Dermatological concerns of healthcare workers (HCWs) amidst the COVID-19 pandemic

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At present, the whole world is going through the coronavirus disease 2019 (COVID-19) pandemic, which is taking its toll on healthcare workers (HCWs) as well as patients. In fact, HCWs are not only at risk of acquiring the disease but also suffer from various problems related to prolonged work in a stressful situation with full personal protective equipment (PPE), which may lead to adverse cutaneous effects

We used search engines to look for data on the dermatological problems in HCWs owing to frequent handwashing and to the use of PPE. The search terms used were 'COVID-19', 'healthcare worker', 'dermatoses', 'personal protective equipment', and 'hand hygiene.'

Healthcare workers are susceptible to various dermatoses caused by multiple confluent factors including working for long hours in PPE, which is usually snug-fitting and includes headgear, masks, goggles, gloves, boot covers, and surgical gowns. They also are subjected to frequent hand cleansing, often more than 20 times a day. All this has led to various dermatoses caused by friction, pressure, humidity, irritation, as well as allergic responses to the equipment used in almost all those who work for prolonged periods in PPE, as shown by various case series and reports. Steps are being formulated to minimize these adverse cutaneous effects through appropriate measures that must be taken by HCWs. Healthcare workers are susceptible to various dermatoses caused by excessive hand hygiene practices and prolonged usage of PPE.

Proper counseling minimizes the morbidity by promoting protective measures.

Keywords: coronavirus, personal protective equipment, hand disinfection, dermatoses

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INTRODUCTION

The end of 2019 saw the emergence of a cluster of pneumonia cases in Wuhan, China, which were later designated as the coronavirus disease 2019 (COVID-2019) attributed to a novel viral strain named the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The virus quickly gripped the entire world, shifting its epicenter from time to time and prompting the World Health Organization to declare a pandemic [1]. As of June 12, 2020, confirmed cases stand at more than 7.41 million worldwide [2].

Here, we discuss the non-infectious impact of COVID-19 on healthcare workers (HCWs) in terms of dermatoses acquired during the implementation of extreme measures of personal safety and hygiene. The data were collected using various search engines (PubMed, Scopus); the terms used were: 'COVID-19', 'healthcare workers', 'personal protective equipment', 'handwashing', 'hygiene', and 'dermatoses.' We went on to collate the data, add on our personal experience, and formulate preventive and safety measures for HCWs that will enable them to minimize the dermatological hazards of excessive hand hygiene and PPE usage. Informed consent was obtained from all HCWs whose lesions were photographed.

COVID-19 and healthcare workers (HCWs)

The emergence of COVID-19 has caused an acute strain in hospital functioning, where there should be an immense focus on the triage of patients with clinical signs such as fever, fatigue, dry cough, pneumonia, headache, etc. The virus persists on inanimate objects like plastics, metals, and glass for up to nine days [3]. Contact with infected surfaces can increase the chance of acquiring the virus. Mucous membranes have been recognized as its main entry points. Healthcare workers, including doctors and nurses, are now at a high risk of transmission due to widespread exposure to patients suspected for COVID-19 and need to be protected. In the dermatological setting, as in most other branches of medicine and healthcare, clinical diagnosis and procedures require close contact, usually within less than a foot (30 cm) of the patient because of the intricacies of both lesions and human anatomy. Dermatoscopy and other dermatological procedures may reduce the distance even further. Hence, HCWs including dermatologists are forced to wear personal protective equipment while providing care to patients.

Personal protective equipment (PPE) and its risks

The term PPE refers to protective clothing, helmets, gloves, face shields, goggles, facemasks, respirators, or other equipment designed to protect users from injury or the spread of infection or illness. Frequent handwashing and disinfectant usage have become a routine for most HCWs to combat the high infectivity of the SARS-CoV-2.

Several studies have recently demonstrated cutaneous damage due to prolonged PPE usage, frequent handwashing, and high exposure to disinfectants [4-6]. Precautions to prevent cutaneous damage due to PPE are essential as damaged skin that has lost its natural barrier may be an easy portal for viral entry. Dermatological concerns among HCWs can be due to PPE usage or hygiene measures; the most prominent issues are collated in Table 1.

