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Original Research Article

Assessment of knowledge, attitude & practices regarding use of personal protective equipment among healthcare workers with regards to COVID 19

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ABSTRACT

Background & Objectives : The COVID-19 Pandemic is an ongoing crisis that has strained hospitals and health systems around the globe. The provision of personal protective equipment (PPE) for frontline healthcare workers is of utmost importance in sustaining an effective response to this crisis. The aim of this study was to assess the knowledge, attitude and practice (KAP) amongst healthcare workers about knowledge, attitude and practices regarding us of PPE.
Materials and Methods: An online cross-sectional descriptive study was conducted from July 2020 to August 2020 at a tertiary care hospital and teaching institute of Navi Mumbai.
Results: A total of 250 subjects responded to the questionnaire. Most of the respondents were 25-35 years of age. 40% were males whereas majority of the respondents were postgraduate residents followed by nursing staffs. Of the 272 respondents in this survey, only 70 (25.7%) had adequate knowledge about PPE. The knowledge of appropriate use of PPE is best among postgraduate residents, whereas the practices is best among nursing staffs.
Interpretation & Conclusion: The study showed that HCWs' knowledge, practices and attitude regarding appropriate use of PPE is good. However, continuous training program must be conducted on practical training on appropriate PPE use.

1. Introduction

Current pandemic, COVID-19, a Coronavirus disease is caused by novel Corona virus, previously known as 2019-nCoV.[1] The outbreak of the coronavirus disease (COVID-19) was first reported in Wuhan, China, in December 2019 and disease has since spread rapidly across the globe impacting greatly on health, economics and social life on a global scale.[2] On 11^{th} March 2020, COVID-19 was declared a pandemic by World Health Organisation (WHO).[3] The rapid spread of COVID-19 has caused challenges world-wide, especially to health-care workers in health care settings. The healthcare workers (HCWs) are at the frontline of COVID- 19 pandemic defence and are exposed to, not only infection with COVID-19 due to their frequent exposure to infected individuals, but also psychological distress, long working hours, fatigue, occupational stigma and physical violence.[1] Outbreaks of any newly emerging or remerging infectious diseases present a unique challenge and a threat to healthcare worker and other frontline responders due to limited understanding of the emerging threat and reliance on infection prevention and control (IPC) measures that may not consider all transmission dynamics of the emerging pathogens. Furthermore, HCWs understanding and skills around the use of personal protective equipment (PPE) vary widely. The use of PPEs is important during the early

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stage of an outbreak or pandemic when drugs, a vaccine and other control measures are not available, or access is limited. Commonly used PPE to protect from respiratory infections like COVID 19 are face masks, respirators, gloves, and goggles or face shields. Face masks (or medical masks) are the most commonly used PPE to protect from influenza and other respiratory infection in healthcare settings whereas N95 mask in most important in airborne infections or COVID 19 aerosol generating procedures. Apart from other infection control and prevention strategies like administrative and environmental control measures, appropriate use of PPE is most commonly used in healthcare settings as standard, droplet and airborne precautions to protect healthcare workers from infections and to prevent further spread to patients around them. It is well documented that transmission of COVID-19 disease among HCWs is associated with overcrowding, absence of isolation room facilities and environmental contamination, but inadequate awareness of hospital infection control & prevention practices , may heightens the risk of infections in HCWs.[4] The correct use of personal protective equipment (PPE) eg. donning, doffing, and other measures are crucial part of COVID 19 infection prevention & control among HCWs.[1,4]

Hence, the knowledge, practices, and attitude of healthcare workers (HCW) about use of PPE also determine the transmission and prevention of COVID-19 infection. So, keeping this as front runner, the present study was conducted with the objective of assessing knowledge, attitude and practices among health care workers regarding correct use of personal protective equipment (PPE) in a tertiary care teaching hospital in Navi Mumbai which may be of immense help to the authorities to formulate protocols as well as strengthening hospital infection control practices.

2. Materials and Methods

2.1. Study design

An online cross-sectional descriptive study was conducted from July 2020 to August 2020 at a tertiary care hospital and teaching institute of Maharashtra.

