

Problems Faced by the Physiotherapists Wearing PPE Kit While Treating the COVID Patients

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Abstract: *Physiotherapists have played a major role during the COVID-19 outbreak, however there have been many problems associated with PPE Kit varying from breathlessness to difficulty in performing manual therapy. A need was felt to assess these problems faced by Physiotherapists to get their effective redressal with objective of identifying whether the physiotherapists are facing any difficulties wearing PPE kit while treating the COVID patients. Total of 150 Physiotherapists from various COVID hospitals of Maharashtra were selected on the basis of inclusion and exclusion criteria. An electronic Questionnaire was formed and designed into a Google Form. The data from Google form was collected in a tabular format via Google sheet and statistically analyzed. Percentage of the result was obtained and conveyed through graphical presentations via pie charts and graphs. The questionnaire was returned by 150 participants giving response rate of 100%. 64% physiotherapists experienced breathlessness, 98.67% experienced moderate-extreme perspiration, 82.67% had communication problem with patients, 78.67% stated that breathlessness or perspiration compromised the quality and time of their treatment, 60.66% faced difficulty while performing manual techniques. This study significantly revealed various parameters that were surveyed in the process like perspiration, breathlessness etc. resulted notable alteration in quality of treatment.*

Keywords: PPE Kit, Physiotherapists, Problems, COVID-19

1. Introduction

The coronavirus disease 2019 (COVID-19) pandemic has turned up as a major healthcare challenge in the entire world [1]. On March 11th, the World Health Organization (WHO) proclaimed COVID-19 which is caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) as a pandemic. India is the second worst country affected due to the virus after the USA. The classical routes of infection for SARS-CoV-2 are through respiratory droplets and by human-to-human contact. Within a couple days of the infection, dry cough, mild feverish sensation, and moderate to severe respiratory distress [3]. The infection causes a cytokine release causing high inflammation levels, resulting in prominent protein exudates, pulmonary damage characterized by edema, vascular swelling along with systemic injuries [4].

Coronaviruses are enveloped, positive single-stranded RNA genome (26 to 32 kb) viruses belonging to the Coronaviridae family in the Nidovirales order (Su et al. 2016). Till date, there are four genera, i.e., alpha (α), beta (β), gamma (γ), and delta (δ), of the virus that have been recognized (Perlman and Netland 2009). However, the novel SARS-CoV-2 belongs to the genera of β -coronavirus with a RNA genome size of 29.9 kb (Wu et al. 2020). SARS-CoV-2 shows 88% nucleotide sequence identity to the two bat derived SARS-like coronaviruses (bat-SL-CoVZC45 and bat-SL-CoVZXC2) and about 79% similarity to the SARSCoV and 50% to the MERS-CoV (Lu et al. 2020) There is increase in the amount of reports that indicate that the genome of SARS-CoV2 has undergone diversification and some evolutionary changes during the geographic dissemination process. The pan-genomic analysis of global SARS-CoV-2 isolates has revealed the identification of

several genomic regions with increased genetic variation, and distinct mutation pattern (Korber et al. 2020; Kumar et al. 2020) [5]

Personal protective equipment (PPE) refers to the equipment that is used to avoid or reduce the unintentional injuries and occupational hazards at the workplace, and are mainly meant to protect against the physical, chemical, and biological factors that are experienced in the work environment. With the emergence of highly infectious epidemics, such as the SARS and Ebola virus disease, healthcare workers are more vulnerable to the infection than the general population, due to the exposure to the highly infectious bodily fluids and droplet nuclei in the immediate patient environment. So, the contact precautionary measures are required while treating and caring for such patients by means of personal protective equipment to reduce the transmission risk [6].

PPE constitutes of protective clothing, helmets, goggles and/or equipment designed to protect the wearer from health and safety hazards at workplace. It also includes respiratory protective equipment (RPE) for making the workplace safer. Proper instructions, training and supervision are essential to ensure that it is used in a proper manner. They are used at various workplaces in healthcare units including the mortuary where dead bodies that have been tested positive with COVID-19 or are being suspected positive are either being examined or handled.

