



AWARENESS OF PREVENTION OF COVID-19 AMONG HEALTHCARE WORKERS IN KOLKATA

Emergency Medicine

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ABSTRACT

Introduction: The recent corona virus infection is known as sars-cov-2 or covid-19. The infection first started in the Wuhan province of China and gradually spread to other countries. On March 12th 2020 it was declared as pandemic by WHO. Extraordinary measures are being adopted to combat the formidable spread of the ongoing outbreak. Under such conditions, people's adherence to preventive measures is greatly affected by their awareness of the disease.

Aim: To assess the knowledge of preventive measures of Covid-19 disease and its related infection control practices among healthcare workers to minimise the risk of transmission.

Material and methods: This is an questionnaire based observational prospective survey on the awareness, knowledge and infection control practices related to Covid 19 infection in the healthcare setting and conducted from May 2020 to September 2020- to collect the data and October 2020 to January 2021 for thesis writing, statistical analysis, discussion and conclusion. This survey involves the doctors, nursing staffs, paramedical staffs, lab technicians and other people who helps in transporting the patients and the people who handles the biomedical wastes. Total 430 participants were taken.

Result: Majority of the health care workers were answered that it is caused by virus (89.1%), the virus can spread from one person to another (89.4%), the virus can be prevented (90.4%), symptoms of the virus was not common cold (94.2%), it is not occurred at certain period of the year (84.7%) and the COVID-19 symptoms are worse with any Co morbidity (83.2%). Health care workers were answered that common symptom of this disease is headache (94.7%), Sore throat (91.6%), Vomiting (92.6%), Persistent cough (96.7%), Running nose (92.6%), Sneezing (95.1%), Muscle aches (93.0%), abdominal pain (93.0%), Fever (96.7%), Diarrhea (92.6%) and Feels tired (93.5%).

Conclusion: This research was help common men to understand the intensity of infection and its symptoms and precaution. It will help out common people to be aware of the threatens level of virus in society and counsel him that it's with everyone, rather than only with him. We suggested that the knowledge of preventive measures of Covid-19 disease and its related infection control practices among healthcare workers to minimise the risk of transmission.

KEYWORDS

COVID-19, Corona virus, Awareness, Questionnaire.

INTRODUCTION

Corona virus contains a positive single stranded RNA genome. The genome estimate is one of the largest among RNA viruses. The recent corona virus infection is known as sars-cov-2 or covid-19. Symptoms are from mild to lethal.

An ongoing outbreak of infection by Severe Acute Respiratory Syndrome-Coronavirus-2 (SARS-CoV-2), termed as COVID-19, aroused the attention of the entire world. The first infected case of coronavirus was reported on December 31, 2019, in Wuhan, China; within few weeks, infections spread across China and to other countries around the world¹. On January 30, 2020, the World Health Organization (WHO) declared the novel coronavirus outbreak a public health emergency of international concern, which was the 6th declaration of its kind in WHO history. Surprisingly, during the first week of March 2020, devastating numbers of new cases were reported globally, and the WHO declared the COVID-19 outbreak a "pandemic" on March 11². The outbreak has now spread to more than 200 countries, areas, or territories beyond China³. SARS-CoV-2 is a novel strain of the coronavirus family that has not been previously identified in humans⁴. The disease spreads through person-to-person contact, and the potential threat to public health is extremely high. It has been estimated that COVID-19 could cost the world more than \$10 trillion, although considerable uncertainty exists concerning the reach of the virus and the effectiveness of the policy response⁵.

Scientists still have limited information about COVID-19, and as a result, the complete clinical picture of COVID-19 is not yet fully understood. Based on as of now accessible data, COVID-19 is a highly contagious disease and its essential clinical indications incorporate fever, dry cough, difficulty in breathing, fatigue, myalgia and dyspnea⁶. This coronavirus spreads primarily through respiratory droplets of >5–10 µm in diameter, release from the mouth or nose, when an infected person coughs or sneezes⁷. Reported illnesses range from very mild (including asymptomatic) to severe including illness resulting to death. Individuals with co-morbidities, including diabetes and hypertension, which are treated with the drugs such as

thiazolidinediones, angiotensin-converting enzyme (ACE) inhibitors, and angiotensin-II receptor blockers (ARBs) have an increased expression of angiotensin-converting enzyme-2 (ACE-2). Since, SARS-CoV-2 binds to their target cells through ACE-2, it was recommended that patients with diabetes, hypertension, and cardiac disease are at the higher risk of developing severe to fatal COVID-19⁸. Besides, elderly people (≥65 years), those and people with chronic lung disease or moderate to severe asthma, who are immunocompromised (due to cancer treatment, bone marrow or organ transplant, AIDS, and long-time use of corticosteroids or other drugs), and those people with severe obesity and chronic liver or kidney disease are at higher risk of developing the COVID-19 severe illness⁹.

