Original Research Article

Nurses' Knowledge and Practice Regarding the Prevention of Complications COVID-19 at Shaheed Ziaur Rahman Medical College Hospital, Bogura, Bangladesh

Md. Saddam Hossain[1*], Zannatun Ferdosi[2], Shalpi Banu[3], Sumaya Akter[4], Sakhina Khatun[5], Mst. Nazma Khatun[6], Selina Khatun[7], Major S. M. Arman Ara[8], Md. Masud Rana[9]

[1]Senior Staff Nurse, 250 Bedded General Hospital, Thakurgoan, Bangladesh
[2]Senior Staff Nurse, Rajshahi Medical College Hospital, Rajshahi, Bangladesh
[3]Senior Staff Nurse, 250-Bedded General Hospital, Dinajpur, Bangladesh
[4]Senior Staff Nurse, 250-Bedded Mohammad Ali Hospital, Bogura, Bangladesh
[5]Senior Staff Nurse, M. Abdur Rahim Medical College Hospital, Dinajpur, Bangladesh
[6]Senior Staff Nurse, 250-Bedded General Hospital, Dinajpur, Bangladesh
[7]Senior Staff Nurse, Rajshahi Medical College Hospital, Rajshahi, Bangladesh
[8]AFNS OfficerCombined Military Hospital, Jessore, Bangladesh
[9]Senior Staff Nurse, National Institute of Cardiovascular Diseases Hospital, Dhaka, Bangladesh

*Corresponding author: Md. Saddam Hossain
Senior Staff Nurse, 250 Bedded General Hospital, Thakurgoan, Bangladesh

Abstract

Background: Coronavirus disease-2019 (COVID-19) was an emerging public health problem threatening the lives of over 2.4 million people globally. It was a great challenge for the management of all hospitals to respond to the coronavirus (COVID-19) outbreak at the early stage in the world. The most prominent problems were the arrangement of medical staff to diagnose and treat patients with COVID-19 and the allocation of medical protective equipment. The estimated basic reproductive number of the virus is significantly higher than many other infectious diseases, which can potentially result in the capacity of health facilities becoming overwhelmed, even in the countries with the most developed healthcare systems. ***Objective:*** The aim was to assess the level of nurses and practice regarding preventing complications of COVID-19 at Shaheed Ziaur Rahman Medical College Hospital, Bogura. ***Methodology:*** This descriptive cross-sectional study design was used, and a sample size of 110 that was a purposive sampling technique followed those who met the inclusion criteria to assess the nurses' practice regarding the prevention of complications of COVID-19 at Shaheed Ziaur Rahman Medical College Hospital, Bogura. The study was conducted from July 2021 to December 2021. The instruments for data collection were a semi-structured questionnaire composed of three parts: Demographic variables, knowledge, and practice-based information on the prevention of COVID-19 complications. ***Results:*** The findings of the present study revealed that the demographic information the highest 40.91% were within ≤ 30 years of age, 77.27% were female, 90% were Muslim, 87.27% were married, and 46.36% were diploma in nursing. The average level of knowledge, 38.18%, was a high level of knowledge regarding the prevention of COVID-19, which may be due to their clinical experiences. ***Conclusion:*** Coronavirus disease 2019 (COVID-19) is a global public health threat, creating a pandemic worldwide. The preventive measures include strict quarantine and screening, as well as education to promote the use of masks and hand-washing practices. Nurses' roles in the disease are an important cognitive key in public health regarding prevention and promotion.
Keywords: Knowledge, Prevention, Covid-19.

INTRODUCTION

Covid-19 pandemic is a major health crisis facing the world in recent years. SERS-CoV-2 is the newest member of the coronavirus family, which was identified as a health emergency causing severe acute respiratory distress syndrome (ARDS) leading to pneumonia and respiratory failure in humans. COVID-

