

Biosafety of healthcare providers during the COVID-19 pandemic in COVID-dedicated hospitals in Bangladesh

Hasna Tuz Zahria, Abu Ansar Md Rizwan, Md. Zafar As Sadiq & Probal Kumar Mondal

Abstract

The COVID-19 pandemic is a latent threat to public health that has multiplied enormously, spread quickly, and is yet shrouded in mystery. In hospitals and lab settings all across the world, biosafety is a significant problem that can be particularly difficult for impoverished nations. Therefore, the goal of this study was to evaluate the biosafety of medical staff during the COVID-19 pandemic in Bangladesh's hospitals with a COVID-specific patient population. All the healthcare professionals who were involved in caring for COVID-19 patients were regarded to be the study population when a descriptive type cross-sectional study was carried out at a chosen COVID-dedicated hospital in Dhaka. A total of 96 respondents who were interviewed for the study's purposes were sampled using a straightforward random sampling technique. For the goal of gathering data, a face-to-face interview was done. The results of this study show that although healthcare professionals have a reasonable level of fundamental knowledge of the present COVID-19 epidemic, they do not always follow acceptable biosafety and waste disposal practices. Fewer than ten percent of healthcare personnel have not received the COVID-19 vaccination, even though more than ninety percent of respondents were immunized. This study unequivocally states that preventing unintentional exposure to biohazardous items is the most important part of biosafety at any institution. The study's findings thus urge teamwork and the planning of foundational training programs to raise healthcare professionals' awareness of fundamental self-hygiene practices and biosafety concepts.



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Introduction

The first instance of Coronavirus Disease 2019 (COVID-19), which is brought on by the SARS-CoV-2 unique human coronavirus, was documented in Wuhan, China, in December 2019 (Li et al., 2020; Lurie et al., 2020). Due to its spread across all continents, the World Health Organization (WHO) proclaimed it a worldwide pandemic on March 11, 2020 (WHO, 2020). SARS-CoV-2 has a high incidence rate that may be attributed to the virus's high degree of transmissibility, a large proportion of patients with little symptoms, asymptomatic virus shedding, and super-spreading episodes (Yuen et al., 2020; Zheng, 2020). Everyone, especially healthcare personnel, is generally susceptible to COVID-19, which can be found in the ambient air of medical facilities. Healthcare professionals (HCWs) are at the vanguard of the COVID-19 containment effort and as a result, they are at higher risk of contracting SARS-CoV-2. People who work in healthcare settings but are not directly involved with patients run the risk of contracting an infection while doing so. These people are the soldiers fighting the Coronavirus Disease of 2019 (COVID-19), and the world's response to the pandemic depends greatly on their health and safety. Thus, this study was conducted to assess the biosafety of healthcare providers during the COVID-19 pandemic in COVID-dedicated hospitals in Bangladesh.

Literature review

Since the COVID-19 pandemic broke out and the fight to stop it began, healthcare workers have been in the spotlight on a global scale. Every nation that has experienced the virus's onslaught now recognizes its healthcare workers as national heroes because of the heroism they displayed in the fight against the pandemic. The first death from COVID-19 was confirmed on March 18, 2020, after Bangladesh reported its first case of a new coronavirus on March 8, 2020 (IEDCR, 2022). Bangladesh reported COVID-19 infections topped 2 million and associated mortality reached around 29,500 as of January 9, 2023 (Worldometer, 2023). Bangladesh, one of the most populated countries in the world, still faces enormous challenges in monitoring people's understanding, attitudes, and behaviors about the COVID-19 epidemic (Haque et al., 2020). HCWs have a higher infection risk than the general population due to their frequent interaction with patients who have been diagnosed with or suspected of having a coronavirus in healthcare institutions. Because of the rising need for healthcare services and the dearth of trained medical personnel, there has been a significant rate of COVID-19 infection among HCWs (Kassie et al., 2020). Additionally, the lack of staff leads to long hours of work, and HCWs frequently struggle to maintain proper safety, which increases the risk of infection (Wang et al., 2019). According to a meta-analysis, 10.1 percent of healthcare workers were infected with SARS-CoV-2, with 4.2 percent of those cases occurring in China, 9 percent in Italy, and 17.8 percent in the USA (Sahu et al., 2020). In addition, HCWs may pose a risk of harm to patients, their families, and members of the community (Ejeh et al., 2020). Infections with SARS-CoV-2 in healthcare workers can be harmful, especially if they spread to areas with a lot of vulnerable people, like people with comorbidities. Due to the lack of an adequate healthcare system, the impact is projected to be especially significant in South Asian nations like Bangladesh. The HCWS must follow the advised COVID-19 prevention measures, which are dependent on their understanding of the virus and the Biosafety precautions in place in healthcare, to lessen the effect of COVID-19 on healthcare in Bangladesh. The best biosafety practices should be implemented in healthcare facilities and HCWs should be adequately trained in COVID-19 preventive strategies to reduce the risk of infection.

