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Original Research Article

Cutaneous manifestations in health care providers wearing Personal Protective Equipment (PPE) during COVID care

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ABSTRACT

Background: To study the cutaneous manifestations of health care workers wearing personal protective equipment (PPE) during COVID care.**Materials and Methods:** This study was carried out in Silchar Medical College and Hospital (SMCH), Silchar, Assam, India. Healthcare providers of SMCH were provided with comprehensive picture based Google form. A total of 63 health care professionals enrolled voluntarily in the study and filled up the questionnaire. The responses were collected and tabulated.**Results:** The mean age of health care workers was 29.2 years. There were 36(57.14%) males and 27(42.85%) females. Out of these, 43(68.25%) were doctors, 14(22.22%) were nurses and 6 (9.52%) were Allied health professionals (AHP). Cutaneous manifestations due to use of PPE were reported in 60(95.23%) participants. Common skin manifestations due to use of masks were ear soreness (61.90%), pressure bruises (44.44%), acne (11.11%). Cutaneous manifestations are frequent with the use of gloves, out of which most common was contact rash and itching (34.92%). Problems due to body protection were less compared to mask and gloves. Excessive sweating and miliaria (73.01%) are most common followed by intertrigo (39.68%) and folliculitis (20.63%).**Conclusion:** This study throws light on the difficulties faced by the health care workers during COVID crisis and highlights few measures by which they can be prevented.This is an Open Access (OA) journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License](https://creativecommons.org/licenses/by-nc-sa/4.0/), which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.For reprints contact: reprint@ipinnovative.com

1. Introduction

The World Health Organization (WHO) on March 11, 2020, has declared the novel coronavirus (COVID-19) outbreak a global pandemic. Different countries have been experiencing multiple waves of rise in cases since then.¹ Because of the high prevalence of COVID-19 transmission and the ambiguity about patients' infection status, HCWs must wear personal protective equipment.² Health care providers (HCP) have worked tirelessly day in and day out to combat this pandemic. HCPs need to wear personal protective equipment (PPE) while treating and caring

for patients suffering from COVID-19 disease. PPE are protective gears designed to protect the wearer from injury or the spread of infection.³ Due to long duty hours, adverse skin reactions owing to PPE have surfaced.⁴ There is a scarcity of study on the incidence and features of these adverse skin responses, as well as their related risk factors. This study is directed toward understanding the different types of cutaneous manifestations of health care providers wearing PPE during COVID care.

2. Materials and Methods

A retrospective observational study was conducted in the Silchar Medical College and Hospital (SMCH), Silchar, Assam, India, for one year from September 2020 to August

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2021 after approval from hospital ethical committee. A questionnaire was developed digitally using Google Forms software for recording the participants' response. Although the digital questionnaire containing the skin rash related questions were shared electronically to all HCPS who were involved in COVID care, only 77 HCPS had shown their interest, and they were included in the study. 14 HCPS had pre-existing skin diseases and hence were excluded from the study. The final sample size was 63 HCPS. The responses from the Google Forms were statistically analysed thereafter.

3. Results

3.1. Age and gender distribution

The mean age of HCPS was 29.2 years. The male female ratio was 1.33:1

There were 36(57.14%) males and 27(42.85%) females.

3.2. Occupation of HCPS

Out of these, 43 (68.25%) were doctors, 14(22.22%) were nurses and 6(9.52%) were technicians. The occupation of the participants have been depicted in Figure 1.

