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Cutaneous menifestations of PPE during COVID-19 Pandemic Among Healthcare Professionals

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Abstract :

Background : The coronavirus disease 2019 (COVID-19) pandemic has emerged as a major healthcare challenge worldwide . The pandemic has necessitated the use of enhanced personal protective equipment (PPE) among healthcare workers (HCW)fighting the disease as a valuable asset to the nations. However, there have been various problems associated with the usage of PPE for prolonged duration, ranging from its shortage to many skin problems arising from frictional heating, dehydration, etc while wearing them. There is a need to assess these problems faced by HCWs both qualitatively and quantitatively for their timely and effective redressal.

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Aim :To estimate the prevalence of various cutaneous manifestations, caused by personal protective equipment (PPE) in medical staff.

Methods : An electronic questionnaire survey was conducted for estimating the skin manifestations among medical staff including doctors, nursing personnel, and other paramedical staff, fighting COVID-19. The questionnaire items included demographic data, grade of PPE and daily wearing time, skin injury types, anatomical sites, and preventive measures. Univariable analyses and logistic regression analyses were used to explore the risk factors associated with skin injuries.

Results : Data were collected from 57 frontline health care workers working in the COVID-19 hospital, mean age of the participants was 30.4 (SD: 3.3; range: 23-45) years, majority of the participants were females (53.3%) . The overall prevalence of skin injuries was 42.8% (95% confidence interval [CI] 41.30–44.30) with three types of device-related pressure injuries, moist-associated skin damage, and skin tear. Co-skin injuries and multiple location injuries were 27.4% and 76.8%, respectively. The logistic regression analysis indicated that sweating (95% CI for odds ratio [OR] 87.52–163.11), daily wearing time (95% CI for OR 1.61–3.21), male (95% CI for OR 1.11–2.13), and grade 3 PPE (95% CI for OR 1.08–2.01) were associated with skin injuries. Data was analyzed with SPSS version 22.0

Conclusion : Our study demonstrates the undeniable enhanced use of PPE kits by health care workers against COVID - 19 can result in a variety of adverse skin effects. In order to combat cutaneous adverse effects exposure time by frontline workers with PPE should be kept minimal and prophylactic dressings could be considered to alleviate the device-related pressure injuries.

Keywords : COVID19, INDIA , PPE KIT ,CONTACT DERMATITIS

INTRODUCTION :

The COVID-19 pandemic affecting 216 countries has resulted in significant mortality and morbidity worldwide [1].With over 4.8 million cases, India is the second-worst affected country so far.The use of personal protective equipment(PPE) has got attention among the healthcare workers during the global public health emergency due to the coronavirus disease-2019 (COVID-19) appeared in December 2019 [2]. Personal protective equipment (PPE) refers to the personal protective equipment used to prevent or reduce the accidental injuries and occupational hazards at hospital, and they are meant to protect against the physical, chemical, and biological factors encountered in the hospital environment. The PPEs comprises the equipment that protect the mouth, nose, ears,eyes, bare skin, and vulnerable parts, such as head and hands from the deadliest infectious secretions from the patients. [Figure 1] In order to prevent the transmission, the healthcare workers are using the personal protective equipment for prolonged duration while caring for the COVID-19 patients; however, PPE may causes serious cutaneous problems by directly affecting the skin physiology and italter its barrier function. This can lead to adverse effects and allergic reactions in susceptible individuals [3].

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During the SARS outbreak in 2003, PPE- related adverse cutaneous effects among HCWs were up to 35.5%, and during the COVID-19 pandemic, it is reported to be remarkably high as 97% [4,5].

So, an appropriate monitoring of these adverse effects should be done and effective preventive measures should be adopted. So, in this study, we have estimated the characteristics of the adverse cutaneous effects caused due to the personal protective equipment and corresponding care and preventive measures required among the frontline HCWs caring for critical COVID-19 patients.