Methodology

At a Dhaka-area hospital with a COVID-focused program, a descriptive type of cross-sectional study was carried out. Between September and October 2021, the study was conducted. The statistical formula ($n = z^2pq/d^2$) was used to compute the sample size, which came to 96. The

healthcare professionals from the chosen hospital who were handling COVID-19 patients were used as the samples. The respondents were chosen using a straightforward random selection method. With the essential precautions taken to prevent the spread of COVID-19, data were obtained by conducting face-to-face interviews with the respondents. After obtaining respondents' verbal informed consent, data were gathered. The responses were securely captured in the questionnaire and on the recorder for further cross-checking. SPSS version 26 was used for the data analysis. The data were routinely verified for quality assurance. Anonymity and confidentiality were scrupulously maintained throughout the entire study.

Results

According to the findings, the majority of the respondents were medical support staff (27.52%), followed by nurses (23.71%) and doctors (19.04%). The number of lab technicians and analysts was respectively 9.25% and 10.20%. Most of the respondents (41.60%) were aged between 20 to 30 years. More than one-third (36.87%) of the respondents were aged between 31 to 40 years. A total of 43.96% of respondents were male and the rest 56.04% were female. About half (43.47%) of the respondents had experience of about 5 to 10 years, whereas 27.85% of respondents had experience of fewer than 5 years. A total of 17.86% of respondents had 10 to 15 years of experience. Only 10.82% of respondents had more than 15 years of experience (Table 01).

Table 01: Socio-demographic characteristics of the respondents (n=96)

Socio-demographic characteristics	Frequency (f)	Percentage (%)
Designation		
Doctor	18	19.04
Nurse	23	23.71
Lab technician	9	9.25
Analyst	10	10.20
Medical support staff	26	27.52
Others	10	10.28
Age group		
20 to 30	40	41.60
31 to 40	35	36.87
41 to 50	11	11.60
More than 50	10	9.93
Sex		
Male	42	43.96
Female	54	56.04
Years of experience in this profession		
< 5 years	27	27.85
5 to 10 years	42	43.47
10 to 15 years	17	17.86
>15 years	10	10.82

The majority of respondents (91.43 percent) agreed that COVID-19 disease is a viral infection and contagious; 92.36 percent said that COVID-19 can be spread through close contact with infected people and infected animals; 89.51 percent knew that fever, sore throat, cough, and shortness of breath are possible symptoms of COVID-19 infection; 67.20 percent said that the novel coronavirus is, and 76.62 percent knew that the incubation period of COVID-19 infection is 1–2 weeks, and 86.39 percent told COVID-19 infection can be caught from a person who presents no symptoms and has recently visited the affected area. A total of 88.56 percent of respondents knew that people with weakened immune systems and older people are more likely to contract the infection; 90.83 percent said that patients with comorbid conditions and those who are older than 60 are more likely to contract the infection; 91.46 percent said that hospitalized patients who are close to infected patients are more likely to contract the infection,

and 86.29 percent knew that people in crowded places are more likely to contract the infection (Table 02).