Globally, the users have often found wearing the PPE uncomfortable while working, much more in the summer season, when facilities for monitoring the environmental temperature like centralized air conditioners are inaccessible or are shut down for fear of dispersion of the infection. In addition to abridged tactile sensitivity and impaired visibility

due to the deposition of water vapors on the glasses, users have also found verbal communication problematic while wearing the personal protective equipment. Although the literature has started to address and highlight the complications and issues related to PPE use on a global scale, there is still a lack of authentic literature relating to the issue from within India.^[1]

Physiotherapists; mainly the respiratory physiotherapists, are among the healthcare professionals who are involved in the management and care of these patients and play an important role in the non-invasive support management, mobilization, postural changes as well as during the weaning from invasive mechanical ventilator support^[8].

2. Literature Survey

- 1) **Agrawal A** et al, conducted a study “Difficulties Encountered while using PPE Kits And How to Overcome Them: An Indian Perspective. An electronic questionnaire survey was prepared by the researchers for a multi-centre survey in the urban India among HCW’s who had used PPE Kits during their COVID duties out of which 253 unique response forms were validated. Their main purpose was to serve as a guide to health administrators as well as other HCW’s in adopting ways and means to tackle the problems encountered in the use of PPE Kits.
- 2) **Raghvendra K Vidua**, et al, conducted a study “Problems arising from PPE when worn for longer periods”. This article considers the aspect of PPE based upon the personal experience of a Forensic team at AIIMS Bhopal in India who wore it during autopsy work and proposed recommendations to minimize the problems faced. The provision of safe, comfortable and standard PPE is a challenge for the system and they consider and research what modification would improve matters.
- 3) **Sinu Jose** et al, conducted a study “Health Problems and Skin Damages Caused by Personal Protective Equipment: Experience of Frontline Nurses Caring for Critical COVID-19 Patients in Intensive Care Units”. A cross-sectional study was conducted using an online-based questionnaire assessing the physical problems, and adverse skin reactions of PPEs were sent among the 150 frontline nurses in ICUs of COVID hospitals. According to them the exposure time of the frontline workers with PPE should be kept minimal and prophylactic dressings could be considered to alleviate the device-related pressure injuries.

3. Methods

The descriptive survey study was conducted among the physiotherapists of Maharashtra state, to find out the problems faced by them wearing PPE Kit while treating the COVID patients. The study received ethical clearance by the Institutional Ethical Committee of Dr. A. P. J Abdul Kalam College of Physiotherapy, PIMS-DU. The sample size for this study was 150. Participants were selected from various hospitals of Maharashtra who had completed their COVID duty. The participants were selected on the basis of

convenient sampling method according to the inclusion and exclusion criteria mentioned above. Participants included in the study were both male and female; with the age group of 25-40 years old.

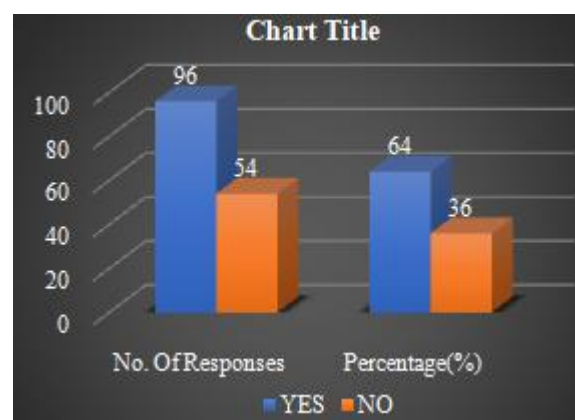
A Questionnaire was formed and was validated by the validator and then it was designed into a Google Form and was kept open for the participants to reduce the risk of transmission of corona virus during this pandemic. Participation of the candidates was voluntary. The willing participants were briefed about the nature and aim of the study in a language best understood by them in the Google form and their informed consent was taken before the study. Also, the confidentiality of information was explained and assured. The data from the Google form was collected in a tabular format via Google sheet and was statistically analyzed. The percentage of the result was obtained and was conveyed through graphical presentations via pie charts and graphs.