AIM OF THE STUDY

The aim of this study is to assess the knowledge of preventive measures of Covid-19 disease and its related infection control practices among healthcare workers to minimise the risk of transmission.

MATERIAL AND METHOD

Questionnaire based observational prospective survey on the awareness, knowledge and infection control practices related to Covid 19 infection in the healthcare setting.

The questionnaire was adopted from the current interim guidance and information for healthcare workers published by the U.S. Centre for Disease Control and Prevention (CDC) and Indian Council of Medical Research (ICMR) and World Health Organisation (WHO)

This survey involves the doctors, nursing staffs, paramedical staffs, lab technicians and other people who helps in transporting the patients and the people who handles the biomedical wastes.

The questionnaire is sent via emails and also distributed among others. Then it will be collected and compared.

Study group:

Sample size was of around 430.

Outcome

- To measure the risk at different aspect of healthcare workers.
- Which group of healthcare workers are more at risk?
- What more they can do to improve the safety measurements?

Timeline: May 2020 to September 2020- data collecting. October 2020 to January 2021- thesis writing, statistical analysis, discussion and conclusion.

Status: On the process of collecting data via soft copies and hard copies.

STATISTICAL ANALYSIS:

For statistical analysis data were entered into a Microsoft excel spreadsheet and then analyzed by SPSS 24.0. and GraphPad Prism version 5. A chi-squared test (χ^2 test) was any statistical hypothesis test wherein the sampling distribution of the test statistic is a chi-squared distribution when the null hypothesis is true. Without other qualification, 'chi-squared test' often is used as short for Pearson's chi-squared test. Unpaired proportions were compared by Chi-square test or Fischer's exact test, as appropriate. p -value ≤ 0.05 was considered for statistically significant.

RESULT AND DISCUSSION

We conducted a questionnaire based observational prospective survey on the awareness, knowledge and infection control practices related to Covid 19 infection in the healthcare setting. This survey involves the doctors, nursing staffs, paramedical staffs, lab technicians and other people who help in transporting the patients and the people who handle the biomedical wastes. Total 430 (100.0%) responders were participated in this survey.

Limbu DK et al¹⁰(2020) showed total of 103 healthcare workers participated in the study. The mean age of the participants was 28.24 ± 6.11 years (range: 20–56); 60.2% were females.

Alao MA et al¹¹(2020) found that the mean age of the respondents was 32.3 ± 9.9 years. There were 116 males (42.6%).

Maleki S et al¹²(2020) found that 191 subjects (118 females and 73 males) with a mean age of 34.7 ± 8.6 years participated in this study. In our study out of 430 (100.0%) respondents, 129(30.0%) respondents were 21-30 years old, 124(28.8%) respondents were 31-40 years old, 135(31.4%) respondents were 41-50 years old, 37(8.6%) respondents were 51-60 years old and 5(1.2%) respondents were 61-70 years old. The mean Age (mean $\pm$ s.d.) of respondents was 37.6814 ± 9.2868 years. 197(45.8%) respondents were Female and 233(54.2%) respondents were Male.

Alao MA et al¹¹(2020) found that the majority of the respondents were medical doctors (114, 41.9%), followed by nurses and clinical students. Of the 272 respondents in this survey, only 70 (25.7%) had adequate knowledge about PPE.

In our survey, 161(37.4%) Doctors, 130(30.2%) Nurses, 90(20.9%) other health care workers and 49(11.4%) Paramedical staffs were present.

