

Problems associated with usage of PPE Kits during COVID19 pandemic : Experience of Healthcare workers of a tertiary care center from Eastern India

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Abstract :

Background: Frontline healthcare workers play a critical role in the containment of the coronavirus disease-2019 (COVID-19) pandemic, and as they are wearing personal protective equipment to minimize cross-transmission and acquire confidence in fighting the pandemic (PPE) they face health problems and discomfort as well because of long duty hours. **Objectives :** To explore the health issues associated with use of PPE among healthcare front liners and to find out the possible solutions for the identified problems. **Methodology:** A cross sectional observational study involving a group of medical staff was done using a pre tested semi structured questionnaire using google forms at a tertiary care teaching hospital. **Results :** Maximum people said that Goggles and gowns are the most uncomfortable part of the PPE and the problems/health conditions faced most frequently was fog in goggles/shield and feeling hot and suffocating. Females, Intern Doctors and those with indefinite/not fixed duty were mostly unsatisfied with the PPE that was given. **Conclusion :** To alleviate healthcare workers' burnout and job pressures, effective strategies for increasing comfort at workplace is required. More training regarding donning /doffing and comfortable and adequate supply of PPE is needed in order to get uninterrupted and quality service from the healthcare workers. **Keywords :** PPE, COVID19, quality, workplace problems

Background:

The entire world is currently engaged in a "global war against the COVID-19 pandemic." Personal Protective Equipment (PPE) manufacture has become a critical component necessary to protect medical, sanitation, and other front-line employees. Personal protection equipment (PPE)

is a piece of clothing designed to keep the wearer safe from harmful, infectious, chemical, radioactive, electrical, and physical agents.(1)

In the event of blood or high airborne diseases, conventional PPE includes gloves, mask, gown, goggles, and mask or face shield, gloves, gown or coverall, head cover, and rubber boots. Currently, the CDC and WHO advise using proper PPE with proper donning and doffing when working with infected patients.(2)

Doctors, nurses, and others were mobilising on social media with the hashtag #GetMePPE, referring to personal protective equipment such as masks, gowns, and face shields, to put pressure on the government to provide them with more equipment to protect them from infection. Some people urged that those who have masks or other medical items to offer contact a nearby hospital. The medical staff at the primary health facility wore rain coats even when performing front-desk responsibilities.

India has only a few indigenous manufacturers for a long time, therefore there was never enough to supply demand. Until March 1, 2020, the country generated only a little amount of PPE. There are only 50 companies that produce these items. However, now, production has risen considerably. By the 5th of May, 2020, the country had manufactured approximately 2.06 lakh PPE suits every day, with 4.5 lakh PPE kits. In addition, the number of firm certificates has increased. Over 600 businesses operate across the country, producing goods.(3)

The Defence Research Development Organization (DRDO) recently created a device called SUMERU-PACS that keeps PPE wearers cool and comfortable without sweating.(4)

Using current varieties of PPE, on the other hand, is neither straightforward or comfortable, particularly for extended duty hours. Suffocation, blurred vision, itching, headache, and other symptoms have been reported by many users, making it unsettling and uncomfortable to use. The long duration of duty hours in epidemic/pandemic scenarios puts a premium on healthcare workers' personal safety, posing issues such as wearing the same PPE when sleeping, resting, eating, and using the restroom. As a result, the goal of this research is to identify the problems and obstacles related with the use of PPE during epidemics, as well as potential solutions. This will also ensure improved compliance with PPE usage.

Objectives: To explore the health issues associated with use of PPE among healthcare front liners and to find out the possible solutions for the identified problems.

Methodology:

A cross sectional observational study involving a group of medical staff was done. A total of 75 Resident doctors and Nursing officers were included by applying a Total enumeration sampling technique. The staff (Healthcare professionals ,Doctors and Nurses) of AIIMS ,Patna using PPE kits and having duties in COVID19 screening area and wards of All India Institute of Medical Sciences (AIIMS), Patna during the study period were included. The people involved in extensive care (Core critical care and core emergency team) were purposively left as they were having lack of time and the interview/questionnaire could hamper the care of the patients in need.