Table 02: Distribution of the respondents according to their knowledge of COVID-19 (n=96)

Statements	Yes		No		Don't know	
	n	%	n	%	n	%
COVID-19 disease is a viral infection and contagious	88	91.43	5	4.76	4	3.81
COVID-19 can be transmitted through close contact with infected people and infected animals	89	92.36	4	3.87	4	3.77
Fever, sore throat, cough, and shortness of breath are possible symptoms of COVID-19 infection	86	89.51	4	4.16	6	6.33
The novel coronavirus is a similar virus as SARS-CoV and MERS-CoV	65	67.20	8	8.12	24	24.68
The incubation period of COVID-19 infection is 1–2 weeks	74	76.62	7	7.29	15	16.09
COVID-19 infection can be caught by a person who presents no symptoms and has recently visited the affected area	83	86.39	7	6.81	7	6.80
People with a compromised immune system and old age people are at more risk of developing the infection	85	88.56	4	4.09	7	7.35
Patients with comorbidities and aged more than 60 years are at more risk of developing the infection	87	90.83	4	3.80	5	5.37
Healthcare workers and hospitalized patients who are near infected patients are at more risk of developing the infection	88	91.46	3	3.07	5	5.47
People in crowded places are at increased risk of getting affected by the disease	83	86.29	6	5.73	8	7.98
Patients with COVID-19 infection should be immediately isolated to avoid the transfer of infection to other people	89	92.66	4	4.17	3	3.17

Table 03 shows that a total of 87.93% of respondents claimed to have had enough bio-safety training before handling the COVID-19 circumstance, and a further 84.62% claimed to be familiar with the term's appropriate definition. Overall, 68.29 percent of respondents reported that the hospital has a biosafety officer, and 63.20 percent claimed that the hospital has a comprehensive SOP for biosafety. A total of 91.64 percent of respondents said there are enough PPEs for all the hospital staff, 85.79 percent said they are familiar with how to use PPE, 78.30 percent said staff members wear PPE while performing triage, 90.37 percent said there are enough soap, hand sanitizers, and disinfectants in the hospital, and 86.02 percent said there are enough hand washing stations.

Table 03: Distribution of the respondents according to their responses on existing COVID-19 bio-safety measures in their hospital (n=96)

Statement	Yes		No	
	n	%	n	%
Received proper training on bio-safety before dealing with the COVID-19 situation	84	87.93	12	12.07
Know the proper definition of bio-safety	81	84.62	15	15.38
There is any bio-safety officer in the hospital	66	68.29	30	31.71
There is any complete SOP of bio-safety in the hospital	61	63.20	35	36.80
There are enough PPEs for all the staff in the hospital	88	91.64	8	8.36
Know the process of using PPE	82	85.79	14	14.21
During conducting the triage, staff use PPE	75	78.30	21	21.70
There is enough soap, hand sanitizers, and disinfectants in the hospital	87	90.37	9	9.63
There are enough hand-washing facilities in the hospital	83	86.02	13	13.98

There is a complete SOP for waste management in the hospital, according to 75.08 percent of respondents; 77.29 percent of respondents said they are aware of the proper donning and doffing techniques for PPEs, and 80.46 percent of respondents said they are aware of the proper segregation, labeling, and packaging of waste materials. Of all the respondents, 90.64 percent said they have received the proper training on waste management. A total of 85.37 percent of respondents said that the hospital has a waste management committee; 89.04

percent said they are aware of the hospital's proper waste storage and transportation facilities; and 91.96 percent said the hospital provides enough waste disposal equipment, such as biohazard bags and sharps containers (Table 04).

Table 04: Distribution of the respondents according to their responses on waste management in their hospital (n=96)

Statement	Yes		No	
	n	%	n	%
Received proper training in waste management	87	90.64	9	9.36
Know the proper definition of waste management	85	88.75	11	11.25
There is a complete SOP for waste management in the hospital	72	75.08	24	24.92
Know about the proper donning and doffing practices of PPEs	74	77.29	22	22.71
Know about proper segregation, labeling, and packaging of waste materials	77	80.46	19	19.54
There is a waste management committee in the hospital	82	85.37	14	14.63
Know about proper storage and transport facilities of waste in the hospital	85	89.04	11	10.96
The hospital provides enough waste disposal materials like biohazard bags and sharp bins for waste disposal	88	91.96	8	8.04

Among all, 86.21 percent of respondents use PPE and gloves constantly in their employment, 99.37 percent of respondents use PPE and gloves when managing COVID-19 patients, and 90.42 percent of respondents wash their hands after removing PPE and gloves. 100 percent of respondents eat or drink at work, 93.10 percent make sure the workplace is decontaminated at least once per day, 98.36 percent dispose of waste in the proper color-coded biomedical waste containers, and 97.59 percent make an effort to label known infectious blood or tissue samples with a biohazard label (Table 05).

