

# Practices and Barriers for Personal Protective Equipment among Health Care Workers during COVID-19 Pandemic Management at Tertiary Care Government Hospital of South Gujarat, India

Keshvi Chauhan<sup>1\*</sup>, Summaiya Mullan<sup>2</sup>, Yogita Mistry<sup>2</sup>

<sup>1</sup>Government Medical College, Surat, India

<sup>2</sup>Department of Microbiology, Government Medical College, Surat, India

Email: \*keshvichauhan@gmail.com, mullasummaiya@gmail.com

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## Abstract

**Introduction:** The recent COVID-19 pandemic has prompted concern about the compatibility of IPC guidelines with health care workers, their working practices and behaviours. These guidelines can be difficult and time-consuming to adhere to in practice. By identifying barriers and facilitators to IPC guideline adherence, especially using personal protective equipment (PPE), we can identify focussed strategies that will support health care workers to undertake the IPC measures needed at such a critical time in health care internationally.

**Material & Methods:** This was a cross-sectional study designed during the COVID-19 pandemic management in the South Gujarat region, to analyse the knowledge, attitude and practices of health care workers about their usage of personal protective equipment. A semi-structured questionnaire-based study was prepared, deriving pointers from our previous experience of seasonal flu outbreaks. 225 participants enrolled who were doctors, resident doctors, nurses, lab technicians, ward boys and food distributors. **Result:** Analysis of the barriers-related questions show good preparedness by the medical institution. Overall we found good knowledge, attitude and practice related to PPE during COVID-19 pandemic management. There are few gaps found in the knowledge of donning of PPE (p=0.0075), N-95 mask related knowledge (p=0.01) and the attitude that PPE use causes discomfort while nursing patients (0.0001).

## Keywords

COVID-19, Personal Protective Equipment, Health Care Workers, Barriers,

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## 1. Introduction

Personal protective equipment helps prevent the spread of germs in the hospital. PPE is used in healthcare settings to create a barrier between health care workers and infectious agents from the patients, sometimes be used by the patient's family/visitors if providing direct patient care or assisting patients in their routine. The recent COVID-19 pandemic has prompted concern about the compatibility of IPC guidelines with health care workers; working practices and behaviours. Strategies in these guidelines include the use of Personal Protective Equipment (PPE) such as masks, face shields, gloves and gowns; the separation of patients with respiratory infections from others, and strict cleaning routines [1]. These strategies can be difficult and time-consuming to adhere to in practice. By identifying barriers and facilitators to IPC guideline adherence, we can more easily identify strategies that will support health care workers to undertake the IPC measures needed at such a critical time in health care intentionally [2]. It can help to minimize the risk of developing COVID-19 while working in clinical laboratories/hospitals. The novel coronavirus outbreak may be especially hazardous to health care personnel. National Institute of Health revealed that the infection rate of health care workers among the total number of COVID-19 patients is as high as 10.7%.

## 2. Material & Methods

This was a cross-sectional study designed during COVID-19 pandemic management at tertiary COVID care Hospital in India to analyze the barriers and knowledge, attitude and practices in health care workers for PPE. Semi-structured questionnaires based study based on our previous experience of seasonal flu outbreak. Health care workers both medical and paramedical staff working in COVID-19 pandemic management were targeted for the study. Approximately 300 health care workers were working in COVID-19 management at tertiary care COVID Hospital of south Gujarat, India. Taking the non-response rate of 25% due to a busy schedule, non-consent, working with PPE, 225 participants enrolled. Convenient sampling was done for those willing to participate and who comprehend Gujarati/English [3]. Treating doctors, resident doctors, nurses, lab technicians, ward boys, food distributors were included [4]. This was the only COVID healthcare sector of the southern zone of Gujarat which is a Teaching institute of Government. Participants were enrolled during their break time or before entering or leaving duty hours for the study. Every participant was interacted with individually. They were informed briefly about the study by a participant information sheet and also informed that have to spend only 10 minutes times once for filling up questionnaires. Informed consent was taken from every

participant. Complete questionnaires about PPE were given to every participant. The identity of them was decoded by giving them a unique ID number [5].

## 2.1. Data Collection

After the Human Research Ethical Committee of the institute approved the study. The survey was done during June and July 2020. All collected data was entered into an excel sheet. Scoring was done as 0 for wrong answers and 1 for the right answer for barrier, knowledge and practices related questions. For attitude-related question analysis, Likert grading was used for the answer of strongly agree, agree, neutral, disagree and strongly disagree.

