


BMJ Open Compliance of healthcare workers with the infection prevention and control guidance in tertiary care hospitals: quantitative findings from an explanatory sequential mixed-methods study in Bangladesh

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ABSTRACT

Objectives To assess healthcare workers' (HCWs) compliance with the infection prevention and control (IPC) practices and identify the factors influencing this compliance using the Health Belief Model as the theoretical framework.

Design Quantitative data from an explanatory sequential mixed-methods study were employed in this research.

Participants and settings From 17 May to 30 August 2020, 604 physicians and nurses working at six randomly selected tertiary care facilities in Dhaka City in Bangladesh took part in this study.

Primary and secondary outcome measures Compliance with the WHO's guidance on IPC measures, as well as the associated factors, was the primary outcome.

Results A mean compliance score of 0.49 (± 0.25) was observed on a 0–1 scale. HCWs were most compliant with the medical mask wearing guidelines (81%) and were least compliant with the high-touch surface decontamination regulations (23%). Compliance with the IPC guidance was significantly associated with increasing age, female sex, working as a nurse, having non-communicable diseases and history of exposure to patients with COVID-19. Perceived benefits ($B=0.039$, 95% CI 0.001 to 0.076), self-efficacy ($B=0.101$, 95% CI 0.060 to 0.142) and cues to action ($B=0.045$, 95% CI 0.002 to 0.088) were positively associated with compliance. Compliance with IPC guidance was 0.061 times greater among participants who reported low perceived barriers compared with those with high perceived barriers.

Conclusion Overall, compliance with IPC guidance among HCWs was unsatisfactory. As self-efficacy exerted the greatest contribution to compliance, it should be emphasised in any endeavour to improve HCWs' IPC adherence. Such interventions should also focus on perceived barriers, including unreliability of the information sources, unsafe working places and unavailability of protective equipment and cues to action, including trust in the administration and availability of adequate IPC guidance.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ The Health Belief Model, a well-established psychosocial theory, was employed to investigate factors influencing healthcare providers' infection prevention and control behaviours.
- ⇒ Participants' compliance with the infection prevention and control guidelines was assessed according to the WHO's guidance.
- ⇒ The participating hospitals were chosen at random and their healthcare staff (physicians and nurses) were invited to participate.
- ⇒ The cross-sectional nature of the study precludes any causative inferences between compliance and the studied factors.
- ⇒ The self-reported nature of infection prevention and control behaviour might have influenced the results due to potential recall bias, social desirability bias, etc, given that strategies typically adopted to eliminate these biases (such as observation) were not practical during the pandemic.

INTRODUCTION

Healthcare workers (HCWs), especially physicians and nurses, are the mainstay of a country's healthcare system. Failure to protect them from being exposed to infection while caring for their patients negatively impacts overall patient management while endangering their health. Since the beginning of the coronavirus (COVID-19) pandemic, a substantial proportion of HCWs have been infected in several countries,^{1 2} despite an interim guidance on the infection prevention and control (IPC) strategies issued by the WHO in March 2020.³ In addition, several studies have demonstrated the effectiveness of appropriate use of personal protective

equipment (PPE) in preventing infection while serving patients.^{4,5} Hence, HCWs' compliance with IPC guidance needs to be ensured for safeguarding a functional health system by reducing the infection rates among the front-line staff.

Compliance, defined as the degree to which a person adheres to instructions, is essential to infection control but has been found to be suboptimal among HCWs in the pre-pandemic era.⁶ Even after the onset of the pandemic, HCWs' IPC behaviour has been found unsatisfactory in several countries.^{7,8} Various factors contributing to HCWs' low adherence to IPC practices have been identified, including an insufficient supply of protective resources, inadequate guidelines on how to use them, increased workload, fatigue, etc.^{9,10} To improve HCWs' adherence to IPC practices, theory-based analysis of human behaviour can be employed. Indeed, several authors have applied psychosocial theories to examine HCWs' IPC behaviour in the pre-pandemic era.^{11,12} However, there is still a scarcity of comprehensive theory-based studies on HCWs' IPC behaviour during the ongoing COVID-19 pandemic.