19 is a great challenge for the management of all hospitals to respond to the coronavirus disease 2019 (COVID-19) outbreak at the early stage in Wuhan. The most prominent problems are the arrangement of medical staff to diagnose and treat patients with COVID-19 and the allocation of medical protective equipment. With the outbreak of novel coronavirus-2 (nCoV-2) declared a pandemic and an international public health emergency by the World Health Organization (WHO), the world is working to address it. It is a rapidly evolving and emerging situation. In <5 months after the first emergence of the virus in December 2019, nearly two million people in 185 countries around the globe have been identified as confirmed cases of coronavirus disease 2019 (COVID-19) [1]. Researchers worldwide are working hard to better understand the biology of nCoV-2 and the epidemiology of the novel coronavirus disease-19 (COVID-19). The estimated basic reproductive number of the virus is significantly higher than many other infectious diseases, which can potentially result in the capacity of health facilities becoming overwhelmed, even in the countries with the most developed healthcare systems [2]. An estimated 20% of cases lead to clinically serious and complex conditions. With some sporadic cases of serious illness in younger individuals, adults >60 years of age and with comorbid conditions make up the most vulnerable group. In earlier December, the first case of pneumonia of unknown cause originated in Wuhan, the capital city of Province Hubei, China. On December 31, 2019, with more such cases, Wuhan gained attention from the World Health Organization [3]. The pathogen identified was named a novel coronavirus (2019-nCoV), currently called severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2). This enveloped and single-stranded RNA virus has a phylogenetic resemblance to SARS-COV-1 [4]. Owing to the rapid spread of this deadly virus from the epicenter to several countries, WHO declared it a public health emergency of international concern (PHEIC) on January 30, 2020. Later, due to uncased fast spread, severity of illness, the continual escalation in the number of affected countries, cases, and causalities, the WHO declared coronavirus disease 2019 (COVID-19) a global pandemic on March 11, 2020 [3]. To date (April 12, 2020), COVID-19 has spread to 210 countries and territories, accounting for 1,790,550 laboratory-confirmed cases and 109,654 mortalities also attributed to this deadly pathogen. As yet no vaccines or antiviral drugs are approved for the disease; hence, nontherapeutic interventions to control the spread of the virus are the most effective measures to control the disease [5]. Worldwide, billions of people are staying at home to minimize the transmission of the virus. Many countries are adopting preventive measures, e.g., remote office activities, international travel bans, mandatory lockdowns, and social distancing. Bangladesh, a lower-middle-income country and one of the world's most densely populated areas, struggles to combat the spread of the disease. Evidence regarding the spectrum of post-COVID-19 illness and management is evolving and will continue to develop in years to come.

Recent suggested definitions have described post-acute COVID-19 as an illness extending beyond three weeks from initial symptoms and chronic COVID-19 as an illness extending beyond 12 weeks from initial symptoms. The incidence of post-COVID-19 squeal in those who have tested positive and who have been managed in an outpatient setting (Such as management in the home) is thought to be between 10% and 35%. However, this may be closer to 80% for those admitted to the hospital. The incidence of prolonged illness significantly increases with age, co-morbidities, and severity of the acute illness. With almost every country adopting aggressive nontherapeutic measures to control the spread of nCoV-2, Bangladesh in Southeastern Asia has followed the same trend; however, there is an ongoing debate about whether measures have been adopted adequately and implemented efficiently. The country confirmed the first COVID-19 case in its territory on March 7. However, many experts speculated that nCoV-2 may have entered the country earlier than that but had yet to be detected due to inadequate monitoring [6]. As of April 13, the country had reported 803 cases of COVID-19, and the death toll stood at 39 [7]. However, concerns have been raised that extreme insufficiency of testing assays may leave many cases undetected in the country. In response to the emergence of the virus, Bangladesh admittedly reduced international flights, imposed thermal scanner checking, and shut down schools; however, offices maintained their regular schedules until March 26. On March 15, the country banned all flights from Europe except the United Kingdom; however, the authority still allowed flights from Europe to land in an airport. As a result, over 631 thousand people entered the country in just 55 days from January 21 [8]. Although the Institute of Epidemiology, Disease Control and Research (IEDCR) claimed that it tested every single person who entered the country, there has been intense criticism of the testing facilities in the ports of entry. Beginning on March 16, the country imposed a 14-day obligatory quarantine on all travellers who entered the country. It attempted to bring travellers from Italy, which was then declared a new epicentre of the pandemic, to a quarantine site. The move was sharply criticized due to a lack of arrangements, and the travellers were allowed to enter the country by themselves on the condition of 14-day-long self-isolation. Since then, hundreds of expatriates from COVID-19-affected countries have been seen in the streets and gatherings, travelling to tourist sites, and meeting with friends and families. On March 19, the country deployed the army to supervise two quarantine facilities in Dhaka. Nurses are at the frontline of the COVID-19 pandemic response and are exposed to dangers like pathogen exposure, long working hours, psychological distress, fatigue, occupational burnout and stigma, and physical violence [3, 9]. A poor understanding of the disease among nurses can delay identification and treatment, leading to the rapid spread of infections. Over 100 health workers have lost their lives to COVID-19, a tragedy to the world and a barrier to the fight against the disease. Guidelines for