4. Result

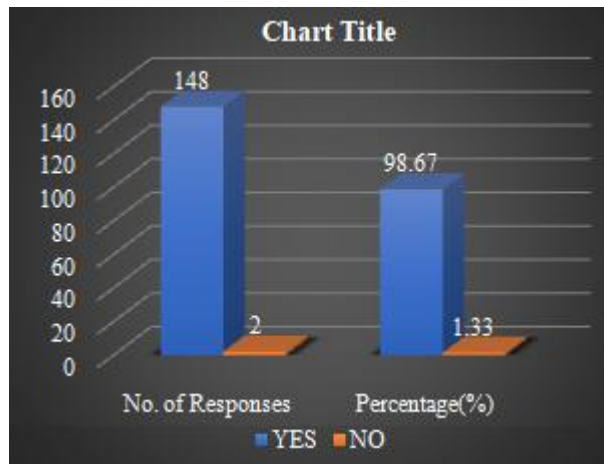
After the desired number of responses was recorded the result was obtained via graphical presentation as follows:



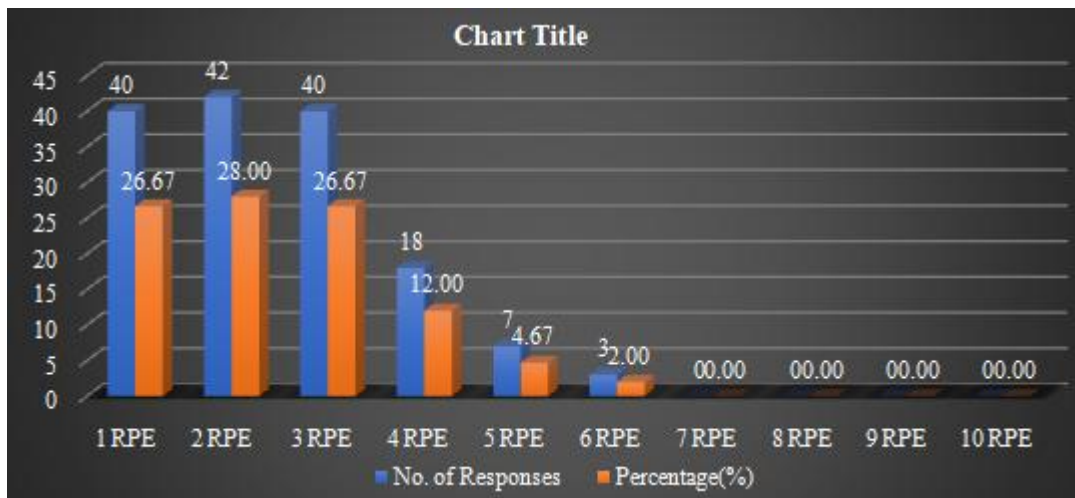
Graph 1: Signifies the No. hours of wearing one PPE Kit in a day



Graph 2: Signifies the breathlessness experienced by the Physiotherapists



Graph 3: Signifies the experience of moderate-extreme perspiration while wearing PPE Kit



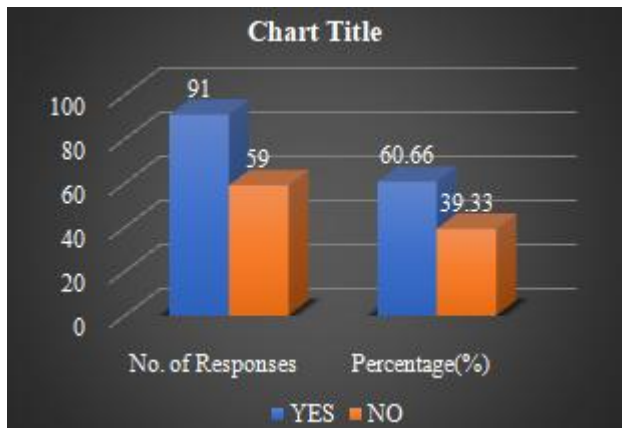
Graph 4: Signifies the rate of perceived exertion while wearing the PPE Kit



Graph 5: Signifies the difficulty in communicating or briefing the patients about breathing exercises



Graph 6: Signifies whether breathlessness or perspiration compromise the quality or time of treatment.



Graph 7: Signifies the difficulty while performing the manual technique

5. Discussion

There has been a bustle of research in recent literature on coronavirus and COVID-19, focusing on its epidemiology, etiopathogenesis, pathology, prevention strategy, components of prevention, and treatment. [1] However, there has been no study conducted from within India that has assessed the difficulties encountered by physiotherapists while using PPEs.