Since the declaration of the first COVID-19 case in Bangladesh on 8 March 2020, Dhaka, the capital city, has remained the most severely affected area. During this study period, community transmission has been reported in the country, and Dhaka and its surrounding districts were declared as the hotspots on the spatiotemporal distribution of COVID-19.¹³ Bangladeshi doctors had the highest mortality rate at the time.¹⁴ Although most of the COVID-19 cases were managed in public hospitals in Dhaka, little is known about the IPC practices of HCWs who worked there. This gap in extant knowledge has motivated the present study, as a part of which HCWs' compliance with the WHO's IPC guidance was assessed, along with the associated factors. The Health Belief Model (HBM) was adopted for this purpose as it is a widely used theory in research focusing on behavioural changes.¹⁵

METHODS

Study design and study setting

Quantitative data were collected as part of a sequential explanatory mixed-methods study whose methodology had previously been published.¹⁶ The study participants were physicians and nurses working at randomly selected six tertiary-level public hospitals in Dhaka City, Bangladesh's capital, who completed a questionnaire designed for this purpose from 17 May to 30 August 2020.

Participant recruitment and data collection

According to the study protocol, a sample size of 440 participants was sufficient.¹⁶ However, considering the pandemic, we approached all physicians and nurses on the same duty roster during the data collection period. Thus, 810 healthcare providers were given a structured self-administered questionnaire, along with informed written consent forms. As 202 HCWs did not return their questionnaires and 4 HCWs returned incomplete

questionnaires, only 604 were included in further analyses. Due to the restrictions imposed by the COVID-19 pandemic, we could not return to the participants who did not submit their questionnaires or left them incomplete.

Study variables

Dependent variable

The WHO proposed an interim IPC guidance on 'Infection prevention and control during health care when COVID-19 is suspected' for HCWs, including using PPE such as gloves, masks, eye protection, disposable gowns, etc, maintaining hand hygiene, sterilising patient care equipment and linen, and early recognition and immediate placement of patients with COVID-19 into quarantine.³ In this study, we considered 12 IPC practices to assess compliance with the IPC guidance. Thus, four survey questions were related to the use of PPE, two were related to donning and doffing of PPE, two were related to disinfecting frequently used surfaces and patient care equipment, and four questions focused on maintaining hand hygiene before and after direct contact with patients, before performing any aseptic procedure, after exposure to the patient's body fluid and after exposure to the patient's surroundings, respectively.

In addition to these questions, respondents were asked to report whether they had performed any aerosol-generating procedure within the past month. Those who responded affirmatively were asked to complete additional items enquiring about using N95 or equivalent respirator and waterproof gown during the procedure, as recommended by the WHO. The respondents were further asked to report the frequency of all aforementioned IPC practices in the past month by selecting the appropriate response on a four-category frequency scale: rarely (<20%), sometimes (20%–50%), most of the time (50%–95%) and always (>95%).

Participants who reported performing a certain IPC practice in >95% of cases were considered compliant with that practice and were assigned a score of 1, and 0 otherwise. Finally, a total compliance score for all the IPC practices was calculated using the following equation¹⁰:

IPC compliance score = number of IPC practice marked as compliant / total number of reported practices.

Therefore, the derived compliance scores ranged from 0 to 1, with higher values indicating better compliance.

Independent variables

Socioenvironmental variables

Data on participants' age, sex, profession (nurse or physician), history of non-communicable diseases (NCDs), exposure to confirmed patients with COVID-19 or their belongings, shifting from usual living place, and attending training or seminar on COVID-19 were recorded. Participants were asked to report any clinically diagnosed NCDs, such as diabetes, cardiovascular diseases, asthma, chronic obstructive pulmonary diseases, hypertension, chronic kidney diseases, etc. They were also asked about their living place before and during the COVID-19 pandemic

to determine if their work obligations necessitated temporarily moving to another address.

HBM constructs

Six HBM constructs (perceived benefits, perceived barriers, perceived susceptibility, perceived severity, self-efficacy and cues to action) were explored in this study¹⁷ and were rated by the participants on a 5-point Likert-type scale. As several statements were provided for each construct, participants' total scores for each construct were compared with the median value and were dichotomised into low and high categories.¹⁸

Perceived benefits were assessed through seven questions probing into the effectiveness of using PPE and maintaining hand hygiene in preventing COVID-19 infection. The perceived barriers were also assessed via seven questions related to PPE availability, workplace safety and reliability of the common sources of information about COVID-19. Higher scores indicated greater perceived barriers.

Perceived susceptibility was assessed by asking participants to rate the likelihood of COVID-19 infection during the study period for themselves, their family members and the general population. Perceived severity was measured via eight questions regarding the nature of COVID-19, its effects on health and personal life, long-term consequences, etc. The perceived risk was subsequently calculated by multiplying each participant's total scores for perceived susceptibility and perceived severity.