Our study showed that 51(31.7%) doctors, 38(29.2%) nurses, 31(34.4%) other health workers and 9(18.4%) paramedical health workers were 21-30 years old. 45(28.0%) doctors, 39(30.0%) nurses, 24(26.7%) other health workers and 16(32.7%) paramedical health workers were 31-40 years old. 48(29.8%) doctors, 42(32.3%) nurses, 28(31.1%) other health workers and 17(34.7%) paramedical health workers were 41-50 years old, 12(7.5%) doctors, 11(8.5%) nurses, 7(7.8%) other health workers and 7(14.3%) paramedical health workers were 51-60 years old. 5(3.1%) doctors were 61-70 years old. Association of Age vs Types of Health Workers was not statistically significant ($p=0.2802$).

It was found that the mean Age (mean $\pm$ s.d.) of Doctors was 37.9814 ± 9.7925 years. The mean Age (mean $\pm$ s.d.) of Nurses was 37.5000 ± 9.0402 years. The mean Age (mean $\pm$ s.d.) of Other Health Workers was 36.3556 ± 9.1065 years. The mean Age (mean $\pm$ s.d.) of Paramedical Health Workers was 39.6122 ± 8.3836 years. Distribution of mean Age with Type of Health Workers was not statistically significant ($p=0.2481$).

We found that 25(15.5%) doctors, 126(96.9%) nurses, 43(47.8%) other health workers and 3(6.1%) paramedical health workers were Female and 136(84.5%) doctors, 4(3.1%) nurses, 47(52.2%) other health workers and 46(93.9%) paramedical health workers were Male. Association of Sex vs Types of Health Workers was statistically significant ($p<0.0001$).

In our study, 377(89.1%) health care workers had answered that it is caused by virus. 381(89.4%) health care workers were answered that the virus can spread from one person to another. 386(90.4%) health care workers were answered that the virus can be prevented. 21(4.9%) health care workers were answered that the symptom of the virus was common cold but 405(94.2%) health care workers were not agreed with the same. 59(13.9%) health care workers were answered that it occurs at certain period of the year but the majority [364 (84.7%)] disagreed with the same. 346(83.2%) health care workers had answered that the COVID-19 symptoms are worse with any Co morbidity.

Our study showed that, 407(94.7%) health care workers were answered that common symptom of this disease is headache. 394 (91.6%) health care workers were answered that common symptom of this disease is sore throat. 398(92.6%) health care workers were answered that common symptom of this disease is Vomiting. 416(96.7%) health care workers were answered that common symptom of this disease is Persistent cough. 398(92.6%) health care workers were answered that common symptom of this disease is running nose. 409(95.1%) health care workers were answered that common symptom of this disease is Sneezing. 400(93.0%) health care workers were answered that common symptom of this disease is Muscle aches. 400(93.0%) health care workers were answered that common symptom of this disease is abdominal pain.

In our study, 416(96.7%) health care workers were answered that common symptom of this disease is Fever. 398(92.6%) health care workers were answered that common symptom of this disease is Diarrhea. 402(93.5%) health care workers were answered that common symptom of this disease is Feels tired.

Tripathi R et al¹³(2020) evaluated that hand hygiene (92.7%) and social distancing (92.3%) were the most common preventive measures taken by respondents that were followed by avoiding travelling (86.9%) to an infected area or country and wearing face masks (86.5%). Significant proportions of HCWs ($P < 0.05$) and more educated participants ($P < 0.05$) showed considerable knowledge of the disease, and all respondents displayed good preparedness for the prevention and control of COVID-19.

Maheshwari S et al¹⁴(2020) assessed that almost all the participants (96.6%) increase the frequency of washing hands under the influence of COVID-19.

WE found that, 418(97.2%) health care workers were advised that Wash hands and face with soap during certain period of time for Prevention from corona virus. 416(96.7%) health care workers were suggested to avoid traveling by any medium for prevention from the corona virus. 400(93.0%) health care workers were suggested to keep social distancing for prevention from the corona virus. 410(95.3%) health care workers were suggested to wear face masks for prevention from the corona virus. 326(75.8%) health care workers were suggested to avoid going to market for prevention from the corona virus. 298(69.3%) health care workers were suggested to avoid morning walk for prevention from the corona virus. 234(54.4%) health care workers were suggested to eat ginger/garlic/hot chilies/pepper for prevention from the corona virus. 243(56.5%) health care workers were suggested to drink warm water for prevention from the corona virus.

Singh AK et al¹⁵(2020) examined that out of total, 98% (513) answered that the virus spreads from one person to another, 95% (494) answered that the disease is caused by a virus.