## 2.2. Data Analysis

SPSS software version-12 was used to analyze the biostatistical data. Chi-square test, Fisher exact test was used for qualitative data analysis. An Independent t-test was used to find out statistically significant. A *P-value* of less than 0.05 was used to see the statistical significance level.

## 3. Result

During June 2020, the study was conducted after ethical approval. During that time, health care workers/frontline workers who were working in COVID-19 and who were willing in COVID 19 study were enrolled. Overall 215 health care workers were enrolled out of which 60(28%) faculty and resident doctors, 26 (12%) intern doctors, 31 (14%) were lab technicians, 62 (29%) were nurses, 36 (17%) were servants.

Out of 215, 27 healthcare workers were experienced with seasonal flu outbreaks in the past; of which 12 were doctors, 4 were nurses, 2 servants and 9 lab technicians were there.

Regarding barriers to PPE related questions, 59 (98%) faculty and resident doctors, 25 (96%) intern doctors, 30 (96%) laboratory technicians, 57 (91%) nurses, 24 (37%) servants have received training regarding PPE donning and doffing. The majority was trained by group training conducted at the institute itself, 20 got training by one to one personal training. Also, they supplemented their learning internet, through tutorial video, through colleagues and by other means. 57 (95%) faculty and resident doctors, 24 (92%) intern doctors, 30 (97%) laboratory technicians, 52 (84%) nurses, 30 (83%) servants have answered that there were separate spaces available for donning and doffing in their working area. As per 57 (95%) faculty and resident doctors, 24 (92%) intern doctors, 30 (97%) laboratory technicians, 59 (95%) nurses, 35 (97%) servants, enough stock of PPE is also available. Quantity of PPE is provided is also good as per 55 (92%) faculty and resident doctors, 15 (58%) intern doctors, 30 (97%) laboratory technicians, 56 (90%) nurses, 33 (92%) servants replied. But only 39 (65%) faculty and resident doctors, 9 (35%) intern doctors, 26 (84%) laboratory technicians, 26 (42%) nurses, 27 (75%) servants healthcare workers have answered that there is

no fitting issue. 21 (35%) faculty and resident doctors, 17 (64%) intern doctors, 5 (16%) laboratory technicians, 36 (58%) nurses, 9 (25%) servants have fitting issue.

Regarding knowledge related questionnaires analysis of HCWs is shown in **Table 1**. 60 (100%) faculty and resident doctors, 26 (100%) intern doctors, 30 (97%) laboratory technicians, 61 (98%) nurses, 22 (61%) servants know the full form of PPE. The sequence of donning a PPE is known only by 30 (50%) faculty and resident doctors, 16 (62%) intern doctors, 23 (74%) laboratory technicians, 34 (55%) nurses, 11 (31%) servants with a statistical significance with p-value 0.0075. 19 (32%) faculty and resident doctors, 14 (54%) intern doctors, 11 (35%) laboratory technicians, 37 (60%) nurses, 21 (58%) servants answered incorrectly regarding N-95 mask related questions, that are about the protective efficacy of N-95 mask, how N-95 differ from the simple surgical mask and this is statistically significant with p-value 0.0174. So this area should also be corrected by training them. 60 (100%) faculty and resident doctors, 26 (100%) intern doctors, 31 (100%) laboratory technicians, 61 (98%) nurses, 36 (100%) servants know that they should wear PPE while transportation of COVID patient/suspected person. 57 (95%) faculty and resident doctors, 26 (100%) intern doctors, 31 (100%) laboratory technicians, 61 (98%) nurses, 36 (100%) servants that PPE should be while handling the dead body of COVID 19 patient.

This suggests that HCWs are well aware of COVID-19 infections and transmission routes so that they have to wear PPE to prevent the spread of infection.

Regarding attitude-related questionnaire, analysis is shown in **Table 2**, which shows that there is a statistically significant with p-value 0.0047 for the question on the use of PPE should be there every time during COVID-19 pandemic management. But there is a gap in attitude related to wearing PPE that brings discomfort while nursing the COVID-19 patients.