We also probed into participants' perceptions on the following issues in the realms of cues to action: their trust in hospital administration, health system and policymakers to do the right things to protect them from COVID-19; their willingness to take personal risks to provide healthcare during this period; and their perception on available guidelines as sufficient in protecting them from COVID-19. When assessing participants' perceived self-efficacy, focus was given to their belief in their ability to perform the IPC practices and their resilience in preventing SARS-CoV-2 infection. A summary of HBM constructs and their internal consistency reliability is shown in [table 1](#).

Statistical analyses

Descriptive analysis was performed on participants' socio-environmental characteristics. For continuous variables (including age, number of reported NCDs and number of attended training or seminar sessions), the mean (SD) was calculated. A hierarchical multiple regression model was constructed to assess the ability of socioenvironmental variables and HBM constructs to predict variance in HCWs' compliance with IPC guidance. Bivariate correlation among the independent variables did not exceed 0.7. Using a cut-off point for tolerance value of less than 0.10 or a variance inflation factor value of above 10, we did not find any evidence of multicollinearity. Normal P-P plot of regression standardised residuals of the dependent variable was acceptable, indicating that the model inferences should be valid. Socioenvironmental variables were entered in step 1 and HBM constructs in step 2. The resulting associations were reported using both unstandardised regression coefficients (B) and standardised coefficients (beta). All statistical analyses were performed using Statistical Package for Social Sciences (SPSS) V.23 and $p < 0.05$ was considered statistically significant.

Informed written consent to participate in this study was obtained from every respondent before commencing the data collection.

Patient and public involvement

We involved one volunteer HCW from each selected healthcare facility in planning and conducting data collection from the participants. Besides, both physicians and nurses were involved in the pretesting of the data collection tool for this study. No patients were involved in this study.

RESULTS

Almost 57% of the participants were female and around 84% reported having at least one NCD ([table 2](#)). Better compliance was found among women, nurses, those with history of exposure to patients with COVID-19 and those who had a shift from their usual living place due to

Table 1 Items, score range and internal consistency of HBM constructs

	Items	Alpha coefficient	Total score range	Classification	
				Low	High
Perceived benefits	7	0.875	7–35	7–28	29–35
Perceived barriers	7	0.728	7–35	7–19	20–35
Perceived susceptibility	4	0.535	4–20		
Perceived severity	8	0.722	8–40		
Perceived risk*	12	0.741	32–800	32–527	528–800
Self-efficacy	5	0.666	5–25	5–16	17–25
Cues to action	7	0.811	7–35	7–24	25–35

*Perceived risk was calculated by multiplying perceived severity and perceived susceptibility scores.
HBM, Health Belief Model.

Table 2 Characteristics of participants with their compliance score (N=604)

	Categories	Frequency (%)	Compliance score	
			Mean (SD)	P value
Socioenvironmental variables				
Age	Mean (\pm SD)	35.32 (7.53)		
Sex				<0.001
	Female	342 (56.6)	0.54 (0.26)	
	Male	262 (43.4)	0.43 (0.23)	
Profession				<0.001
	Nurse	355 (58.8)	0.58 (0.26)	
	Physician	249 (41.2)	0.43 (0.24)	
Presence of at least one NCD				0.50
	Yes	508 (84.1)	0.50 (0.25)	
	No	96 (15.9)	0.49 (0.26)	
Number of NCDs	Mean (\pm SD)	0.43 (0.66)		
Exposure to COVID-19				<0.001
	Yes	294 (48.7)	0.54 (0.26)	
	No	310 (51.3)	0.45 (0.24)	
Shift from usual living place				<0.001
	Yes	177 (29.3)	0.55 (0.29)	
	No	427 (70.7)	0.47 (0.24)	
Attending COVID-19-related training/seminar				0.02
	Yes	292 (48.3)	0.47 (0.24)	
	No	312 (51.7)	0.52 (0.27)	
Number of training/seminars attended	Mean (\pm SD)	0.95 (1.39)		
HBM constructs				
Perceived benefits				0.002
	Low	263 (43.5)	0.46 (0.25)	
	High	341 (56.5)	0.52 (0.26)	
Perceived barriers				<0.001
	Low	333 (55.1)	0.56 (0.26)	
	High	271 (44.9)	0.41 (0.22)	
Perceived risks				<0.001
	Low	314 (52.0)	0.53 (0.26)	
	High	290 (48.0)	0.46 (0.24)	
Self-efficacy				<0.001
	Low	236 (39.1)	0.39 (0.23)	
	High	368 (60.9)	0.56 (0.25)	
Cues to action				<0.001
	Low	306 (50.7)	0.42 (0.24)	
	High	298 (49.3)	0.57 (0.25)	

HBM, Health Belief Model; NCDs, non-communicable diseases.