The present study "PROBLEMS FACED BY THE PHYSIOTHERAPISTS WEARING PPE KIT WHILE TREATING COVID PATIENTS" was conducted in various hospitals where physiotherapists had their COVID duty in Maharashtra. In total 150 samples were taken for the study. The participants were selected on the basis on convenient sampling method and according to the inclusion and exclusion criteria. Total 150 responses were recorded.

In the current study, 14.67% physiotherapists reported that they had completed one week of COVID duty, 23.33% stated that they had completed two weeks of COVID duty, 10.67% documented that they had completed three weeks of COVID duty, 6% registered that they had completed four weeks and 45.33% physiotherapists specified that they had completed their COVID of more than one month. It states that the majority of physiotherapists had worked for more than a month in the COVID hospitals.

In the present study 32% stated that they worked for 6-10 hours per week wearing the PPE Kit, 58.67% specified that they worked for 10-15 hours per week, 5.33% documented that they worked for 15-20 hours per week and 4% registered that they worked for more than 20 hours a week wearing the PPE Kit. Also, 42.67% participants stated that they wore one PPE Kit for 1-2 hours, 48% recorded that they wore the kit for 2-4 hours being the majority here, 5.33% specified that they wore the kit for 4-6 hours, 3.33% registered that they wore the kit for 6-8 hours, and 0.67% participants wore the PPE Kit for more than 8 hours in a day.

In our study, there were 64% physiotherapists who reported that they experienced breathlessness while treating the COVID patients wearing the PPE Kit, while 36% participants stated that there was no such episode of

breathlessness experienced by them. A study conducted by Agrawal A, Agrawal S, Motlani (November 23, 2020) on 253 Health Care Workers found that there were 61% participants who experienced breathlessness while wearing the PPE Kit. A similar study conducted by Sinu Jose, Maneesha C Cyriac, et al. (2021 Feb) on 137 frontline nurses stated that there were 36.7% participants who experienced such episodes of breathlessness working on daily basis.

In the current study, 148 (98.67%) respondents specified that they experienced moderate-extreme perspiration while wearing the PPE Kit, whereas 2 (1.33%) participants stated that they did not experience moderate-extreme perspiration while wearing the PPE Kit. A study by Agrawal A, Agrawal S, Motlani (November 23, 2020) on 253 Health Care Workers found that there were 100% participants who experienced excessive sweating. India is a tropical country with hot and, many a times, both hot and humid conditions. Hence, this problem was even more appalling. Shutting down the central air conditioning systems (with common air duct systems) in the hospitals to prevent the spread of droplets and droplet nuclei further aggravated this problem for the health care workers. [7] PPE creates a microenvironment around the skin due to a higher thermal resistance and lower water vapor permeability of the materials that are being used when compared with the normal clothing ensemble of Health care professionals. Consequently, heat loss capacity via the skin surface is reduced at a greater extent. The metabolic energy expenditure from regular working activities could, therefore, not be completely lost to the surrounding environment, leading to problems like heat strain, thermal discomfort, excessive sweating, faster dehydration and an increased cardiovascular strain. [14]

In our study 26.67% participants stated that they experienced 1 RPE according to the Modified Borg scale, 28% and 26.67% participants reported that they experienced 2 and 3 RPE respectively, 12% registered that they experienced Grade 4 dyspnea, 4.67% and 2.00% specified that experienced 5 and 6 RPE respectively according to the Modified Borg scale. None of the participants reported of experiencing 7-10 RPE.

In the present study 82.67% specified that they had a communication gap while explaining the breathing exercises to the patients wearing the PPE, whereas, 17.33% stated that there was no such inconvenience observed by them. A study by Agrawal A, Agrawal S, Motlani (November 23, 2020) on 253 Health Care Workers found that 203 (80%) respondents reported facing communication issues with patients and colleagues after donning PPE kits, most of the time. This issue related to communication, mostly difficulty in hearing and understanding speech, has been corroborated by other studies, which also suggested a definitive direct effect on situational awareness. This issue was addressed to some extent by devising sign language for commonly used phrases or directions [1] The therapist usually had to shout out loud in order to communicate and listen to what the patient was trying to say.