healthcare workers and online refresher courses have been developed by the WHO, CDC, and various governmental organizations in various countries to boost knowledge and prevention strategies. There is a paucity of literature on the KAPs of HCWs during the COVID-19 pandemic. However, a study with mostly Asian HCWs and medical students revealed that they had insufficient knowledge about COVID-19 but had a positive attitude toward preventing COVID-19 transmission [3].

METHODOLOGY & MATERIALS

In this research, a descriptive cross-sectional study design was employed to investigate the knowledge and practice of nurses in preventing COVID-19 at Shaheed Ziaur Rahman Medical College Hospital in Bogura, Bangladesh. Situated in the northern region of Bangladesh, this hospital serves as a multi-disciplinary institution with a current focus on treating COVID-19 patients. The study was conducted over six months, from July to December 2021. The study's target population consisted of all nurses employed at Shaheed Ziaur Rahman Medical College Hospital, Bogura. The study sample was drawn from specific departments, including medicine, surgery, paediatrics, and orthopaedics. Ethical approval for the research was obtained from the ethics committee of Bogura Nursing College, Bogura, Bangladesh.

Inclusion Criteria
- Nurses are those who work in the selected area of the hospital.
- Nurses who were willing to participate.
- Respondents who were available on duty during the data collection period.

Exclusion Criteria
- Nurses who were not willing to participate.
- Respondents who were not available during the data collection period.
- Nurses who work less than at least 6 months in the selected wards in the hospital.

A purposive sampling technique was followed to complete data collection in this study. The researchers prepared a Semi-structured questionnaire according to the objectives and variables of the study. Research instruments consisted of three parts for collecting data. The part-A covered the demographic information about the respondents. Moreover, part B contained a knowledge-related questionnaire, and part C consisted of a practice-related checklist questionnaire. The questionnaire was pretested on ten respondents at 250 Bedded Mohammad Ali Hospital, Bogura, in a Medicine and Surgery department. A pilot study of the questionnaire was done for research instrument development and to check the validity, reliability, and acceptability of the questionnaire. Then, necessary corrections and modifications were made by an expert teacher.

Data collection and analysis

Researchers obtained the necessary approvals from Bogura Nursing College, Bogura, and sought permission from the Hospital Director and Nursing Superintendent. After receiving authorization, the researchers approached the relevant authorities to explain the educational purpose of their study. They then requested consent from these individuals for their willingness to participate. Upon receiving consent, the researchers provided questionnaires and explained the process to the participants, ensuring they understood how to complete the questionnaires. Written consent from the respondents was obtained before data collection began. The data collection process involved face-to-face interviews using semi-structured questionnaires and spanned three days, with data collection sessions conducted in both the morning and evening. The collected data was reviewed, organized, coded, edited, and analyzed manually and with computer assistance. To analyze the data, the researchers employed descriptive statistics such as frequency, percentage, and mean using a scientific calculator. The study's objectives were met by analyzing fundamental variables, and the results were tabulated for reference.

RESULT

Table 1 shows the demographic characteristics of the study population. A significant portion, 40.91%, are aged 30 or younger, and a majority, 77.27%, are female. The religious affiliation of the participants primarily aligns with Islam (90.00%), and a substantial 84.55% reside in urban areas. Educational backgrounds exhibit diversity, with 46.36% holding a diploma in nursing and 35.00% having completed secondary education. Impressively, a majority, 78.18%, have received specialized training, and a significant portion, 62.73%, has personal experience with COVID-19, respectively (Table 1). Table 2 provides a comprehensive presentation of survey results pertaining to the participant's experiences and comprehension of COVID-19. The majority of 62.73% of respondents have personally encountered COVID-19, while an impressive 90.91% are aware of the potential post-COVID complications. Among those who reported complications, depression emerged as the most prevalent (54.55%), followed by phobia and psychosis, each experienced by 19.09% of participants. Significantly, an overwhelming 96.36% correctly identified the virus as the causative agent of COVID-19. The data also highlights the modes of transmission, with 94.55% recognizing close contact as a primary means of spread. Remarkably, 77.27% identified diabetes mellitus (DM) and hypertension (HTN) as significant risk factors for COVID-19. Furthermore, the majority, 82.73%, correctly identified the 14-21 day incubation period. Table 3 offers a comprehensive overview of various aspects related to complications of COVID-19. It is noteworthy that 38.18% of participants reported anxiety, while 49.09% experienced short-term memory issues. In terms of detection methods, 48.18% preferred RT-PCR,