Skin damage due to the use of personal protective equipment (PPE)

Some PPE including N95 masks, goggles, and face shields are associated with hyperhydration, pressure-induced damage, friction, epidermal barrier breakdown, and contact reactions. Lan *et al.* mentioned that the nasal bridge was the most commonly affected site (83.1%), with lesions in the form of an indentation, ecchymosis, maceration, abrasion, and/or erosion [4]. Existing skin diseases like acne, rosacea, and seborrheic dermatitis may flare up due to occlusion, humidity, pressure, and friction [7]. The prolonged wearing of protective clothing and occlusive body suits can lead to heat, humidity, sweating, and, if tight, can cause chafing in certain places. All this may lead to intertrigo, dermatophytosis like tinea cruris and tinea corporis, miliaria crystallina or rubra due to the occlusion of sweat ducts, irritant dermatitis due to the pressure effect, chafing, and chemical content and allergic contact dermatitis, especially to the adhesives, rubber bands and metal strips of masks, goggles and headbands, and to the formaldehyde textile resins of gowns in susceptible individuals [8]. Furthermore, delayed pressure urticaria may occur after wearing goggles and masks. Previously, the use of N95 masks had been associated with flare-up of acne, dermatitis, and pigmentation of the nasal bridge and cheeks in one-third of users [9]. Frequent and prolonged usage of shoe covers may also cause fungal infections of the feet as well as toe web intertrigo. Plastic gloves, latex gloves, and nitrile gloves are all associated with many adverse skin reactions, including irritant or allergic contact dermatitis as well as contact urticaria [10]. Glove powder has been reported to cause allergic

Table 1. Dermatological concerns of healthcare workers precipitated by the COVID-19 pandemic

Skin damage due to personal protective equipment			
Equipment	**Damage caused**	**Pathophysiology**	**Treatment/prevention**
N95 masks, goggles, and face shields	Indentation, ecchymosis, maceration, abrasion, or erosion	Hyper-hydration, pressure-induced damage, friction, epidermal barrier breakdown, and contact reactions	Moisturizers; topical antibiotics
	Flare up of acne, seborrheic dermatitis, or rosacea	Occlusion leading to pressure effect, sweating, and hyper-hydration	Specific treatment
	Delayed pressure urticaria	In susceptible people due to mast cell degranulation on pressure	Anti-histamines
Protective body suits	Folliculitis; intertrigo, dermatophytosis (esp. tinea cruris); miliaria rubra	Occlusion, hyper-hydration, warmth, and sweating	Specific treatment
	Dermatitis	Irritant contact due to chafing at tight-fitting places; allergic contact in susceptible people	Moisturizers; topical steroids
Shoe covers	Intertrigo; tinea pedis		Topical steroids; topical antifungals
Hand gloves; glove powder	Hand dermatitis; pressure urticaria; contact urticaria	Plastic, vinyl and nitrile may cause allergic dermatitis in susceptible individuals	Barrier creams; moisturizers; topical steroids; antihistamines
Sanitizers and detergents	Irritant contact dermatitis; allergic contact dermatitis; pompholyx; paronychia; xerosis; itching; burning	Irritation to chemicals in soap or absolute alcohol; allergy to additive agents/perfumes	Moisturizers; topical steroids

reactions and hand dermatitis; long-term use can cause pompholyx.

Skin damage due to handwashing and disinfectants

Frequent handwashing, more than ten times a day, has resulted in a high incidence of hand hygiene-induced skin damage in first-line COVID-19 HCWs in the form of skin dryness and irritant or allergic contact dermatitis [4,11]. Repeated and frequent use of lipid-emulsifying detergents or lipid-dissolving alcohols in sanitizers deplete lipids in the stratum corneum, resulting in a compromised barrier and making the skin prone to the development of features of dermatitis like dryness, roughness, itching, burning, erythema, edema, blistering, scaling, and fissuring [12]. Strong irritants like caustic chemicals used in sanitizing work places and hospitals may induce acute dermatitis on initial contact; milder irritants like hot water, detergents, or alcohols are implicated in cumulative insult dermatitis. Loss of nail cuticles and paronychia may follow repeated handwashing.

The authors of this study have personally observed a rising number of cases of inflammatory acne on the cheeks (Figures 1 & 2), erythema on the nasal bridge and cheeks, deep painful indentations left by masks and goggles, miliaria rubra after the use of PPE gowns, lamellar exfoliation, paronychia, and hand dermatitis (Figures 3 & 4).