We found that 161(100.0%) doctors, 130(100.0%) nurses, 45(54.2%) other health workers and 41(83.7%) Paramedical Health Workers suggested that the disease was caused by virus. 7(7.8%) other health workers answered that they don't know the cause of the disease. Association of It is caused by virus vs Types of Health Workers was statistically significant ($p<0.0001$).

We also found that 161(100.0%) Doctors, 130(100.0%) nurses, 47(54.7%) other health care workers and 43(87.8%) Paramedical workers were answered that the virus can spread from one person to another. 4(4.4%) other health care workers were answered that they don't know that the virus can spread from one person to another or not. Association of It can spread from one person to another vs Types of Health Workers was statistically significant ($p<0.0001$).

It was found that 161(100.0%) Doctors, 130(100.0%) Nurses, 55(62.5%) Other health care workers and 40(83.3%) Paramedical health care workers were advised that the virus can be prevented. Only 1(2.0%) Paramedical staffs answered that he doesn't know that the virus can be prevented or not. Association of it can be prevented vs Types of Health Workers was statistically significant ($p<0.0001$).

In our survey out of 430 respondents, all doctors [161(100.0%)], nurses [130(100.0%)] and 70 (77.8%) Other health care workers, 44(89.8%) paramedical health care workers were answered that the symptom of the virus was not only common cold. 17(19.5%) Other health care workers and 4(8.3%) Paramedical health care workers were answered that symptoms of the virus was common cold. Association of It is the same as common cold vs Types of Health Workers was statistically significant ($p<0.0001$).

We found that 161(100.0%) Doctors, 124(95.4%) Nurses, 24(31.2%) Other health care workers and 37(77.1%) Paramedical health care workers were suggested that the symptoms of COVID - 19 are worse with any Co morbidity. 1(2.0%) Paramedical staff and 13(14.4%) Other health care workers were answered that they don't know that the COVID-19 symptoms are worse with any Comorbidity or not. Association of COVID-19 symptoms are worse with any Comorbidity vs Types of Health Workers was statistically significant ($p<0.0001$).

It was found that, 161(100.0%) Doctors, 130(100.0%) Nurses, 68(75.6%) Other health care workers and 48(98.0%) Paramedical health care workers were answered that common symptom of this disease is headache. Association of Headache vs Types of Health Workers was statistically significant ($p<0.0001$). 161(100.0%) Doctors, 130(100.0%) Nurses, 57(63.3%) Other health care workers and 46(93.9%) Paramedical health care workers were answered that common symptom of this disease is Sore throat. Association of Sore throat vs Types of Health Workers was statistically significant ($p<0.0001$). 161(100.0%) Doctors, 130(100.0%) Nurses, 62(68.9%) Other health care workers and 45(91.8%) Paramedical health care workers were answered that common symptom of this disease is Vomiting also. Association of Vomiting vs Types of Health Workers was statistically significant ($p<0.0001$).

Priya P et al¹⁶(2020) examined that Cough (95.87%) and fever (90.72%) were the most common symptoms. The majority of the interns (90%) agreed that coronavirus could lead to pneumonia, respiratory failure, and renal failure.

We found that 161(100.0%) Doctors, 130(100.0%) Nurses, 78(86.7%) Other health care workers and 47(95.9%) Paramedical health care workers were answered that common symptom of this disease is Persistent cough. Association of Persistent cough vs Types of Health Workers was statistically significant ($p<0.0001$). 161(100.0%) Doctors, 130(100.0%) Nurses, 78(86.7%) Other health care workers and 47(95.9%) Paramedical health care workers were answered that the common symptom of this disease is Fever. Association of Fever vs Types of Health Workers was statistically significant ($p<0.0001$).

It was found that, 161(100.0%) Doctors, 130(100.0%) Nurses, 60(66.7%) Other health care workers and 47(95.9%) Paramedical health care workers were answered that common symptom of this disease is running nose. Association of Running nose vs Types of Health Workers was statistically significant ($p<0.0001$). 161(100.0%) Doctors, 130(100.0%) Nurses, 70(77.8%) Other health care workers

and 48(98.0%) Paramedical health care workers were answered that common symptom of this disease is Sneezing. Association of Sneezing vs Types of Health Workers was statistically significant ($p<0.0001$).