and the same proportion relied on family support as a protective measure. Chronic pneumonia affected 29.09% of individuals, and a substantial 73.64% opted for Remdesivir for prophylaxis. High protein diets were the preferred nutritional approach for reducing post-COVID complications, with 92.73% of respondents endorsing this. Notably, N-95 masks were widely used (86.36%) as a preventive measure, and among vaccine side effects, local pain was prevalent (45.45%). Factors contributing to vulnerability included older age groups (38.18%) and healthcare providers (43.64%). Additionally, Figure 1 visually illustrates participants' knowledge levels, with 38.18% exhibiting a high level of knowledge, 20.91% possessing a moderate understanding, and 31.82% demonstrating limited comprehension. Table 4 presents participants' responses to a series of questions concerning the management and handling of post-COVID-19 patients. A significant proportion, 86%,

indicated that they approach patients in a friendly manner, while 96% accept post-COVID-19 patients cordially. Hand hygiene practices were highly emphasized, with 98% reporting that they wash their hands before and after handling post-COVID-19 patients. A substantial majority adhered to safety measures such as the use of personal protective equipment (PPE) and maintaining proper distance from post-COVID-19 patients, with 82% wearing PPE and 83% opting for surgical or 4-fold cotton masks. Impressively, 89% of respondents ensured accurate vital sign recording, highlighting their precision in patient monitoring (Table 4). Furthermore, the table indicates a strong focus on patient education and advice. A significant proportion, ranging from 76% to 87%, provided health education and nutritional guidance to both post-COVID-19 patients and their families.

Table 1: Demographical characteristics of the study population (n=110)

Characteristics	Frequency (n)	Percentage (%)
Age group (years)		
≤ 30	45	40.91
31-40	44	40.00
>40	16	14.55
>50	5	4.55
Gender		
Male	25	22.73
Female	85	77.27
Religion		
Islam	99	90.00
Hindu	6	5.45
Christian	4	3.64
Buddhist	1	0.91
Marital status		
Married	96	87.27
Unmarried	12	10.91
Widow	2	1.82
Professional educational qualification.		
diploma in nursing	51	46.36
BSc in nursing/PHN	47	42.73
MSN/MPH	12	10.91
Residential area		
Urban	93	84.55
Rural	17	15.45
Length of service (years)		
≤ 10 yrs	85	77.27
11-20 yrs	11	10.00
>20 yrs	14	12.73
Specialized Training		
Yes	86	78.18
No	24	21.82

Table 2: Participants experiences and understanding of COVID-19(n=110)

Response	Frequency (n)	Percentage (%)
Ever Attacked by COVID-19		
Yes	69	62.73
No	41	37.27
Awareness of Post-COVID Complications		

Response	Frequency (n)	Percentage (%)
Yes	100	90.91
No	10	9.09
Post-COVID Complications Experienced		
Phobia	21	19.09
Panic	8	7.27
Depression	60	54.55
Psychosis	21	19.09
Organism Responsible for COVID-19		
Bacterial	2	1.82
Viral	106	96.36
Protozoal	1	0.91
Fungal	1	0.91
Transmission of COVID-19		
Close Contact	104	94.55
Not Close Contact	3	2.73
Through Eating	1	0.91
Far Distance	2	1.82
COVID-19 Risk Factors		
UTI	3	2.73
DM, HTN	85	77.27
Fever	13	11.82
Sore Throat	9	8.18
Incubation Period of COVID-19		
7 days	17	15.45
14-21 days	91	82.73
28 days	1	0.91
More than one month	1	0.91