COVID-19. Individuals who scored high on the perceived benefits, perceived risks, cues to action and self-efficacy and low on perceived barriers scales were significantly better at compliance.

About 43% of the respondents reported wearing gloves more than 95% of the time when working with patients, while compliance with using medical masks was found in 81% of the sample. Almost 30% of the respondents were

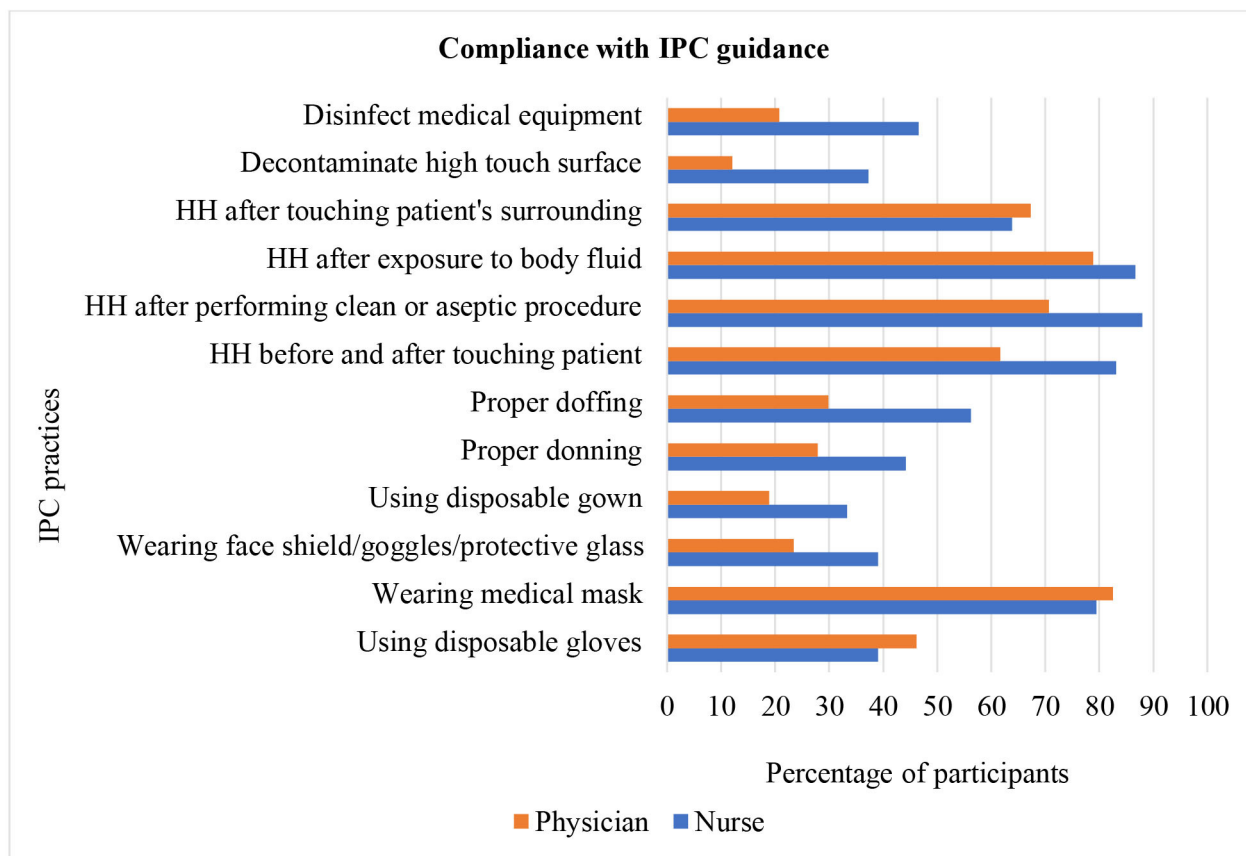


Figure 1 Percentage of participating healthcare providers compliant with IPC guidance. HH, hand hygiene; IPC, infection prevention and control.

found to be compliant with wearing face shields, goggles or protective glasses. However, there was a substantial difference in the IPC practice adherence between nurses and physicians. Physicians were more compliant with the guidelines for wearing masks and gloves and maintaining hand hygiene after touching patients' surroundings. Conversely, nurses were found to be more compliant than physicians with the remaining IPC practices (figure 1).