**Table 1.** Analysis of No. of HCWs for knowledge related questions of PPE.

Knowledge Assessment	Answer	Faculty & Resident No (%) n = 60	Intern Doctor No (%) n = 26	Lab Technician No (%) n = 31	Nurse No (%) n = 62	Servant No (%) n = 36	Total Health Care workers	P value
Full Form of PPE	Correct	60 (100)	26 (100)	30 (96.8)	61 (98.4)	22 (61.1)	196	0.2
	Incorrect	NIL	NIL	01 (3.2)	01 (1.6)	14 (38.9)	16	
Sequence of Donning of PPE	Correct	30 (50.0)	16 (61.5)	23 (74.2)	34 (54.8)	11 (30.6)	114	0.0075
	Incorrect	30 (50.0)	10 (38.5)	08 (25.8)	28 (45.2)	25 (69.4)	101	
N-95 mask protects against the particle which are of size less than	Correct	41 (68.3)	10 (38.46)	20 (64.5)	19 (30.64)	9 (25)	99	0.0174
	Incorrect	19 (31.66)	14 (53.84)	11 (35.48)	37 (59.67)	21 (58.33)	102	
Wear full PPE while transport of patient	Correct	60 (100)	26 (100)	31 (100)	61 (98.4)	36 (100)	214	0.6484
	Incorrect	NIL	NIL	NIL	01 (1.6)	NIL	1	
Wear full PPE while transport of dead patient	Correct	57 (95.0)	26 (100)	31 (100)	61 (98.4)	36 (100)	211	0.285
	Incorrect	03 (5.0)	NIL	NIL	01 (1.6)	NIL	4	

**Table 2.** Analysis of No of HCWs for attitude related questions of PPE.

Attitude Assessment	Result	Faculty & Resident No (%) n = 60	Intern Doctor No (%) n = 26	Lab Technician No (%) n = 31	Nurse No (%) n = 62	Servant No (%) n = 36	Total HCW	P value
<b>Wearing PPE in pandemic outbreak can protect me from COVID-19 infection</b>	SA	13 (21.7)	08 (30.8)	06 (19.3)	22 (35.5)	15 (41.7)	<b>64</b>	<b>0.5035</b>
	A	38 (63.3)	16 (61.5)	22 (71.0)	32 (51.6)	19 (52.8)	<b>127</b>	
	N	09 (15.0)	02 (7.7)	03 (9.7)	07 (11.3)	02 (5.6)	<b>23</b>	
	D	NIL	NIL	NIL	NIL	NIL	<b>0</b>	
	SD	NIL	NIL	NIL	01 (1.6)	NIL	<b>1</b>	
<b>For my patients, I can endure the discomfort caused by PPE during COVID-19 Pandemic Management</b>	SA	14 (23.3)	10 (38.5)	06 (19.3)	14 (22.6)	20 (55.6)	<b>64</b>	<b>0.2</b>
	A	35 (58.3)	13 (50.0)	11 (35.5)	38 (61.3)	15 (41.7)	<b>112</b>	
	N	11 (18.3)	02 (7.7)	14 (45.2)	10 (16.1)	01 (2.7)	<b>38</b>	
	D	NIL	01 (3.8)	NIL	NIL	NIL	<b>1</b>	
	SD	NIL	NIL	NIL	NIL	NIL	<b>0</b>	
<b>I would work wearing PPE anytime during COVID-19 pandemic outbreak</b>	SA	13 (21.7)	09 (34.6)	09 (29.0)	24 (38.7)	17 (47.2)	<b>72</b>	<b>0.0047</b>
	A	41 (68.3)	08 (30.8)	18 (58.1)	33 (53.2)	17 (47.2)	<b>117</b>	
	N	06 (10.0)	06 (23.1)	03 (9.7)	04 (6.5)	02 (5.6)	<b>21</b>	
	D	NIL	03 (11.5)	01 (3.2)	01 (1.6)	NIL	<b>5</b>	
	SD	NIL	NIL	NIL	NIL	NIL	<b>0</b>	
<b>Wearing PPE brings discomfort in nursing care to the COVID-19 patients</b>	SA	08 (13.3)	06 (23.1)	11 (35.5)	22 (35.5)	15 (41.7)	<b>62</b>	<b>0.0001</b>
	A	39 (65.0)	17 (65.4)	18 (58.1)	36 (58.1)	19 (52.8)	<b>129</b>	
	N	13 (21.7)	NIL	01 (3.2)	04 (6.4)	02 (5.5)	<b>20</b>	
	D	NIL	03 (11.5)	01 (3.2)	NIL	NIL	<b>4</b>	
	SD	NIL	NIL	NIL	NIL	NIL	<b>0</b>	
<b>I know very well how to use PPE</b>	SA	24 (40.0)	06 (23.1)	24 (77.4)	33 (53.2)	20 (55.6)	<b>107</b>	<b>0.0008</b>
	A	35 (58.3)	16 (61.5)	06 (19.4)	26 (41.9)	14 (38.8)	<b>97</b>	
	N	01 (1.7)	04 (15.4)	NIL	03 (4.8)	01 (2.8)	<b>9</b>	
	D	NIL	NIL	01 (3.2)	NIL	01 (2.8)	<b>2</b>	
	SD	SD	NIL	NIL	NIL	NIL	<b>0</b>	