Table 3: Aspects related to complications after COVID-19

Response	Frequency (n)	Percentage (%)
Complications After COVID-19		
Skin Rash	5	4.55
Anxiety	42	38.18
Anosmia	9	8.18
Short Time Memory	54	49.09
Methods to Detect Post-COVID Complications		
RT-PCR	53	48.18
Antibody Test	26	23.64
CT-Scan	21	19.09
X-ray	10	9.09
Precautions for Reducing Post-COVID Complications		
Proper Oxygen Supply	30	27.27
Family Support	53	48.18
Diet	14	12.73
Treatment	13	11.82
Common Complications of COVID-19		
Chronic Pneumonia	32	29.09
Shortness of Breath	46	41.82
Secondary Infection	16	14.55
Lung Fibrosis	16	14.55
Prophylaxis for Prevention of Post-COVID Complications		
Hydroxychloroquine	21	19.09
Cipro floxacillin	6	5.45
Remdesivir	81	73.64
Diazepam	2	1.82
Nutritional Diet for Reducing Post-COVID Complications		
Junk Food	3	2.73

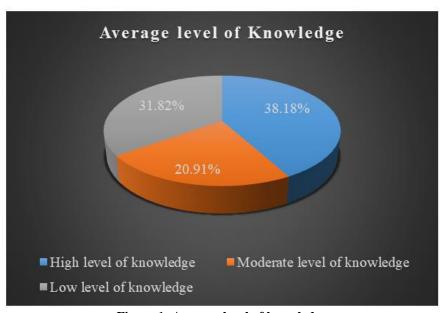| Response	Frequency (n)	Percentage (%)
High Protein Diet	102	92.73
Fast Food	2	1.82
High Carbohydrate Food	3	2.73
Masks for Preventing Post-COVID Complications		
Surgical Mask	7	6.36
N-95 Mask	95	86.36
KN-95	6	5.45
Four Folded Homemade Mask	2	1.82
COVID-19 Vaccine Side Effects		
Attack of COVID-19	13	11.82
Local Pain	50	45.45
Swelling of Lymph Node	7	6.36
Anaphylactic Shock	28	25.45
Body ache	12	10.91
Vulnerability to Post-COVID Complications		
Healthcare Provider	48	43.64
Co-morbidity	16	14.55
Older Age Group	42	38.18
Don't Take COVID-19 Vaccine	4	3.64
Gender Vulnerability to Post-COVID Complications		
Brain	3	2.73
Heart	3	2.73
Lungs	102	92.73
Kidneys	2	1.82

Figure 1: Average level of knowledge

Table 4: Healthcare professionals' practices and attitudes regarding patients with post-COVID-19 complications

No.	Question	Yes		No		Don't know	
		n	%	n	%	n	%
1	Do you introduce patients with friendly?	95	86	14	13	01	1
2	Are you accepting patient who have any post Covid-19 complications?	106	96	03	3	01	1
3	Do you Wash hands before & after handling post Covid-19 complication patient?	108	98	01	1	01	1
4	Do you avoid close contact with the people who have any covid-19 complication?	63	58	45	41	01	1
5	Do you ware PPE when manage any post covid-19 complicated patient?	90	82	18	16	02	2

No.	Question	Yes		No		Don't know	
		n	%	n	%	n	%
6	Do you wear surgical/4-fold cotton mask?	92	83	15	14	03	3
7	Do you maintain distance with the post covid-19complication patient?	70	64	34	31	06	5
8	Do you allow patient without any mask who has covid-19 complication?	35	32	72	65	03	3
9	Do you wear hand gloves during any procedure of post covid-19 complication patient?	96	87	11	10	03	3
10	Do you record vital sign appropriately of post covid-19 complication patient?	98	89	08	7	04	4
11	Do you provide health education to the post covid-19 patients & relatives?	84	76	20	18	06	5
12	Do you advice the patients and relatives about nutritious diet and personal hygiene?	95	87	08	7	07	6