MATERIALS AND METHODS:

We conducted a multi-centric, cross-sectionalstudy among healthcare professionals who use enhanced PPE.A 23-item, online questionnaire was disseminated to all teams using enhanced PPE consistently, within the hospital (UPUMS and GMC, ORAI) to evaluate the cutaneous adverse effects. Data entry was voluntary and completed anonymous.Internal consistency of the questionnaire was validated by keeping a spectrum of discrete options, eliminating the scoring system, and having a simple multiple-choice format. Content validation and construct validation of the questionnaire had been done by independent assessment by the two investigators in different time scales. Inter-rater reliability was ensured by allowing the respondents to fill in the questionnaires by themselves and keeping the questions simple.

The structured questionnaire was developed by the researchers by using the thorough literature review and discussion with health professionals regarding the health problems experienced by them, and it consisted of general health problems and specific adverse skin reactions of using mask, goggle, face shields, and protective clothing. The respondents were asked to select the skin related problems experienced by the particular PPE.(Table 1)

The content-validated survey tool developed by Google Forms was sent to 65 HCWs of COVID-19 hospital in North India through various social media during the month of June 2021. The participation to the study was fully voluntary and non-commercial. We could get 91% response rate from the participants with reminders, and the mandatory items were highlighted in the tool.

Statistical analysis :

All the data were derived from “The Questionnaire Star” website, and the analysis of database was established after two researchers checked. The mean (standard deviation) was used to describe participants' characteristics for continuous variables. Categorical variables were described as frequencies (percentages). Univariate analysis was first performed for identifying potential factors for the skin injuries. Fisher's exact tests were used for comparing categorical data as appropriate. Significant variables with $p < 0.05$ on univariate analysis were entered multivariate logistic analysis. All analyses were done with the statistical software package (SPSS) 22.0.

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Results :

Data were collected from 57 frontline health care workers working in the COVID-19 hospitals. Valid responses were received from 57 of 65 frontline health care workers who were selected for the study, mean age of the participants was 30.4 (SD: 3.3; range: 23-45) years, majority of the participants were females (59.6%).

Table 2.Depicts that more than half (68.4%) of the study participants were above 30 years old, with a mean of 8 (SD = 1.48+-0.56) years.

The healthcare workers comprised of 34 (59.6%) doctors, 16 (28%) nurses, 7(12.2%) ward boys. The meanduration of PPE kits usage was 41.46 +-14.71day and the mean duration of the onset of skin complaints was 11.05 +- 7.40 days. 41(71.9%) health care workers have PPE kit wearing time <2 hours, whereas, 28 % health care workers (included nurses and ward boys) have >2 hours PPE kit wearing time.(Table 3,4)

In our study, the most common offender protective measure encountered was sanitizer 36.8% (21/57), followed by soap and water in 50.8% (29/57), mask 19.2% (11/57), gloves 45.6% (26/57), and full body suit in 3.5% (2/57) of cases.The type of masks used were mainly N 95 in 61.9% and surgical masks . The material of the gloves used by most of the cases was latex (95.8%).

Hand washing with soap and water was observed in 54.3% (31/57) with mean frequency of washing 6.3 times per day. The composition of sanitizers used were mainly (70%) alcoholbased with mean frequency of use 6.8 times per day. Adverse cutaneous effects in nearly half of the cases (50.5%) had skin lesions with continued use of PPE during COVID-19 duties, 43 (75.4%) expressed nasal bridge scar and 37 (64.9%) felt indentation and pain on back of the ears. Fourty one (70.1%) HCWs had complaint of excessive sweating/soaking due to the protective clothing.

Adverse skin reactions reported by frontline nurses while using personal protective equipment (PPE) in caring critical COVID-19 patients (n = 57) Figure 1.

The majority of the patients (96%) were symptomatic exceptfor 4.9% who did not report any symptoms. The most commonsymptom was pruritus 42.1% (24/57) followed by burning 3.5%(2/57) and stinging 1.7% (1/57). There were 38.5% (22/57)patients who reported more than one symptom with itching andburning (38.6%) being the most common. Hands were the mostcommon site affected (72.3%). The common morphologiesseen were erythema 77.1% (44/57), papules 59.6% (34/57), vesicles 15.7% (9/57), xerosis 15.7% (9/57), and pustules 10.5% (6/57) (Graph 1& 2)

Contact dermatitis(CD) was the most common adverse effect observed in 71.9%(41/57) of cases (Fig. 1). Acne and related disorders like rosaceaand perioral dermatitis comprised 7.01% (4/57) of the totalcases, followed by eczema 33.3% (19/57), urticaria 10.5% (6/57), and others 3.5% (2/57) (Table 3, Figs. 1–3). In ourstudy, the use of PPE resulted in aggravation of pre-

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existingskin conditions in 17.5% (10/57) of patients. These includedatopic dermatitis in 57.8% (11/19), rosacea in 3.5% (2/19) ofcases, and acne and seborrheic dermatitis in 5.3% (1/19) each.(Table 5).