In the hierarchical regression analysis, after entering socioenvironmental variables at step 1, the model explained about 16% of the variance in HCWs' compliance with IPC guidance. After the inclusion of HBM constructs in step 2, the total variance explained by the model was 25.4% ($F(12, 591)=16.76, p<0.001$).

Compliance with IPC guidance was found to be significantly associated with age, sex, profession, number of NCDs and COVID-19 exposure (table 3). As age increased, HCWs became more compliant with IPC guidance ($B=0.005, 95\% \text{ CI } 0.002 \text{ to } 0.008$). Female HCWs and nurses were found to be significantly more compliant with IPC guidance. Furthermore, those who reported direct contact with patients with COVID-19 or their belongings showed significantly better compliance ($B=0.070, 95\% \text{ CI } 0.030 \text{ to } 0.110$). Participants' chronic disease status was also found to be positively associated with compliance.

Compliance with IPC guidance was found to be greater among those who scored higher on the perceived benefits

($B=0.039, 95\% \text{ CI } 0.001 \text{ to } 0.076$), self-efficacy ($B=0.101, 95\% \text{ CI } 0.060 \text{ to } 0.142$) and cues to action ($B=0.045, 95\% \text{ CI } 0.002 \text{ to } 0.088$) scales, while high perceived barriers were associated with significantly less compliance with IPC guidance.

DISCUSSION

HCWs' IPC behaviour has been a subject of extensive research over the last decades with the aim of developing effective intervention programmes for improving compliance. This study portrays a comprehensive picture of healthcare professionals' compliance with the WHO-recommended IPC guidance, while also highlighting some socioenvironmental and cognitive factors that influence their compliance.

Although the study participants' overall compliance with IPC guidance was unsatisfactory, hand hygiene practices among HCWs were much better than in the pre-pandemic period, as previously highlighted in a nationwide study.¹⁹ Similarly, Lai and colleagues¹⁰ found improved although unsatisfactory IPC behaviour among Chinese HCWs after the COVID-19 outbreak, which indicates that this pandemic has had a positive impact on IPC compliance among health professionals.

We found older HCWs to be more compliant with IPC guidance than their younger colleagues, likely because

Table 3 Predictors of compliance with IPC guidance among healthcare workers (N=604)

	Regression coefficient†			β	P value
	B	95% CI of B			
		Lower	Upper		
Socioenvironmental					
Age	0.005	0.002	0.008	0.142	<0.001*
Sex					
Female (reference)					
Male	-0.050	-0.099	-0.001	-0.098	0.04*
Profession					
Nurse (reference)					
Physician	-0.077	-0.130	-0.024	-0.148	0.005*
Shifting from usual living place					
No (reference)					
Yes	0.030	-0.014	0.074	0.053	0.18
Number of NCDs	0.029	0.001	0.058	0.075	0.04*
Exposure to COVID-19					
No (reference)					
Yes	0.070	0.030	0.110	0.137	0.001*
Training/seminar attended	0.003	-0.035	0.042	0.006	0.87
HBM constructs					
Perceived benefits					
Low (reference)					
High	0.039	0.001	0.076	0.075	0.04*
Perceived barriers					
Low (reference)					
High	-0.061	-0.103	-0.019	-0.119	0.004*
Perceived risk					
Low (reference)					
High	-0.018	-0.057	0.020	-0.036	0.35
Self-efficacy					
Low (reference)					
High	0.101	0.060	0.142	0.193	<0.001*
Cues to action					
Low (reference)					
High	0.045	0.002	0.088	0.088	0.04*

*Significant at $p < 0.05$.

† $R^2 = 25.4\%$, adjusted $R^2 = 24.0\%$, $F(12, 591) = 16.76$, $p < 0.001$, R^2 change = 9.3% , F change (5, 591) = 14.79 , $p < 0.001$.