Regarding practices related questionnaire, the majority has responded correctly. 18 (30%) faculty and resident doctors, 25 (96%) intern doctors, 23 (74%) laboratory technicians, 15 (24%) nurses, 4 (11%) servants responded correctly for their hand hygiene practice before wearing PPE. 58 (97%) faculty and resident doctors, 25 (96%) intern doctors, 31 (100%) laboratory technicians, 59 (95%) nurses, 33 (92%) servants responded correctly about the use of hand rubbing/washing in between two COVID-19 patients. 60 (100%) faculty and resident doctors, 26 (100%) intern doctors, 30 (97%) laboratory technicians, 61 (98%) nurses, 32 (89%) servants having a practice at discarding PPE in a designated doffing room. 59 (98%) faculty and resident doctors, 25 (96%) intern doctors, 30 (97%) laboratory technicians, 59 (95%) nurses, 36 (100%) servants practicing correctly about goggles and gloves discarding, that is in a recorded biohazard bag. 60 (100%) faculty and resident doctors, 26 (100%) intern doctors, 30 (97%) laboratory technicians, 57 (92%) nurses, 33 (92%) servants practicing double-layered gloves while touching patient. **Table 3** is showing an analysis of HCWs for their practices related to PPE.

#### 4. Discussion

Since its initial outbreak in December 2019, the COVID-19 disease has had a cascading effect worldwide [6]. The identification and isolation of a suspected case is the most important step in preventing the spread of COVID-19. Awareness of the use of personal protective equipment (PPE) for suspected/confirmed COVID-19 cases was high among all groups of healthcare professionals similar to other studies [7].

**Table 3.** Analysis of No of HCWs for practice-related questions of PPE.

Practice Assessment	Answer	Faculty & Resident No (%) n = 60	Intern Doctor No (%) n = 26	Lab Technician No (%) n = 31	Nurse No (%) n = 62	Servant No (%) n = 36	Total HCWs	P value
Are you doing your hand hygiene before PPE wearing during COVID-19 management?	Correct	18 (30.0)	25 (96.2)	23 (74.2)	15 (24.2)	04 (11.1)	85	0.2
	Incorrect	42 (70.0)	01 (3.8)	08 (25.8)	47 (75.8)	32 (88.9)	130	
Do you perform hand-rubbing or hand-washing in between 2 COVID-19 patients?	Correct	58 (96.7)	25 (96.2)	31 (100)	59 (95.2)	33 (91.7)	206	0.5445
	Incorrect	02 (3.3)	01 (3.8)	NIL	03 (4.8)	03 (8.3)	9	
Are you discarding your PPE in designated doffing room during COVID-19 management?	Correct	60 (100)	26 (100)	30 (96.8)	61 (98.4)	32 (88.9)	209	0.0174
	Incorrect	NIL	NIL	01 (3.2)	01 (1.6)	04 (11.1)	6	
Where you discard your goggles and gloves?	Correct	59 (98.3)	25 (96.2)	30 (96.8)	59 (95.2)	36 (100)	209	0.6626
	Incorrect	01 (1.7)	01 (3.8)	01 (3.2)	03 (4.8)	NIL	6	
Are you using double layered gloves while touching COVID-19 patient?	Correct	60 (100)	26 (100)	30 (96.8)	57 (91.9)	33 (91.7)	209	0.1033
	Incorrect	NIL	NIL	01 (3.2)	05 (8.1)	03 (8.3)	6	

In barrier related questions, the overall response is good. Healthcare workers are trained by various means. Also dedicated donning and doffing areas were allotted, but due to immediate preparedness, within a short time, different size PPEs would not be made available to them [8].

Regarding the sequence of donning PPE and N-95 mask protection efficacy related knowledge questions, there is a gap and need training regarding proper PPE donning and doffing [9]. As they are already trained for the same but not practicing properly and that's why it is seen in knowledge also. HCWs are well aware of COVID-19 infections and transmission routes so that they have to consistently wear PPE in hospitals to prevent the spread of infection. Attitude and practices related questions are also answered correctly overall.

## 5. Conclusion

Overall institutional preparedness along with the help of the Government of Gujarat is good for COVID-19 pandemic management. Staff was trained by various means still, there is a gap found in knowledge regarding donning of PPE and N-95 mask-related knowledge. HCWs have a good attitude and practice regarding PPE use. Few gaps which were found can be corrected by proper training and re-training.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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