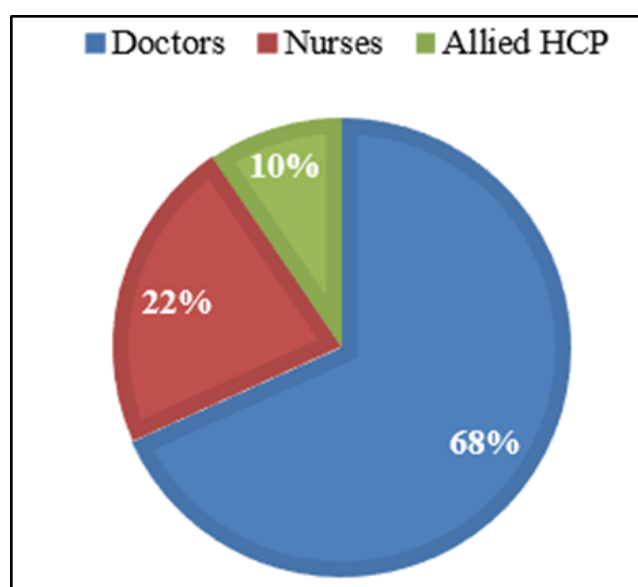


Fig. 1: Number of study participants

3.3. Duration of PPE worn by HCPS

Duration of PPE used was assessed and 63.49% used it for 5-8hrs and 26.98% used it for more than 8hrs in a single stretch. The longest wearing time was 10 hours.

Table 1: Duration of PPE

| Duration of PPE used in single stretch | Total number (n=63) |
|--|---------------------|
| 1-4 hrs | 6 (9.52%) |
| 5-8 hrs | 40 (63.49%) |
| >8 hrs | 17 (26.98%) |

3.4. Pattern of skin manifestations

Ear soreness and fissuring due to mask-straps was the most common cutaneous manifestation and was seen in 39(61.90%) HCPS. Miliaria also known as prickly heat was seen in 28(73.01%) HCPS. Pressure bruise was seen in 28 (44.44%) HCPS. Pressure bruise was most common over nose. Other sites of pressure bruise were waist, wrist and ankle. Intertrigo was seen in 25(39.68%) HCPS. The most common site of intertrigo was the bilateral groin area. Contact dermatitis (CD) was noted in 22(34.92%) HCPS. The most common site of CD was hands and forearms. Folliculitis and boils were noted in 13(20.63%) HCPS. The common site of folliculitis was lower leg. Acne and acneiform eruptions were seen in 7(11.11%) HCPS. The common sites of acne and acneiform eruptions were the cheeks, angle of mandible and retro-auricular area. Fungal infection was seen in 2(3.17%) HCPS. The pattern of cutaneous manifestation is tabulated in Table 2 in descending order.

4. Discussion

COVID-19 has brought dramatic changes in day-to-day life. Wearing PPE to not only save patients but also to protect themselves and their families has become mandatory to health care professionals. The usage of personal protective equipment (PPE) might result in adverse skin effects. However, there are only few studies related to adverse skin effects due to PPE. In this scenario, it is feasible to investigate the adverse effects produced by the personal protective equipment (PPE) to draw solutions which help present and future Health Care Providers.⁵

In this study, a total of 63 health care professionals participated. Adverse skin manifestations were seen in 60(95.23%) participants. These results were similar to study conducted by Lan J et al, where 97% HCWs showed skin reactions.⁶ Doctors (68.25%) had greater cutaneous adverse reactions than nurses (22.22%) in our study which was contradictory to findings by Hu et al, where nurses (51.6%) showed more reactions than doctors (49.1%).⁵ This may be due to differences in protective measures taken by doctors and nurses.

The PPE associated skin manifestations of face include pressure-induced skin damage and acne due to mask. Pressure-induced skin damage is a frequent effect of using goggles and tight fitting N95 masks for long periods. These initially present as redness and indentation. If proper care

Table 2: Pattern of Skin manifestations

| Skin Manifestation | Total number (n=63) | Doctors (n=43) | Nurses (n=14) | Allied HCP (n=6) |
|------------------------------|---------------------|----------------|---------------|------------------|
| Ear soreness and fissuring | 39 (61.90%) | 24 | 12 | 3 |
| Miliaria | 28 (73.01%) | 18 | 7 | 3 |
| Pressure bruise | 28 (44.44%) | 17 | 9 | 2 |
| Intertrigo | 25 (39.68%) | 16 | 7 | 2 |
| Contact dermatitis | 22 (34.92%) | 15 | 5 | 2 |
| Folliculitis and boils | 13 (20.63%) | 8 | 4 | 1 |
| Acne and acneiform eruptions | 7 (11.11%) | 4 | 2 | 1 |
| Fungal infection | 2 (3.17%) | 0 | 1 | 1 |