In our study, 161(100.0%) Doctors, 130(100.0%) Nurses, 63(70.0%) Other health care workers and 46(93.9%) Paramedical health care workers were answered that common symptom of this disease is Muscle aches. Association of Muscle ache vs Types of Health Workers was statistically significant ($p<0.0001$). 161(100.0%) Doctors, 130(100.0%) Nurses, 65(72.2%) Other health care workers and 44(89.8%) Paramedical health care workers were answered that common symptom of this disease is abdominal pain. Association of Abdominal pain vs Types of Health Workers was statistically significant ($p<0.0001$). 161(100.0%) Doctors, 130(100.0%) Nurses, 60(66.7%) Other health care workers and 47 (95.9%) Paramedical health care workers were answered that common symptom of this disease is Diarrhea. Association of Diarrhea vs Types of Health Workers was statistically significant ($p<0.0001$). 161(100.0%) Doctors, 130(100.0%) Nurses, 64(71.1%) Other health care workers and 47 (95.9%) Paramedical health care workers were answered that common symptom of this disease is tiredness. Association of Feeling tired vs Types of Health Workers was statistically significant ($p<0.0001$).

Priya P et al¹⁶(2020) showed that about 90% considered that it can be prevented by hand washing, wearing masks, and by maintaining distance.

Karthek AV et al¹⁷(2020) evaluated that 97.6% respondents agreed about frequently washing hand, only 77.87% confirmed about washing hands ≥ 20 secs.

We found that 161(100.0%) Doctors, 130(100.0%) Nurses, 78(86.7%) Other health care workers and 49 (100.0%) Paramedical health care workers were advised that wash hands and face with soap during certain period of time to prevent the spread of COVID-19 which was statistically significant ($p<0.0001$). 161(100.0%) Doctors, 130(100.0%) Nurses, 70(77.8%) Other health care workers and 49 (100.0%) Paramedical health care workers were advised to wear face masks to prevent the spread of COVID-19 diseases. Association of Wearing face masks vs Types of Health Workers was statistically significant ($p<0.0001$).

Karthek AV et al¹⁷(2020) examined that the adherence to social distancing and lockdown restrictions was confirmed by 97.3% and 97.3%, respectively.

We found that 161(100.0%) Doctors, 130(100.0%) Nurses, 60(66.7%) Other health care workers and 49 (100.0%) Paramedical health care workers were suggested to maintain social distancing to prevent the spread of COVID-19 disease. Association of Social distancing vs Types of Health Workers was statistically significant ($p<0.0001$).

We studied that, 161(100.0%) Doctors, 130(100.0%) Nurses, 76(84.4%) Other health care workers and 49 (100.0%) Paramedical health care workers were suggested to avoid traveling by any medium to prevent the spread of COVID-19. This was also statistically significant ($p<0.0001$).

It was found that, 87(54.0%) Doctors, 71(54.6%) Nurses, 48(53.3%) Other health care workers and 28 (57.1%) Paramedical health care workers were suggested to eat ginger/garlic/hot chilies/pepper as prevention from COVID-19 disease which was not statistically significant ($p=0.9775$). 91(56.5%) Doctors, 74(56.9%) Nurses, 51(56.7%) Other health care workers and 27 (55.1%) Paramedical health care workers were suggested to drink warm water as prevention from COVID-19 disease. Association of Drinking warm water vs Types of Health Workers was not statistically significant ($p=0.9971$).

Table: Association between Persistent cough, COVID-19 symptoms are worse with any Comorbidity, It can spread from one person to another, Fever and Wash hands and face with soap during certain period of time : Type of Health Workers

		TYPE OF HEALTH WORKERS					p-value
		Doctor	Nurse	Other	Paramedical	TOTAL	
Persistent cough	No	0	0	12	2	14	<0.0001
	Row %	0.0	0.0	85.7	14.3	100.0	
	Col %	0.0	0.0	13.3	4.1	3.3	