Table 05: Distribution of the respondents according to their response on the impact of bio-safety on health care providers (n=96)

Statement	Yes		No	
	n	%	n	%
Vaccinated against COVID-19	89	92.84	7	7.16
Use PPE and gloves while handling COVID-19 patients	95	99.37	1	0.63
Use PPE and gloves all time in your workplace	83	86.21	13	13.79
Wash hands after removing PPE and gloves	87	90.42	9	9.58
Ensure the workplace is decontaminated at least once daily	89	93.10	7	6.90
Eat/drink at the workplace	96	100.00	0	0.00
Dispose of waste in appropriate color-coded biomedical waste containers	94	98.36	2	1.64
Ensure biohazard label is put on known infectious blood/tissue samples	94	97.59	2	2.41

Discussion

The principles, techniques, and procedures used to prevent unintentional exposure to pathogens, toxins, and other dangerous chemicals, including accidents, are referred to as biosafety (Islam et al., 2020). The goal of the current study was to examine the biosafety of hospital staff in a COVID-19 facility. Due to their close contact with confirmed and suspected coronavirus patients, healthcare workers around the world are at significant risk of contracting COVID-19 (Xiao et al., 2020). Healthcare workers (HCWs) were occasionally also in charge of community transmission. The transmission of disease among HCWs is correlated with crowding, a lack of adequate safety equipment, and a lack of isolation facilities (Wu & McGoogan, 2019). When HCWs are ignorant of infection control and prevention procedures, this situation is probably made worse. According to past studies, having the right information, having a positive attitude, and adopting healthy behaviors can lower the chance of infection (Askarian et al., 2004). The current study was conducted among the medical staff of a COVID-19 hospital in Bangladesh as a descriptive cross-sectional observational study. This is the first study of its kind to evaluate the biosafety of HCWs in Bangladesh. The majority of the health professionals had adequate awareness about the pandemic, which is consistent with some of

the earlier research done before the survey was conducted over two years after the COVID-19 epidemic rocked the world (Jawed et al., 2020). The type of virus and whether it was similar to SARS-CoV and MERS-CoV or not, which could be readily transmitted to the HCWs through learning sessions, were questions that over one-third of the participants either did not answer or did not know the answers to. Nearly 30% or more of the responses from the HCWs revealed a lack of understanding regarding two crucial elements of the COVID-19 biosafety measures already in place at their hospital, namely the existence of a Biosafety officer and a comprehensive biosafety SOP. On the other hand, when questioned about the waste management facilities, more than 70% of the HCWs were knowledgeable of every aspect of their hospital's current waste management system. Finally, when given multiple questions about this, approximately 90% of the respondents were aware of how biosafety affects healthcare professionals. Several limitations could apply to this study. The study's findings may not apply to generalizing the biosafety of all healthcare personnel in Bangladesh due to the study's limited sample size. However, as the first of its kind, this study highlights the need for conducting additional similar studies and suggests enhancing the biosafety of healthcare professionals by recommending the addition of biosafety officers and SOPs for biosafety to all hospitals that specialize in COVID-19 treatment.

Conclusion

The primary means of transmission for the extremely contagious COVID-19 are touching and droplets. This study demonstrates unequivocally that preventing unintentional exposure to biohazardous items is the most important part of biosafety at any institution. The best method to reduce the spread of any sickness and ensure a healthy atmosphere is through enough fundamental knowledge and preventative measures. The study's findings also show that most respondents had a solid understanding of COVID-19 and that the hospital's biosafety and waste management facilities operated at a satisfactory level. However, their use of insufficient biosafety and waste disposal practices can be risky. Given this, greater attention should be paid to the proper use of PPE, proper waste disposal, and regular hand hygiene. In addition, regular training and collaboration with coworkers can help to ensure biosafety for healthcare professionals. To generalize the results, a similar sort of study with a larger sample size should be carried out at various hospitals.

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Conflict of interest

There were no competing interests in this work, according to the authors. Authorization to publish this article's writers have all given their approval for it to be published.

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