DISCUSSION

This descriptive cross-sectional study aimed to determine the nurses' Knowledge and practice regarding the prevention of COVID-19 at Shaheed Ziaur Rahman Medical College Hospital, Bogura. This chapter summarizes the study, findings about those previously reported in the literature, and discussion. In addition, the suggestions for practice and recommendations for future research will also be addressed. The present study findings revealed that the socio-demographic information 40.91% were within ≤ 30 years of age, 40% were within 30-40 years, 14.55% were 41-50 years, and 4.55% were >50 years of age; 22.73% were male whereas the 77.27% were female; 90% were Muslim, 5.45% were Hindu, 3.64% were Christian, and 0.91% was Buddhist; 10.91% were single, 87.27% were married, and the rest of 1.82% were widow; 46.36% were diploma in nursing, 42.73% were BSc/PHN in nursing, and the rest of 10.91% were MSc in nursing; 77.27% were ≤ 10 yrs, 10% were 11-20 yrs and 12.73% were >20 yrs of length of service; 78.18% were answered yes whereas the 21.82% were no received specialized training among the respondents. Nemati *et al*., (2020) found the participants' demographic characteristics [10]. More than 75% of the respondents were in the group less than 40 years old. Concerning the education level, (56.3%) of participants had a high school diploma or less; more than half of them (67%) had associate's or bachelor's degrees, providing data regarding work experience; 30.6% between 5 and 15 years. Moreover the current study findings of knowledge based information revealed that the 62.73% was answered the option of Yes, where as the 37.27% were answered the option of No of ever attacked by covid-19; 90.91% was answered the option of Yes, where as the 9.09% were answered the option of No for any idea about posts Covid-19 complication; 19.09% were answered the option of phobia, 7.27% the option of panic, 54.55% the option of depression and 19.09% the option of psychosis with experience of post Covid-19 complication; 1.82% were answered the option of bacteria, 96.36% were answered the option of viral, 0.91% the option of Protozoal and 0.91% the option of Fungal with responsible for COVID-19; 94.55% were answered the option of Close contact with the infected person & animal, 2.73% were answered the option of Not close contact with the infected person & animal, 0.91% the option of Through eating and 1.82% the option of through seeing from far distance with transmitted for COVID-19; 2.73% were answered the option of UTI, 77.27% were answered the option of DM, HTN, 11.82% the option of Fever and 8.18% the option of Sore throat with risks factors of Covid-19; 15.45% were answered the option of 7 days, 82.73% were answered the option of 14-21 days, 0.91% the option of 28 days and 0.91% the option of More than one month with incubation period of Covid-19; 4.55% were answered the option of Skin rash,38.18% were answered the option of Anxiety, 8.18% the option of Anosmia and 49.09% the option of Short time memory with complication may arise after Covid attack; 48.18% were answered the option of RT-PCR, 23.64% were answered the option of Antibody test, 19.09% the option of CT scan and 9.09% the option of X-ray with detect the post Covid complication; 27.27% were answered the option of Proper oxygen supply, 48.18% were answered the option of Family support, 12.73% the option of Diet and 11.82% the option of Treatment with Precaution needed for reduce post covid-19 complication; 29.09% were answered the option of Chronic pneumonia, 41.82% were answered the option of Shortness of breath, 14.55% the option of Secondary infection and 14.555% the option of Lung fibrosis with most common complication of Covid -19; 19.09% were answered the option of Hydroxychloroquine, 5.45% were answered the option of Ciprofloxacillin, 73.64% the option of Remdisivir and 1.82% the option of Diazepam with prophylaxis for prevention of post covid-19 complication; 2./73% were answered the option of Junk food, 92.73% were answered the option of High protein diet, 1.82% the option of Fast food and 2.73% the option of High carbohydrate food with nutritional diet you supply for reduction of post Covid-19 complication; 6.36% were answered the option of Surgical mask, 86.36% were answered the option of N-95 mask, 5.45% the option of KN-95 and 1.82% the option of Four folded home making mask with preventing post covid-19 complication; 11.82% were answered the option of Attack of Covid -19, 45.45% were answered the option of Local pain, 6.36% the option of Swelling of lymph node, 25.45% were answered the option of Anaphylactic shock and 10.91% the option of Bodyache with side effects of Covid-19 vaccine; 43.64% were answered the option of Health care provider, 14.55% were answered the option of Who have co-morbidity, 38.18% the option