	Yes	161	130	78	47	416	
	Row %	38.7	31.3	18.8	11.3	100.0	
	Col %	100.0	100.0	86.7	95.9	96.7	
	TOTAL	161	130	90	49	430	
	Row %	37.4	30.2	20.9	11.4	100.0	
	Col %	100.0	100.0	100.0	100.0	100.0	
COVID-19 symptoms are worse with any Comorbidity	Don't Know	0	0	13	1	14	<0.0001
	Row %	0.0	0.0	92.9	7.1	100.0	
	Col %	0.0	0.0	14.4	2.0	3.3	
	No	0	6	53	11	70	
	Row %	0.0	8.6	75.7	15.7	100.0	
	Col %	0.0	4.6	58.9	22.4	16.3	
	Yes	161	124	24	37	346	
	Row %	46.5	35.8	6.9	10.7	100.0	
	Col %	100.0	95.4	26.7	75.5	80.5	
	TOTAL	161	130	90	49	430	
	Row %	37.4	30.2	20.9	11.4	100.0	
	Col %	100.0	100.0	100.0	100.0	100.0	
It can spread from one person to another	Don't Know	0	0	4	0	4	<0.0001
	Row %	0.0	0.0	100.0	0.0	100.0	
	Col %	0.0	0.0	4.4	0.0	0.9	
	No	0	0	39	6	45	
	Row %	0.0	0.0	86.7	13.3	100.0	
	Col %	0.0	0.0	43.3	12.2	10.5	
	Yes	161	130	47	43	381	
	Row %	42.3	34.1	12.3	11.3	100.0	
	Col %	100.0	100.0	52.2	87.8	88.6	
	TOTAL	161	130	90	49	430	
	Row %	37.4	30.2	20.9	11.4	100.0	
	Col %	100.0	100.0	100.0	100.0	100.0	
Fever	No	0	0	12	2	14	<0.0001
	Row %	0.0	0.0	85.7	14.3	100.0	
	Col %	0.0	0.0	13.3	4.1	3.3	
	Yes	161	130	78	47	416	
	Row %	38.7	31.3	18.8	11.3	100.0	
	Col %	100.0	100.0	86.7	95.9	96.7	
	TOTAL	161	130	90	49	430	
	Row %	37.4	30.2	20.9	11.4	100.0	
	Col %	100.0	100.0	100.0	100.0	100.0	
Wash hands and face with soap during certain period of time	No	0	0	12	0	12	<0.0001
	Row %	0.0	0.0	100.0	0.0	100.0	
	Col %	0.0	0.0	13.3	0.0	2.8	
	Yes	161	130	78	49	418	
	Row %	38.5	31.1	18.7	11.7	100.0	
	Col %	100.0	100.0	86.7	100.0	97.2	
	TOTAL	161	130	90	49	430	
	Row %	37.4	30.2	20.9	11.4	100.0	
	Col %	100.0	100.0	100.0	100.0	100.0	

CONCLUSION

We found that 161(37.4%) health care workers were Doctor, 130(30.2%) health care workers were Nurse, 90(20.9%) health care workers were other and 49(11.4%) health care workers were Paramedical.

Majority of the health care workers were answered that it is caused by virus (89.1%), the virus can spread from one person to another (89.4%), the virus can be prevented (90.4%), symptoms of the virus was not common cold (94.2%), it is not occurred at certain period of the year (84.7%) and the COVID-19 symptoms are worse with any Co morbidity (83.2%).

We found that doctors and nurses correct answered among the knowledge of Covid-19 disease and its related infection control practices which were statistically significant.

Health care workers were answered that common symptom of this disease is headache (94.7%), Sore throat (91.6%), Vomiting (92.6%), Persistent cough (96.7%), Running nose (92.6%), Sneezing (95.1%), Muscle aches(93.0%), abdominal pain (93.0%), Fever (96.7%), Diarrhea (92.6%) and Feels tired (93.5%).

It was found that doctors and nurses correctly answered among the COVID-19 symptoms which were statistically significant.

All doctors and Nurses were advised that wash hands and face with

soap during certain period of time for Prevention from corona virus, avoid traveling by any medium for prevention from the corona virus, maintain social distancing to prevent spread of Corona virus disease, wear face masks to prevent the spread of corona virus diseases. Majority of the doctors were suggested to avoid going to market by any medium and avoiding morning walk by any medium for prevention from the corona virus.

In conclusion this research was help common men to understand the intensity of infection and its symptoms and precaution. It will help out common people to be aware of the threatens level of virus in society and counsel him that it's with everyone, rather than only with him.

We suggested that the knowledge of preventive measures of Covid-19 disease and its related infection control practices among healthcare workers to minimise the risk of transmission.

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