A pre tested semi structured questionnaire using google forms, was used for the quantitative responses, to maintain social distancing and to avoid unnecessary crowd. Data was analyzed using SPSS v.20 in the department of CFM, AIIMS ,Patna. A chi-square test for possible association was applied wherever needed.

Ethical clearance : It was obtained from the institutional ethics committee.

Source of funding : Nil

Results:

Table-1: Various Characteristics of the participants using PPE

	Frequency	Percentage
Gender (N=83)		
Female	38	45.78%
Male	45	54.21%
<i>Total</i>	83	100.0
Designation (N=83)		
Intern	18	21.68%
JR (Acad)/PG Trainee	13	15.66%

Nursing Officer (Junior)	11	13.25%
Nursing officer (Senior)	30	36.44%
SR	11	13.25%
<i>Total</i>	83	100.0
Work area (N=83, Multiple responses)		
Covid Screening area/casualty	39	46.98%
Covid suspect ward	16	19.27%
Covid confirm ward	24	28.91%
ICU (Other than Covid)	1	1.2%
Covid ICU	7	8.43%
General Ward (Other than covid)	5	6.02%
OT	1	1.2%
Duty hours (N=83)		
12 hours	48	57.83%
6 hours	16	19.27%
8 hours	10	12.04%
More than 12 hours	1	1.2%
Not fixed	8	9.63%
<i>Total</i>	83	100.0

A total of 83 respondents participated in the study, out of which, males were 54.21 % and females were 45.78%. Out of 83 respondents 42 were doctors (Senior/junior residents and Interns) and 41 were nursing officers (Senior /Junior nursing officers). Maximum (46.98%) respondents were working in the COVID screening area/casualty followed by Those working in COVID confirm ward (28.91%) and COVID suspect ward (19.7%).

Maximum respondents (57.83%) were doing 12 hours duty shift while some were doing 6 hours (19.27%) and 8 hours (12.04%) shifts.

Table-2 : Type and features of PPE used

Type of PPE used recently (N=83)		
PPE with Shield	23	27.71%
PPE with goggles	34	40.96%
Other type of PPE kit	26	31.32%
<i>Total</i>	83	<i>100.0</i>
The better PPE (N=83)		
The one with goggles	9	10.84%
The one with shield	28	33.73%
The one with soft and comfortable material	46	55.42%
<i>Total</i>	83	<i>100.0</i>
Which part of the PPE is most uncomfortable for you (N=83)		
Cap	1	1.2%
Gloves	1	1.2%
Goggles	33	39.75%
Gown	28	33.73%
Mask	6	7.22%
Shield	12	14.45%
Shoe cover	2	2.4%
<i>Total</i>	83	<i>100%</i>
Which one part of the PPE do you think is most important (Protection wise)? (N=83)		
Cap	1	1.2%
Gloves	9	10.84%
Gown	2	2.4%
Mask	61	73.49%
Shield	10	12.04%
<i>Total</i>	83	<i>100%</i>
Do you think by wearing a full PPE you are protected from COVID? (N=83)		
Definitely no	1	1.2%
Definitely yes	30	36.14%

Not sure	52	62.6%
Total	83	100%

When asked about the PPE kit they have used recently, maximum said they have used PPE with goggles (40.96%). Majority of the respondents said they liked the one with soft and comfortable material (55.42%) while some liked the one with shield (33.73%). The goggles were the most uncomfortable part reported by most of the respondent (39.75%) followed by gown (33.73%). As good as 73.5% of the respondents thought that mask is the most important equipment (protection wise). Some of them also said Shield (12.04%) and gloves (10.84%) are the most effective equipment of a PPE (protection wise).