HBM, Health Belief Model; IPC, infection prevention and control; NCD, non-communicable disease.

older age was identified as one of the main risk factors associated with more severe forms of COVID-19.^{20, 21} This might also be the reason for older HCWs and those having NCDs being more compliant with protective behaviours, and is in line with the available evidence.¹⁰ Besides, Imai and colleagues²² argued that older age correlates with an increased ability to cope with emergencies related to infectious diseases. On the contrary, Aliyu and colleagues²³ found good IPC practices among younger HCWs before

the COVID-19 pandemic in Nigeria, while Mitchell and colleagues²⁴ did not find any relationship with age or sex. We found female HCWs to be more compliant with IPC guidance than their male counterparts. Moreover, nurses were more compliant than physicians. Stein *et al.*²⁵ also reported physicians' lower compliance with infection prevention practices compared with nurses in the UK.

Among the six HBM constructs, in our study, self-efficacy emerged as the strongest predictor of HCWs' compliance

with IPC guidance. We found that self-efficacy (ie, participants' belief in their ability to perform IPC practices and thus protect themselves from being infected with SARS-CoV-2) significantly increased their compliance. Self-efficacy is an established factor for initiating and maintaining any health-promoting behaviour.¹⁷ Perceived self-belief in one's competence has also been shown to act as a facilitator in maintaining social distancing²⁶ and other respiratory infection prevention behaviours, such as wearing masks and practising hand hygiene,^{27 28} in the context of previous infectious disease outbreaks.

These findings also concur with the HBM, as it implies that if an individual perceives a healthful action to be beneficial enough to prevent a certain illness, the likelihood of adopting that action will increase.¹⁷ We found a significant positive association between the perceived benefits of practising IPC measures and IPC compliance. Individuals who perceived using different PPE and maintaining hand hygiene as more effective in preventing COVID-19 infection were more likely to adhere to the IPC guidance.

Individual impediments to the adoption of a desired action are considered perceived barriers. Perceived barriers (including the perceived unavailability of necessary PPE, feeling of insecurity at the workplace and unreliability of common sources of information regarding COVID-19) were addressed in this study. Participants who scored highly on the perceived barriers scale demonstrated less compliance with IPC guidance. A shortage of necessary PPE had been observed globally at the beginning of this pandemic.²⁹ With the disruption of import facilities and supply chains and a delay in establishing domestic production and distribution, Bangladesh initially faced severe PPE shortages. Unavailability of protective equipment coupled with the pre-existing infrastructural inadequacy, overcrowded hospitals and lack of IPC mechanisms made hospitals particularly vulnerable to COVID-19.³⁰ Thus, it is not surprising that majority of HCWs who took part in this study considered their workplace unsafe and this issue was exacerbated by the lack of reliable information sources.

Adequate risk communication with front-line HCWs is the cornerstone of crisis management amid any health emergency. Successful risk communication demands trust, credibility, honesty, transparency and accountability of the information sources.³¹ This study shows that HCWs' perception of reliability of the common sources of information about COVID-19, including local and international news media and the government's health department, was significantly associated with their IPC practices. The perceived unreliability of these sources resulted in reduced compliance with the IPC guidance. A growing body of literature makes it evident that lack of credible sources of information results in inconsistent information, misinterpretation of messages and misunderstanding of the situation, leading to the complete failure of the communication efforts.^{31 32}

In addition to these issues, we found that trust in the administration, policymakers and government in taking appropriate measures amidst this pandemic acted as a cue to action for adopting IPC practices. Glanz and colleagues¹⁷ stated that cues to action are the triggers to instigate a desired behaviour. We found that participants who scored higher on this scale were better at adhering to the IPC measures. It is evident from this study that HCWs' voluntariness and the availability of sufficient preventive guidelines influence their IPC behaviours. A recent qualitative review aimed at identifying the barriers to and facilitators of HCW adherence to IPC guidance similarly demonstrated that constant changes in local and international IPC guidelines during any disease outbreak make HCWs sceptical of their relevance and thus less likely to comply with the recommended practices.⁹ This review further suggested that compliance with the IPC guidance is influenced by the level of support HCWs get from the hospital administration, which is consistent with our findings.

According to the HBM, individuals' subjective perception of an illness's severity and the chance of acquiring this illness influence their level of preventive action. Extant studies on this topic indicate that a higher perceived risk of being infected results in a better engagement in protective behaviours against COVID-19 among the general population in both the USA and Turkey.^{33 34} However, we did not find any statistically significant association between perceived risk and the IPC practice among HCWs. In a recent meta-analysis, Brewer and colleagues³⁵ demonstrated that healthcare providers are less motivated by risk perception to take protective measures as they feel that it is their duty to perform their jobs. An earlier study conducted in China similarly revealed that HCWs considered serving patients as an obligation during COVID-19 pandemic even though this significantly increased their exposure risk.³⁶ The sense of responsibility of HCWs as stated in these two studies, along with the finding of an inverse relationship between the perceived barriers and compliance in the present study, explains our failure to identify an association between perceived risks and IPC compliance.