In our study 78.67% stated that breathlessness or perspiration did compromise the quality and time of their treatment,

whereas, 21.33% participants registered that there was no such inconvenience experienced by them. To accommodate heat loss, blood redistribution from central organs and skeletal muscle to the skin occurs, which will further exacerbate the physiological strain, ultimately leading to shorter work tolerance times and a reduced physical and cognitive performance. The most common recommendation for working in PPE is to adjust the work/rest schedule and incorporate frequent longer breaks in order to alleviate heat strain. However, this recommendation is not always workable in clinical settings as the hospitals are often understaffed during the COVID-19 pandemic. Some cooling devices when worn under PPE, can decrease the physiological and subjective strain in a simulated hot and humid laboratory environment.^[14]

In the current study, 60.66% respondents stated that they faced difficulty while performing the manual technique while treating the COVID patients wearing the PPE Kit whereas, 39.33% respondents specified that there was no difficulty faced by them while performing the manual technique wearing the PPE Kit. A few respondents stated that due to the size issue of the PPE it was difficult for them to perform the desired techniques. A study by Agrawal A, Agrawal S, Motlani (November 23, 2020) on 253 Health Care Workers showed that 153 respondents (61%) did not report any size-related issues with PPE kits and reported that there was free availability of various sizes of or free-size PPE kits; 98 respondents (39%) reported issues with size while using PPE kits or any of its components. Size issue has been most commonly attributed to extremes of height, higher BMI, and facial hair.^[1]

Some other problems that were faced by the participants were extreme level of sweating and fogging over the glasses which made it difficult for them to treat the patient appropriately. The respondents also reported having severe headache, dizziness. A lot of participants reported having skin allergies, rashes, dry hands, and pigmentation on a greater extent. The irritation from excessive sweating and the repeated friction of protective clothing during walking leads to an allergic skin reaction. The physical discomfort and its symptoms can lead to psychological burden and also affect their work.^[6] In a study conducted in China, majority of healthcare workers revealed dry skin, itching, and rash as the adverse reactions of using latex gloves. This was similar to the findings of the study conducted during SARS in 2006.^[15] These adverse reactions are mainly caused due to the hypersensitivity to latex and frequent hand washing with soap and water, without proper drying of the hands, resulting in the irritation and improper air circulation inside the gloves, which causes contact dermatitis and rashes. This can be prevented by appropriate drying of hands before putting on the gloves and wearing a plastic glove inside the latex gloves to prevent allergic dermatitis.^[6]

In our current study the participants also stated that they got pressure markings on their forehead and wrist and sometimes on the ankle. The compression of the metal strap at the fixed site for prolonged duration constantly results in the device-related pressure injuries. The excessive binding of the mask is in such a way that edge of the mask is in close contact with the skin for a long period of time; now this

results in friction between the edge of mask and skin that leads to the formation of erythema, blisters, or ulcers in few cases.^[6] Donning and doffing was somewhat difficult to achieve as it could get torn while doffing risking the therapist and people around them. Also, there was movement restriction experienced by the participants of this study when they had to perform passive range of motion or perform any manual technique.

There are certain problems reported in the literature from other countries that none of our respondents have mentioned here. For example, a few studies have reported health care professionals having dissatisfaction with work, a statistically significant drop in oxygen saturation, and an increase in pulse rate after wearing PPE for four hours as compared to baseline. Another finding has been that most of the participants tended to adjust their N95 masks intermittently due to the major breathing issues, which raises the risk of self-contamination. One report also stated about a child getting frightened at seeing someone in a PPE kit, hence to make the child comfortable, the surface of the kit was enhanced with cartoon stickers which worked wonderfully, making the PPE suit more child-friendly.^[1]

6. Conclusion

This study significantly revealed that humongous issues were reported by physiotherapists on problems faced while wearing PPE kit. Various parameters that were surveyed in the process like perspiration, breathlessness, dyspnea etc. resulted notable alteration in quality of treatment. It has also been observed that due to more of manual work; it is more burdensome for a physiotherapist to treat patients wearing PPE kit.

Future scope of the study

The study can be conducted on a larger sample size with longer duration.

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