Majority (53%) of the respondents were not sure if the full PPE protects from COVID while around 36.1% said it definitely protects. More than 65% of the respondents didn't feel difficulty in donning and doffing, although around 31% people said they feel difficulties sometimes.

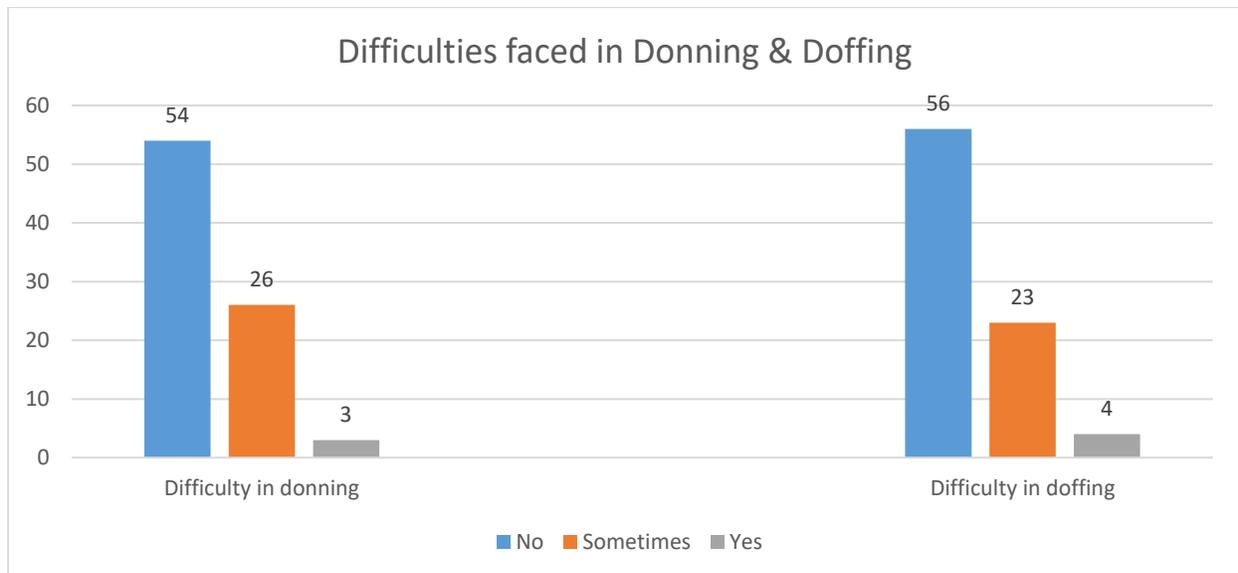


Table-3 : Difficulties faced while wearing a full PPE

What kind of difficulty you face wearing PPE (N=83) Multiple response		
Symptoms/difficulties	Frequency	Percentage

Fog/mist in glasses/ shield	63	75.90%
Feels hot	55	66.26%
Suffocation	43	51.80%
Visibility issues	32	38.55%
Itching	17	20.48%
Headache	16	19.27%
Others	06	13.95%

The most common problem faced by the healthcare workers wearing PPE was Fog/mist in glasses/ shield (75.90%) followed by feeling hot (66.26%) and suffocation (51.80%). Around 38.55% people also reported of visibility issues, while some (20.48%) reported itching. Headache was also one of the issues reported by some of the respondents (19.27%).