Perceived risk is considered a significant moderator in shaping health behaviour in most health behaviour theories.¹⁷ Failure to find any relationship between perceived risk and IPC compliance can be explained by two hypotheses. First, Brewer and colleagues³⁵ argued that appropriate wording of risk questionnaires (such as constructing risk questions under certain behavioural conditions) is a prerequisite to exploring the relationship between risk perception and behaviour. For example, if our objective is to test the association of the perceived susceptibility of being infected with COVID-19 and the compliance with preventive measures, we need to recognise participants' perceptions of their likelihood of infection in the absence of any preventive measures. There would be a substantial difference in the risk perception between participants who are already compliant with the

IPC guidelines and those who are not, resulting in lower perceived risk among highly compliant individuals. Thus, failure to differentiate between those who are adopting preventive behaviour from those who are not leads to underestimating the relationship between risk perceptions and behaviour. This argument is applicable to this study, as the questions used to elicit perceived susceptibility were not conditioned on the absence of preventive measures.

Another hypothesis behind an inconsistent relationship between risk perception and behaviour relates to individuals' dual process of assumption as proposed in the fuzzy-trace theory.³⁷ In any decision-making situation, an individual's memory acts through verbatim and gist processing methods. Verbatim processing uses more accurate data to analyse a situation, while gist processing relies on subjective interpretation. Cognitive theories consider human behaviour a subjective measure determined by the value-expectancy trade-off through mental processes like thinking, reasoning, hypothesising or expecting. Generally, most adults rely on the least precise gist representations while making a decision, despite parallel processing of both gist and verbatim representations.³⁷ Thus, a contradictory relationship arises between the risk perception and acting accordingly. Therefore, any intervention on IPC behaviour among HCWs needs to communicate information in more meaningful ways to form an appropriate gist response.

Our study has some limitations. First, its cross-sectional nature prevents the assertion of cause and effect. Therefore, all our conclusions, particularly those related to the relationship between HBM constructs and compliance, are based on inferences. Second, even though knowledge is an established correlate to behaviour, it could not be evaluated in this study as it was conducted during the early phase of COVID-19. At the time, there was much conflicting information about the preventive ways in the country and globally, and any attempt to assess knowledge about COVID-19 among healthcare providers might not have accurately reflected their actual knowledge levels. Third, as COVID-19 is a new-onset disease and HCWs were asked to recall only the last month's behaviour, we expected an ease of recall. However, the self-reported nature of the questionnaire employed to capture their IPC behaviours poses a risk of recall bias, social desirability bias, priming, etc. Fourth, all questionnaire items related to the HBM constructs were rated on a Likert-type scale and participants' responses were later converted into categories, which might have affected the analysis.

CONCLUSIONS

This study reveals that compliance with IPC guidance among HCWs who are working in tertiary-level public hospitals of Bangladesh amidst the COVID-19 pandemic, while improved, is still unsatisfactory. HCWs' self-efficacy to perform preventive behaviours was the strongest predictor of their compliance with IPC guidelines. Our

findings also revealed that, while unreliability of the information sources about COVID-19 along with the unavailability of PPE lessened their IPC compliance, trust in administration and government emerged as a facilitator to improve compliance. Apart from these cognitive factors, better compliance is also associated with increasing age, female sex, nurses, having NCDs and having exposure to confirmed patients with COVID-19. These findings are expected to facilitate future endeavours to develop interventions for healthcare professionals in improving their IPC behaviour.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. Refer to the Methods section for further details.

Patient consent for publication Not required.

Ethics approval This study involves human participants and the study protocol was ethically approved by the Institutional Review Board of Bangabandhu Sheikh Mujib Medical University at its 199th meeting (Memo number: 2020/6040). Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available in a public, open access repository. Relevant data can be accessed from Mendeley Data (Salwa, Marium (2022), 'COVID-19: Risk perception, risk communication, and infection prevention & control among healthcare workers', Mendeley Data, V1, doi: 10.17632/kmmn9ngg62.1).

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