is not taken to protect the affected areas, they may end up in fissures, erosions or blisters.^{7,8} The most common skin reaction due to prolonged use of mask was ear soreness and fissuring (61.90%) in our study, which was similar to findings by Rashid T et al, where 54.9% presented with ear soreness and fissuring.⁴ Possible reason may be prolonged pressure and friction. In contrast to findings of Rashid T et al, where 56.8% presented with acne, our study showed only 11.11% of acne and acneiform eruptions.⁴ Possible reason for acne could be blocking of sebaceous ducts due to prolonged pressure. The above manifestations can be reduced by gently pinching the metal clip at the bridge of the nose, and using a surgical mask inside of the N95 mask, which can reduce friction and pressure. HCPs with acneiform eruptions due to PPE can be treated with combination of topical retinoids, benzoyl peroxide, topical antibiotic therapy and in some cases systemic antibiotics can also be used as second-line.⁹

Among the adverse skin manifestations due to gloves, 34.92% participants showed contact dermatitis which was similar to 37.5% cases by Foo et al.⁴ Allergy to latex, IgE mediated hypersensitivity to latex and repeated use of alcohol sanitisers were probable causes of this reactions.^{10,11} Using only single pair of gloves unless there is an existing hand skin injury and also by using moisturising creams can limit these manifestations. It is well known that hand hygiene is an important factor to prevent spread of bacteria and virus. But, skin is also exposed to harmful chemicals and friction because of frequent hand wash, which may result in skin barrier damage due to loss of moisture.¹² Emollients are required for repairing skin barrier damage and they also don't affect the efficacy of hand sanitizers.¹³

Healthcare professionals need to wear protective clothing for a long period of time to protect themselves. Therefore, undesired skin reactions have occurred. Use of protective gown in direct care of COVID-19 patients as well as during aerosol-generating procedures is recommended.¹⁴ Protective gowns are made of natural and synthetic nonwoven fabrics which are rarely associated with adverse skin manifestations. However, there are few reports of irritant and allergic contact dermatitis due to melamine formaldehyde, an additive chemical which is added to

provide wet strength to the protective gown.¹⁵ Adverse effects on the skin of health care workers due to protective clothing are relatively rare. 73.01% participants presented with excessive sweating and miliaria in our study whereas 82.3% participants showed excessive sweating in study by Rashid T et al.⁴ Other manifestations are folliculitis (20.63%), intertrigo (39.68%) and fungal infection (3.17%). Difference in results may be due to quality of protective covering used and climatic conditions. Frequent change of protective clothing can effectively decrease occurrence of above conditions.

Some practical steps to prevent these adverse skin effects include:

1. For acneiform eruptions, use noncomedogenic facewash, water based moisturizers and remove mask for 15 minutes every 2-3 hours.
2. In case of contact or irritant dermatitis due to masks, use foam dressings behind the ears and tie N95 mask straps on the occipital region to decrease friction on ears.
3. Low potency topical steroids and tacrolimus can be used in case of eczema. Topical antifungals and antibacterial agents are used to treat mild fungal and bacterial skin infections.
4. For preventing pressure-related facial skin injury, use foam dressing under surgical masks and also wear surgical mask prior to wearing N95 masks.
5. Adequate water intake and frequent use of emollient moisturizer before wearing face mask.
6. To prevent glove related reactions, use good quality non-powdered latex gloves after applying moisturizer on hands. Use cotton gloves inside latex gloves if susceptible to latex allergy. Try to avoid wearing gloves for prolonged periods. Use mild soaps for hand washing.
7. Excessive sweating can be prevented by adequate air conditioning at wards, use good quality PPE, avoid long working hours with rotation of duties. In case of worsening skin problems, consult a Dermatologist.

5. Conclusion

Skins reactions were frequent among frontline HCPs who worked against COVID-19. As skin is the first line of defence, the integrity of the skin barrier is crucial for self-protection and increase the possibility of infected with COVID-19. It is suggested that more attention should be paid to skin safety and proper preventive strategies should be taken for skin care. Some medical staff have already realized the significance of protection but without enough knowledge and skills. Any skin impairment caused by PPE should be treated immediately during the fight against the COVID-19. Currently the threat of epidemic is still alarming, our study provides the evidence of the high incidence of adverse skin reactions and hopes to promote the education of preventive strategies for healthcare fighters worldwide.

6. Conflict of Interest

None.

7. Source of Funding


None.


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