of them obtained information from less authentic sources like social media and television. Regarding the professional categories, physicians had maximum knowledge scores as expected compared to others and, this observation is in accord with other studies published in recent times.^{24,26}

Concerning the attitude scores of the HCWs, the scores improved with the increase of age, which was in parallel to the works by Limbu, Piryani, and Sunny.²⁹ Furthermore, HCWs with higher working experience had shown the highest positive attitude scores than relatively less experienced HCWs. It is to be noted that with age and growing expertise, HCWs gather experiences of working under pressure and emergency situation and, this quality might have improved their attitude toward COVID-19.⁶

TABLE 4 ORs of having better practice regarding COVID-19

Variables	Practice level		
	OR	95% CI	P value
Profession			
Physician	1		
Nurse	1.43	0.69-2.94	.336
Others (radiologists, pathologists)	4.54	2.22-9.29	<.001
Education			
Post-graduate (masters)	0.92	0.44-1.96	.836
Graduate (bachelor)	1.23	0.65-2.33	.529
Diploma	1		
Work place			
Coronavirus isolation unit	1		
CCU	0.25	0.07-0.928	.038
Other wards (general)	0.23	0.09-0.571	.002
Managed/contacted with COVID-19 patients			
Yes	4.69	3.11-7.08	<.001
No	1		
Training status			
Trained	1.72	1.01-2.94	.046
Untrained	1		
Attitude level			
Better attitude	1.90	1.27-2.84	.002
Not better attitude	1		

Note: Reference categories: 1 and better or more appropriate. HCWs scoring ≥ 23.0 was considered having better practice. Abbreviation: OR, odds ratio.

Although the ratio of the participants for better knowledge level and appropriate attitude was nearly alike, surprisingly, a lesser portion of them had better practice as for COVID-19. Besides, it is alarming that the portion of the HCWs (ie, 62.2%) having better preventive practices was much lower than the numbers previously described by M. Zhang et al³⁰ and Saqlain et al¹⁵ (ie, 89.7% and 88.7%, respectively). Several malpractices such as “using face mask more than once,” “not wearing N-95 masks during patient contact,” and “not regularly wearing PPE during patient contact” might have attributed to these poor proportions. HCWs who managed/contacted a COVID-19 affected patient had higher practice scores than those who did not. Although pathologists/radiologists had lower knowledge scores than physicians, they had higher practice scores. They had a lower chance of direct contact with COVID-19 patients compared to physicians or nurses that might have given them scopes for better practices.

This investigation did not find a significant association between knowledge and practice scores. Limbu et al²⁹ also reported the similar (ie, HCWs with higher knowledge scores having poor practice scores). Unavailability of the essential protective equipment (ie, face masks, N-95 masks, and PPE) might have resulted in such poor practice

scores. However, this study found a significant association between a positive attitude and better practice. HCWs with a better attitude were twice more likely to have better practices. A similar association was also reported by Limbu et al.²⁹ It was possibly the HCWs' positive attitudes that lead them to better practice even when some of them did not have enough textbook knowledge.

Working in coronavirus isolation units contributed to better knowledge, a more appropriate attitude, and better preventive practice. This was probably due to the fact that they might have had to learn about safety procedures and perform better practices for their own safety or occupational necessity. Moreover, this study found a significant correlation between the pairs of knowledge, attitude, and practice scores that were weakly positive. Similar correlations were also described by Saqlain et al.¹⁵ Although, 70% HCWs believed that the regulation and support provided by the government were enough to restrain COVID-19, it was necessary to arrange more offline trainings. As the odds of having better practice in trained HCWs was two-fold and for the HCWs working in coronavirus isolation units was 4.69, proper training in the COVID-19 isolation unit will enhance their future prevention practices. Such improvements in practice level were reported likewise in the previous studies.^{11,27,31} Overall, this investigation identified a few barriers, such as the unavailability of PPE and facemask, unable to maintain 1-m, distance etc., which need to be considered by authorities. Although being in a stressful situation did not significantly affect the practices of HCWs, systems should be installed to reduce their stress and workload.

The current study was cross-sectional in nature, and did not apprise other important predictors of preventive behaviors,³² restricting the generalizability of the findings. Although all the district hospitals were covered in the selected region of the country, this study necessarily does not visualize the practice behaviors of the HCWs from the entire Bangladesh. Also, the study was non-representative to the overall country perspective due to small data size and, it did not provide any district-wise mapping as well. Moreover, one-to-one interview process could have generated unwanted personal biases in the sampling process. Nevertheless, this is the first study on various factors determining the preventive practices of HCWs in Bangladesh. So, the finding of this investigation would solve initial queries and thus allow government and authorities to set their priorities.

5 | CONCLUSION

In this investigation, the majority of the Bangladeshi HCWs had better knowledge and better attitudes toward COVID-19. Besides, higher age and working experience were associated to better attitudes. However, the prevention practice level was not satisfactory compared to other studies. Training, exposure to COVID-19 patients, and better attitude are regarded as significant influencing factors of HCWs' practice. Government should address these observations and make policies for preventing the malpractices of the professionals. A proper training program would enable the HCWs to fight better in preventing

COVID-19. Providing updated information through authentic sources is also recommended.

CONFLICT OF INTEREST

The authors declare that they have no potential conflicts of interest.

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Najmuj Sakib and Md. Tanvir Islam had full access to all the data in this study and take complete responsibility for the integrity of the data and the accuracy of the data analysis.

TRANSPARENCY STATEMENT

The lead author affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon request.

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

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