of Older age group and 3.64% the option of Don't take covid-19 vaccine with vulnerable for post Covid-19 complication; 2.73% were answered the option of Brain, 2.73% were answered the option of Heart, 92.73% the option of Lungs and 1.82% the option of Kidneys with men are more vulnerable then female for post Covid-19 complication among the respondents. The findings of the current study by the average level of Knowledge: 38.18% had a high level of Knowledge, 20.91% had a moderate level of Knowledge, and 31.82% had a low level of Knowledge regarding the post-COVID-19 complications among the respondents. A study's findings revealed that the opposite of nurses had poor Knowledge about covid 19; low scores may be attributed to the fact that COVID-19 is a new, advanced emerging virus, and the nurses still need to improve in this issue. Also, after graduation, nurses neglect reading and updating their professional Knowledge and are expected to find such a low level of Knowledge. Another study's findings are congruent with those of Joshi *et al*., (2020) [11], who studied" Knowledge and Awareness among Nursing Students regarding the COVID-19: A Cross-sectional Study" and concluded that the study participants showed adequate Knowledge and awareness of COVID-19. There is a strong need to implement periodic educational interventions and training programs on infection control practices and other updates on COVID-19 across all healthcare professions, including nursing students. Additional online education interventions and campaigns are also required. This would improve the Knowledge and confidence of nursing students to provide the right care to their patients and protect themselves from COVID-19. According to Fernandez *et al*., (2020), who studied nurses' experiences of working in acute care hospital settings during a respiratory pandemic," concluded that nurses should receive clear, concise and current information about best practice nursing care and infection control, as well as sufficient access to appropriate PPE to optimize their safety [12]. Adequate staffing is essential to ensure nurses can take breaks during shifts, take leave when ill, and provide an appropriate skill mix. Support for nurses to manage competing family responsibilities and maintain safe contact and communication with family members can reduce personal stress and anxiety. The nurses participating in the study reported the care of many cases of pneumonia, cough, and fatigue after the acute infection of COVID-19. This corroborates the fact that the lung is among the affected organs with the highest complication rate. This is the organ where sequels are most significant and evident, such as pulmonary fibrosis, abnormal lung function, and even embolism. Concerning nurses' practices towards COVID-19, the study's findings revealed that about two-thirds of the studied nurses had incompetent practices toward COVID-19 before intervention. Meanwhile, after the intervention, the percentage changed to most of the studied nurses having competent practices toward COVID-19. This could be because receiving training from educational intervention and high adherence to training sessions with their active

participation improves their Knowledge and leads to competent practices. A study revealed that the majority of nurses have good practice in following precautionary measures. The highest good practice was observed in washing hands with soap, similar to the findings of Khan *et al*., (2014) and Nour *et al*., (2017), who reported that 95.4% and 85.7% of nurses used to wash their hands continuously[13, 14]. Regarding integrating Knowledge into practices, the study demonstrated a positive statistically significant correlation between Knowledge and practices, with improved Knowledge associated with competent practices. This finding is quite expected and is consistent with McEachan *et al*., (2016), who studied "Meta-analysis of the reasoned action approach (RAA) to understanding health behaviours" and reported that some healthcare workers have inadequate awareness of infection prevention practices [15]. Knowledge of disease may influence healthcare workers' practices, and incorrect practices directly increase the risk of infection. Understanding healthcare workers' Knowledge, practices, and possible risk factors helps to predict the outcomes of planned behavior. Additionally, the current study's findings illustrated a highly statistically significant correlation between total Knowledge, total practice scores, and general characteristics. These findings are supported by Zhang *et al*., (2020), who studied "Knowledge and practice regarding COVID-19 among healthcare workers in Henan, China," which emphasized that training regarding protection should be organized according to different factors (work experience, educational attainment, and so on), and medical systems should ensure that frontline workers have enough time to rest between shifts, to avoid overwork and non-conscious errors during epidemic relief efforts [16]. Moreover, to reduce the risk of infection among healthcare professionals who are not in direct contact with patients, policy and education should be implemented to convey the importance of disclosing possible exposure to the virus.

Limitations of the study

There was a small sample size. This is a small representation of nurses at Shaheed Ziaur Rahman Medical College Hospital, Bogura, and, as such, the study's results may be limited to one particular area. The limitations of our study were the small sample size and the selection of samples only from the limited population at Shaheed Ziaur Rahman Medical College Hospital, Bogura. Thus, large-scale studies with larger sample sizes selected randomly from all parts of society are recommended to obtain more generalized results for further study in the health sector.

CONCLUSION AND RECOMMENDATIONS

The coronavirus disease 2019 (COVID-19) is a global public health threat, creating a pandemic worldwide. Many countries are adopting preventive measures, e.g., remote office activities, international travel bans, mandatory lockdowns, and social distancing. Bangladesh, a lower-middle-income country and one of

the world's most densely populated areas, struggles to combat the spread of the disease. The preventive measures for COVID-19, including aggressive tracing of cases and contacts, strict quarantine and screening, and education to promote good hand hygiene practices, should be implemented. Nurses' Knowledge and roles of the disease is an important cognitive key in public health regarding health prevention and promotion.