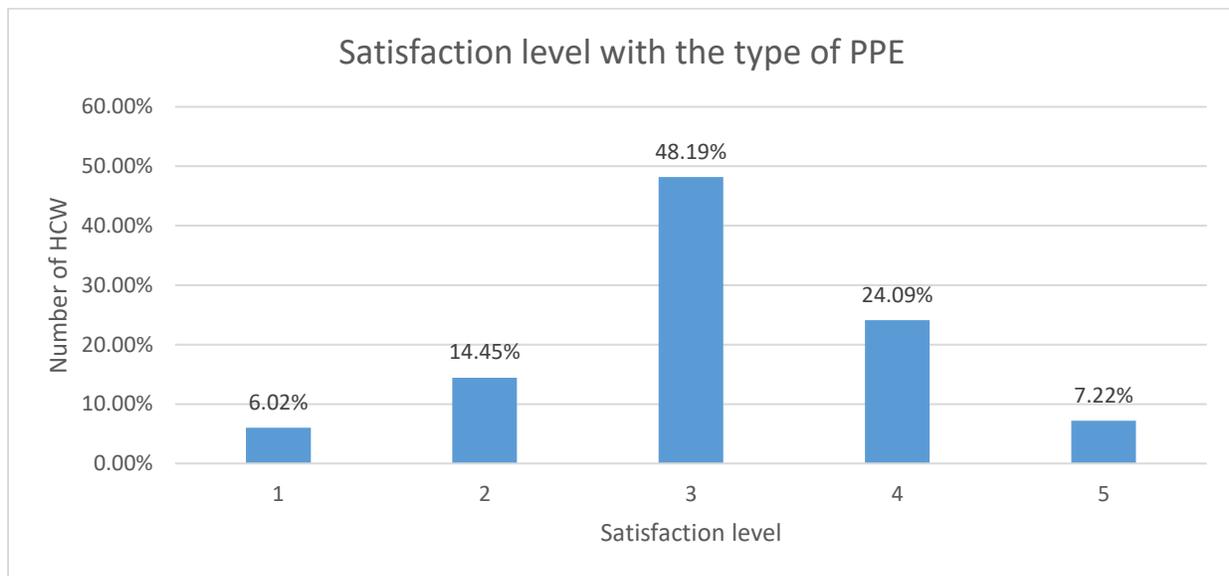


Table-4 : Performing routine daily activities while in PPE

Do you use washroom/toilet while wearing PPE? (N=83)		
Generally avoid	13	15.66%
No	70	84.33%
Total	83	100%

Do you eat and drink while wearing PPE? (N=83)		
Generally avoid	11	13.25%
No	69	83.13%
Yes	3	3.61%
Total	83	100%
Do you sleep/Lie down while wearing PPE? (N=83)		
Generally avoid	13	15.66%
No	61	73.49%
Yes	9	10.84%
Total	83	100%

Performing daily essential activities is generally avoided by the respondents, majority (84.33%) of them said they don't use toilet/washroom while in PPE, and around (83.13%) said they don't eat and drink while in PPE. Almost 73.5% of the respondents said they don't sleep/lie down while in PPE.

Table-5 : Association of Satisfaction with PPE with various factors

		Satisfaction with PPE		<i>p-value</i>
		N (percentage, CI)		
		Not satisfied (1,2,3)	Satisfied (4,5)	
Age (in years)	20-30 years	31 (68.8%,54.3-80.4)	14 (31.1%,19.5-45.6)	<i>0.841</i>
	31-40 years	26 (68.4%, 25.5-80.9)	12 (31.5%,19.0-47.4)	
Gender	Female	31 (81.5%, 66.5-90.7)	7 (18.4%, 9.2-33.4)	<i>0.036</i>
	Male	26 (57.7%, 43.3-71.0)	19 (42.2%, 28.9-56.7)	
Duty hours	>= 12 hours	31 (63.2%, 49.2-75.3)	18 (36.7%, 24.6-50.7)	<i>0.329</i>
	6-8 hours	19 (73.0%, 53.9-86.3)	7 (26.9%, 13.7-46.0)	
	Not fixed	7 (87.5%, 52.9-97.7)	1 (12.5%, 2.2-47.0)	