Frontline Health-care workers who were directly involved COVID-19 treatment and prevention and having direct contact with suspected or confirmed COVID-19 patients were enrolled for the study after an informed consent. These included Doctors, Nurses, Post-graduate students and administrators.

The faculties and Staff, above 60 years, with co-morbidities were excluded from the study.

We opted to use WhatsApp Messenger for enrolling the participants as the nationwide lockdown at the time of study. HCWs, who could approach through WhatsApp groups participated in study.

An online data collection for the study was designed and executed by using Google forms (via docs.google.com). The google form link to the self-administered questionnaire consisting of socio-demographic questions (like age , gender, profession & work experience in years) and 20 questions based on knowledge , attitude and practices regarding use of personal protective equipment related to COVID -19 disease in health care setting. The questions were prepared and adapted from standard guideline of WHO, CDC.[1,5] Consent was obtained from all study participants.

Each correct response weight 1 point and 0 point for incorrect responses. Data was tabulated in Microsoft Excel 2016, and descriptive statistics were performed using SPSS 20.0 version.

3. Results

A total of 250 participants were included the study after taking consent. Most of them were post-graduates 95 (38%) followed by 83 nursing staffs (33.3%), 46 faculty members (18.4%) and 26 administrators (10.4%). Since the study was conducted in a COVID 19 designated hospital and regular training had been conducted by infection control team members one of the most important infection prevention measure ‘appropriate & correct use of personal protective equipment.

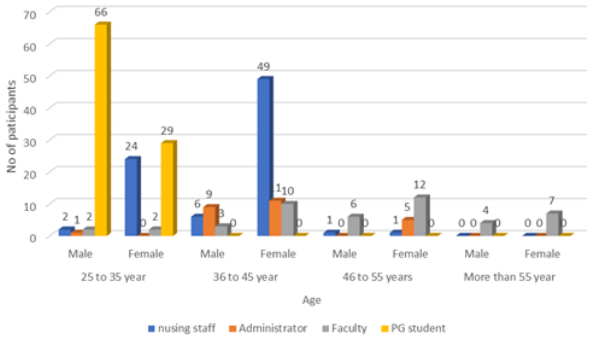

Fig. 1: Age, Gender and Staff wise Classification of Study Participants

Most of the participants attended the regular training program on PPE. 206 participants correctly answered that the most critical part of PPE is mask or N95 mask. (Table 1) It has been observed that who have not attended training most of them were also correctly answered. Among 250 participants, 91 PG students, 67 nursing staffs, 41 faculty members and 15 administrators had answered the correct donning sequence of PPE. While doffing is a crucial part for COVID-19 infection prevention, it has been observed that only 171 participants answered the correct doffing sequence. (Table 1)

Table 1: The participant's knowledge on use of PPE

Staff Questions↓	Nursing staff	Administrator	Faculty	PG students	Total	Chi square	p
1. **Have you ever attended any training on COVID-19 in your hospital**							
Yes	81	20	39	82	222	11.472	0.009
No	2	6	7	13	28		
2. Most critical component which determines the efficacy of PPE for COVID-19 is							
Correct	61	25	41	79	206	9.405	0.024
Incorrect	22	1	5	16	44		
3. Which of the following is correct PPE donning sequence?							
Correct	67	15	41	91	214	26.497	0.000
Incorrect	16	11	5	4	36		
4. Which of the following is true about PPE doffing							
Correct	67	24	39	86	216	4.528	0.210
Incorrect	16	2	7	9	34		
5. The correct sequence of doffing of PPEs is							
Correct	43	16	37	75	171	19.111	0.000
Incorrect	40	10	9	20	79		
6. What is the percentage of alcohol used in hand-rub in COVID-19 areas?							
Correct	29	20	37	44	130	32.279	0.000
Incorrect	54	6	9	51	120		
7. How many steps are there to do the hand hygiene using hand-rub?							
Correct	42	13	25	60	140	3.388	0.336
Incorrect	41	13	21	35	110		
8. N95 mask to be mandatory used in OPDs for routine examination of patients during COVID-19 pandemic							
Correct	29	7	34	63	133	32.817	0.000
Incorrect	54	19	12	32	117		
9. The correct method of wearing regular triple layered medical mask is							
Correct	80	20	43	83	226	10.376	0.016
Incorrect	3	6	3	12	24		
10. You are posted in COVID ICU and need to use washroom, what steps will you follow before you enter COVID ICU							
Correct	47	15	32	82	176	21.135	0.000
Incorrect	36	11	14	13	74		