Based on the study results, the following recommendations were made:
1. The study can be replicated on a large sample to validate and generalize the findings.
2. The study can be conducted in different settings, like the national level.
3. The level of nurses' knowledge was assessed.
4. A comparative study can be conducted to assess the nurses' knowledge and practice regarding the prevention of COVID-19 at Shaheed Ziaur Rahman Medical College Hospital, Bogura.
5. There is a need to improve knowledge and positive practices to prevent post-COVID-19. This can be achieved by providing educational and motivational activities and improvement in nursing services, which are needed to promote the health and prevention of catheter-associated urinary tract infections and their consequences.
6. A similar study can be undertaken on a large scale.

REFERENCES
1. Dong, E., Du, H., & Gardner, L. (2020). An interactive web-based dashboard to track COVID-19 in real time. *The Lancet infectious diseases*, *20*(5), 533-534.
2. Liu, Q., Luo, D., Haase, J. E., Guo, Q., Wang, X. Q., Liu, S., ... & Yang, B. X. (2020). The experiences of health-care providers during the COVID-19 crisis in China: a qualitative study. *The Lancet Global Health*, *8*(6), e790-e798.
3. World Health Organization 2. Clinical management of COVID-19: interim guidance, 27 May 2020. World Health Organization; 2020.
4. Guan, W. J., Ni, Z. Y., Hu, Y., Liang, W. H., Ou, C. Q., He, J. X., ... & Zhong, N. S. (2020). Clinical characteristics of coronavirus disease 2019 in China. *New England journal of medicine*, *382*(18), 1708-1720.
5. Bootsma, M. C., & Ferguson, N. M. (2007). The effect of public health measures on the 1918 influenza pandemic in US cities. *Proceedings of the National Academy of Sciences*, *104*(18), 7588-7593.
6. Perera, R. A., Mok, C. K., Tsang, O. T., Lv, H., Ko, R. L., Wu, N. C., ... & Peiris, M. (2020). Serological assays for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), March 2020. *Eurosurveillance*, *25*(16), 2000421.
7. Alam, M. A. (2020). Leading in the shadows: understanding administrative leadership in the context of COVID-19 pandemic management in Bangladesh. *International Journal of Public Leadership*, *17*(1), 95-107.
8. Tasnim, R., Sujan, M. S. H., Islam, M. S., Ritu, A. H., Siddique, M. A. B., Toma, T. Y., ... & van Os, J. (2021). Prevalence and correlates of anxiety and depression in frontline healthcare workers treating people with COVID-19 in Bangladesh. *BMC psychiatry*, *21*(1), 1-14.
9. Mancuso, L. (2021). Nursing in the time of COVID. Nursing 2022.
10. Nemati, M., Ansary, J., & Nemati, N. (2020). Machine-learning approaches in COVID-19 survival analysis and discharge-time likelihood prediction using clinical data. *Patterns*, *1*(5).
11. Singh, H. K., Joshi, A., Malepati, R. N., Najeeb, S., Balakrishna, P., Pannerselvam, N. K., ... & Ganne, P. (2021). A survey of E-learning methods in nursing and medical education during COVID-19 pandemic in India. *Nurse education today*, *99*, 104796.
12. Fernandez, R., Lord, H., Halcomb, E., Moxham, L., Middleton, R., Alananzeh, I., & Ellwood, L. (2020). Implications for COVID-19: A systematic review of nurses' experiences of working in acute care hospital settings during a respiratory pandemic. *International journal of nursing studies*, *111*, 103637.
13. Nabi, G., & Khan, S. (2020). Risk of COVID-19 pneumonia in aquatic mammals. *Environmental Research*, *188*, 109732.
14. Khatib, S. F., & Nour, A. (2021). The impact of corporate governance on firm performance during the COVID-19 pandemic: Evidence from Malaysia. *Journal of Asian Finance, Economics and Business*, *8*(2), 943-952.
15. McEachan, R., Taylor, N., Harrison, R., Lawton, R., Gardner, P., & Conner, M. (2016). Meta-analysis of the reasoned action approach (RAA) to understanding health behaviors. *Annals of Behavioral Medicine*, *50*(4), 592-612.
16. Zhang, M., Zhou, M., Tang, F., Wang, Y., Nie, H., Zhang, L., & You, G. (2020). Knowledge, attitude, and practice regarding COVID-19 among healthcare workers in Henan, China. *Journal of Hospital Infection*, *105*(2), 183-187.