Patients who wore PPE for more than 2 hours per day reported more than one symptom as compared to those who used PPE for <2 hoursper day (P = 0.026). Those who complained of pruritus were prescribedantihistamineswherever, required. Treatment of eczemasincluded emollients and topical corticosteroids. Patients who developed acne and related disorders were prescribed topical and/or oral antibiotics and retinoic acid cream. All patients were counseled for goodskin care regimen to allow healing and prevent recurrence.

Patients were also advised to switch to gentler formulations of sanitizers whenever, possible and emolliation every time after hand wash with soap and water.

Discussion :

The outbreak of COVID-19, raise a new global concern in December 2019 and the World Health Organization (WHO) declared it a pandemic in March 2020 [6,7,8]. In the absence of an effective treatment options or a vaccine, countries across the globe have employed various preventive measures to reduce transmission of the novel coronavirus. Cutaneous manifestations among medical staff wearing PPE was immense affecting mainly hands, face and trunk.The grade of PPE, duration of wearing time, heavy sweating, and male (gender) increased risk of skin problems. First, heavy sweating increases skin injuries. Second, longer the wearing time, increases skin injuries. That is why PPE should be replaced every 4 hourly, as given in the national guidelines. Thirdly, male have more adverse cutaneous reactions than females, as males have more presipration.

India is a tropical country, so skin problems due to sweat is more profound. In our study most common problem associated with PPE Kit was contact dermatitis, followed by acne, eczema and urticarial.[Figure 2,3] The most common symptom was burning followed by pruritus, blistering around mouth, retro-auricular pain and nasal bridge scar. In order to prevent COVID -19 infection HCWs were using N95 longer duration, that results in retro-auricular pain, redness of ears and nasal bridge scars [9,10].

Similar study was conducted in Hubei Province in China that most common adverse cutaneous reactions were acne, itching over face and rash, pigmentation of nasal bridge, cheeks, and chin [11].In our study, acne was one of the most prevalent skin reactions associated with the use of N95 masks. The metal strip and elastic bands of the N95 mask, at the fix site for longer duration leads to device related pressure injuries, like retro-auricular pain, erythema, itching and papules over face and blistering around mouth [12,13].

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Due to frequent use of hand sanitizer and latex gloves leads to contact dermatitis, dryness and fissuring [10]. This could be due to hypersensitivity to latex, humid atmosphere and tight gloves; improper air circulation inside the gloves, which causes contact dermatitis and rashes [14,15].
This study enlights the modification in PPE kit that could be safely worn and remain safe for prolong duration and effectively prevent transmission. The duty hours should be reduced or atleast short break so the contact with PPE kit will be less. The strap of N95 mask should be tied on crown rather than behind the ears, use of emollients over the nasal bridge area. Apply alcohol free sanitizers, dry hands before donning the gloves and use of petrolatum every time after washing hands. In case of pre – existing dermatosis cotton padding before wearing gloves.
Appropriate training of HCWs on the ways of prevention of adverse cutaneous lesions due to PPE kit. The quality of PPE kit materials should be good enough to reduce the incident of these adverse effects, and thereby, we can enhance the mental health and morale of the health care workers.

Conclusion

None of the health care worker participated in our study reported to any dermatologist consultation, but some had reported self-medications and application of emollients, home-made therapies and other topical lotions on the skin rashes minimized the irritations and dermatitis. It may be due to inaccesbility to the deramatologist , because of lockdown. The cutaneous problems among health care worker were immense. To reduce this, the time period of wearing PPE kit should be minimized by reducing the working hours, shift duties, protective padding, liberal use of urea based moisturizers to prevent pressure related injuries.

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