Hand hygiene by using alcohol-based hand sanitizer or hand rub another important infection prevention measure for COVID-19. Among 250 participants, only 120 participants knew the correct alcohol percentage of hand-rub and 140 participants knew correct steps of hand hygiene using 70% alcohol-based hand-rub. According to majority of the study participants (133) N95 mask use is mandatory for routine OPD examination. But most of the participants (226) knew the correct method of wearing surgical. 176 participants correctly answered the right etiquettes of using washroom on COVID-19 ICU duty and 196 followed donning-doffing protocol on ICU duty. (Table 1)

Regarding right practices of PPE use, among 250 participants, 237 participants were aware about regularly outer gloves change during COVID-19 duty and all of them (250, 100%) were familiar with removal of personal items eg. Bangles, rings before donning. 226 study participants agreed that they reuse N95 mask at hospital. Majority of them (200) were in favour of wearing double mask i.e. surgical mask beneath N95 mask whereas 215 were familiar with correct method of adjusting surgical mask or N95 mask on duty. According to 246 participants wearing full PPE during 6-8 hours of COVID-19 ICUs/Wards duty was very exhausted inside PPE, few documented skin allergy and breathing problems. (Table 2)

It has been observed that, the practice of using handrub after each doffing steps were followed by 221 participants, whereas 226 were aware with the necessity of fit testing of N95 mask. However, there were poor compliance to biomedical waste segregation as per guideline among the participants after doffing. (Table 3)

4. Discussion

Among the 250 participants, 222 (88.8%) attended training conducted on indication and appropriate use of PPE. However, 13 postgraduate students, 6 administrator, 7 faculty members, 2 nursing staffs did not attended training. The inability to attend training program probably was due to night shift duty hours or workload. However, despite of vigorous training program 85.6% and 68.4% respondents knew the correct method of donning and doffing PPE respectively. 82% participants were aware

Table 2: The participant's attitude on use of PPE

Staff Questions↓	Nursing staff	Administrator	Faculty	PG students	Total	Chi square	p
11. How often do you follow the PPE donning & doffing protocol?							
Correct	52	21	38	81	192	14.246	0.003
Incorrect	31	5	8	14	58		
12.Do you think it is important to regularly change the outer gloves during patient care?							
Yes	82	25	46	84	237	13.149	0.004
No	1	1	0	11	13		
13.Do you think removing personal items eg. rings, bangles before donning play an important role in infection prevention?							
Yes	83	26	46	95	250	0	0.000
No							
14.Do you re-use N95 mask in your hospital?							
Yes	74	25	46	81	226	8.913	0.030
No	9	1	0	14	24		
15.What is your opinion on wearing surgical mask beneath the N95 mask?							
Correct	53	18	43	86	200	27.207	0.000
Incorrect	30	8	3	9	50		
16.What is your opinion about method of adjusting the medical mask or N 95 mask once you wear them on duty?							
Correct	63	21	40	91	215	15.215	0.002
Incorrect	20	5	6	4	35		
17. How do you feel after wearing PPE for 6-8 hours duty in COVID ICU?							
Correct	82	26	46	92	246	2.718	0.437
Incorrect	1	0	0	3	4		