Post	Resident doctors	12 (50.0%, 31.4-68.5)	12 (50.0%, 31.4-68.5)	0.048
	Interns	15 (83.3%, 60.7-94.1)	3 (16.6%, 5.8- 39.2)	
	Nursing Officers	30 (73.1%, 58.0-84.3)	11 (26.8%, 15.6-41.9)	
Type of PPE used	The one with Shield	2 (8.7%, 2.4-26.8)	21 (91.3%, 73.2-97.5)	0.334
	The one with goggles	10 (29.4%, 16.8-46.1)	24 (70.5%, 53.8-83.1)	
	Others	5 (19.2%, 8.5-37.8)	21 (80.7%, 62.1-91.4)	
Wearing a full PPE protects from COVID?	Definitely Yes	4 (13.3%, 5.3-29.6)	26 (86.6%, 70.3-94.6)	0.091 (Fisher's exact)
	Definitely No	0 (0.0, 0.0-79.3)	1 (100.0%, 20.6-100.0)	
	Not Sure	13 (25.0%, 15.2-38.2)	39 (75.0%, 61.7-84.7)	

It was observed that more (81.5%) of the female were not satisfied with the PPE that was provided as compared to the males (57.7%) and the association was found to be significant. Interns were more (83.3%) dissatisfied as compared to resident (50%) doctors and Nursing officers (73.1%).

Discussion :

In our study males were 54.21 % and females were 45.78%. Out of 83 respondents 42 were doctors and 41 were nursing officers similarly in the study by Srinath et al, the majority (58.6%) were aged 24-35 years, with a male preponderance (65.62%) out of which doctors were 41% and nurses (35%).(5)

A. Tabah et al. in their study found that almost half (45%) reported being very or confident with their technique in using the available PPE (6) while in our study more than 65% didn't feel any difficulty in donning and doffing both.

When asked about the confidence in adequacy of protection, 36 % thought they are protected by the PPE similarly Confidence in the adequacy of protection was reported by 44%, while 14% were not confident at all in A. Tabah et al's study.(6) This was similar for doctors, nurses and

allied health ($p=.93$). There was a strong association between confidence in protection and the absence of PPE shortage and confidence in technique ($p < .001$ for both comparisons).

A study by Yanez Benitez et al done on the surgeons from over 30 countries shows that almost two-thirds (63%) participants experienced visual interference, two-thirds (66%) expressed a decrease in overall comfort, a significant majority (82%) an increase in fatigue.(7)

Another study on nurses by Atay S et al says that most commonly reported physical problems were sweating (64.2%), followed by redness of cheeks , dry mouth, redness across the bridge of the nose , headache, and redness of the ears.(8) While In our study around 76% complained of visibility (fog /mist) issues and 51.8% said they felt suffocation/fatigue. Similar findings were there in the study by Choudhury et al (Fogging 100%, Headache 90.6% and Tiredness >70%.(9) Another study by Agarwal et al observed that the most common problems associated with using PPE kits was excessive sweating (100%), fogging of goggles, spectacles, or face shields (88%), suffocation (83%), breathlessness (61%), fatigue (75%), headache due to prolonged use (28%), and pressure marks on the skin at one or more areas on repeated use (19%).(10) (11)

Most common adverse health effects expressed by the participants in the study by Jose et al were headache (73.4%), extreme sweating (59.6%), and difficulty in breathing (36.7%); 91.7% complained about the fogging of the goggle which is similar to our study. (12)

Conclusion : The study shows that Fog formation, feeling hot and suffocation etc. were the common issues faced by the participants which warranted need of training of donning as improper way of wearing glasses/shields might have made them uncomfortable. People with long duty hours were more dissatisfied which reflects a discomfort with PPE if it is worn for long or indefinite time. A break in duty hours and provision of PPE change can be a solution for this. Wearing PPE makes the people comfortable and gives them a sense of protection hence adequate supply of PPE is critical for uninterrupted service to the patients.

Lastly a qualitative study is needed to explore the exact difficulties and problems faced by the healthcare workers using PPE kits.

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