Table 3: Participants Attitude on use of PPE

Staff Questions↓	Nursing staff	Administrator	Faculty	PG students	Total	Chi square	p
18.What do you think about use of alcohol-based hand-rub during each step of doffing?							
Correct	65	26	43	87	221	13.740	0.003
Incorrect	18	0	3	8	29		
19.What is your opinion regarding fit testing of N95 mask?							
Correct	75	21	46	85	227	8.012	0.046
Incorrect	8	5	0	10	23		
20.Where will you dispose of gown?							
Correct	73	11	27	45	156	36.988	0.000
Incorrect	10	15	19	50	94		

about the most critical component of PPE, eg. mask. Similar study conducted in Nigeria showed that despite of training programs were organized, approximately half of the respondents had some form of training on PPE, only 6.6% and 12.5% knew the correct procedure to don and remove PPE, respectively and 46% knows how to correctly select appropriate PPE for use. Another study in the United States assessed the doffing practices of HCWs and found that in 90% of cases, the selection and/or the sequence of doffing PPE was incorrect. Another study in the United States found that 100% and 27% of HCWs at least breached the protocol for Ebola for donning and doffing PPE, respectively. The high levels of breaches of the protocol in wearing and removal of PPE could be attributed to the complexity of the protocols and the need for training and retraining. Following the appropriate steps is important to avoiding self-contamination when utilizing PPE.[6] However, in present study the compliance to donning is better, but doffing practices need to improve to avoid cross transmission of infection. There is a strong possibility that post duty doctors are so exhausted in PPE that eager to remove it quickly which leads to incorrect steps of doffing.

Being an essential part of COVID 19 infection prevention, approximately 54% & 56 % participants responded correctly about steps of hand hygiene and percentage of alcohol in hand rub. However, WHO emphasizes maximum adherence to hand hygiene steps as well as the percentage of alcohol before using in COVID 19 set-up.[7]

Among the study participants, only 53.2% correctly responded that N95 mask is required for routine examination in OPDs. Zhang et al. also mentioned the various type of PPE and their use in their study. In this study Zhang et al mentioned that N95 mask is advisable

when the person coughs forcefully or one does not follow cough etiquettes and these both reasons are quite common in OPD areas of our hospital.[8]

Approximately 90% were aware of correct method of wearing surgical mask. The Nigerian study demonstrated HCWs' poor knowledge about the indications for and selection of appropriate PPE. Chia et al. in Singapore during the SARS-CoV outbreak in 2003 in which more than half of the nurses and clerical staff agreed that paper face masks serve a similar function to surgical masks.[9]

Regarding the attitude towards appropriate use of PPE, it was observed that 76.8% HCWs participants knew that they need to follow donning and doffing protocol always when they enter COVID designated ICUs. The finding is similar to Phan et al. as well as WHO and CDC that to avoid maximum risk of self-contamination on HCW's clothing and skin after providing care for patients having acute respiratory virus infections, HCWs need to follow donning and doffing practices stringently.[10]

Among the respondents 94.8 % agreed the importance of regularly change the outer gloves during patient care. All of the participants (100%) were aware of mandatory removal of personal items eg. rings, bangles before donning. As per WHO patient Safety guideline, these are mandatory for any contact and droplet infection.[11]

Approximately 90.4% participants have reused N95 mask at the work set up. 86% participants were familiar with the correct method of adjusting mask while on duty. Re-use policy of N95 was adapted due to shortage of the same in market during COVID 19 pandemic as per CDC and ICMR guidelines.[12,13] Reuse of PPE including N95 mask was also reported in many studies, mainly because of unavailability of PPE.[14]

98.4% participants documented that they felt exhausted in PPE after 6-8 hours COVID 19 duty and rest reported some sort of skin problem. The same were reported from various parts of country.[15]

Regarding practices of appropriate use of PPE, it was observed that 88.4% participants were used hand rub after every step of doffing and 90.8% were in opinion of prior fit testing of N95 mask. However, 62.4% correctly segregated the gown post doffing. It takes approx. 30-40 mins for doffing by following all instructions to prevent aerosol generation as well as cross contamination.

5. Conclusion

In our study the low compliance of biomedical waste segregation might be due to exhaustion of post duty. However, it was observed that nursing staffs were the most compliant to proper biomedical waste segregation in comparison with faculty, PG students and administrators.

6. Conflict of Interest

The authors declare that there are no conflicts of interest in this paper.

7. Source of Funding

None.

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