Worldwide statistics on skin damage in HCWs following the COVID-19 outbreak

Most of the published large-scale studies are from China. Here, three major case series are worth mentioning. Lan *et al.* surveyed 542 HCWs involved in COVID-19 management, including doctors and nurses, and reported that 97% had skin damage due to enhanced personal protection against the infection. The nasal bridge was the predominantly affected site (83.1%); dryness/tightness was seen in 70.3% of the individuals, and the prevalence rate of skin desquamation was 62.2%. The damage was proportionate to the duration of PPE usage, especially when this duration was more than six hours. Hand damage had a greater correlation with frequent handwashing (> 10 times per day) than prolonged use of gloves [4]. A cross-sectional survey by Lin *et al* involving 10 hospitals in Wuhan, China, on 376 HCWs reported dryness and scaling (68.5%), erythema/papular eruptions (60.4%), and macerations (52.9%) as common findings, with the hands, cheeks and nasal bridge representing the typical areas involved (84.6%, 75.4%, and 71.8%, respectively) [13]. The severity and frequency of involvement were higher in areas where the

Figure 1. Inflammatory acne (right cheek) in the area of friction caused by the use of face masks.

Figure 2. Inflammatory acne (left cheek) in the area of occlusion caused by the use of face masks.

Figure 3. Contact dermatitis due to frequent handwashing.

Figure 4. Early paronychia.

numbers of COVID-19 cases were more and where the usage of PPE was prolonged (> 6 hours). Pei *et al.*, in a pan-Chinese survey, found that medical workers with higher biosafety levels of protection (level 2 & 3) experienced pruritus at a higher rate. Advanced protection, higher work frequency, and longer duration of donning PPE correlated with facial skin involvement and cutaneous erythema [14]. The authors have personally observed increasing cases of inflammatory acne, frictional erythema over the nasal bridge and periauricular area, hand dermatitis, paronychia, lamellar exfoliation, miliaria rubra, and dermatophytosis secondary to prolonged work while donning PPE under hot and humid conditions.

Essential concern of skin barrier damage to HCWs

Skin damage, especially to the hands and face, can provide a portal of entry for microorganisms, with the SARS-CoV-2 being no exception. The associated symptoms like itching and burning may lead to discomfort at work and unnecessary touching of the skin. Furthermore, extreme cases of dermatitis and dermatoses may lead to absenteeism from work, thereby causing more burden on other workers. In particular, HCWs who are known atopics, work in areas of low humidity, have prolonged shifts, indulge in frequent and prolonged handwashing, or perform wet work are known to experience more cutaneous adverse effects, especially hand dermatitis [15].

Recommendations for HCWs

Counselling HCWs regarding the skin damage associated with PPE usage and educational intervention for HCWs about hand eczema risk factors such as frequent handwashing, surgical scrubbing, and prolonged glove use [16] goes a long way in improving their quality of life.

1. A full-face respirator or a full-face shield rather than goggles should be used in those with a history of sensitivity [4].
2. Masks: different masks with different types of ties (but all of which afford the best protection) may be used to avoid sustained pressure and friction at the same site. Those with allergic contact dermatitis to masks may use two layers of soft gauze within the mask in unavoidable circumstances [7].
3. Gloves: use powder-free gloves, with an inner cotton lining in the case of prolonged use. Wash hands with mild soap after glove removal. Avoid using wet gloves or wearing gloves on a damp hand [11].
4. Proper handwashing: wet the hands, lather them with soap, scrub for at least 20 seconds, rinse with warm or cool running water (avoiding hot water), and pat dry the hands with a soft cloth or tissue.
5. Soaps without fragrances and preservatives, or alcohol-based hand solutions containing glycerine and at least 60% alcohol are less damaging to skin and can be used [17]. These agents should be rubbed onto the hands for 20 s in lieu of soap and water [16].
6. Hot water and antibacterial soap do not afford extra protection and may be avoided to minimize skin irritation.
7. Emollient moisturizers and fragrance-free humectant creams or emulsions (e.g., containing urea, propylene glycol, or ceramide) should be applied regularly after handwashing to combat barrier damage induced by irritant or allergen exposure [18] and for xerosis caused by long-term PPE use.
8. Topical glucocorticoids should be used with adequate strength and dosing at the earliest indication of dermatitis to prevent further skin barrier compromise.
9. Always use well-fitting PPE.
10. A hydrocolloid dressing applied prophylactically over the nasal bridge can prevent injury due to pressure and friction [19].
11. For severe skin indentations after use tightfitting goggles and mask, the use of a cold compress followed by the application of moisturizer is indicated [7].

CONCLUSION

COVID-19 case numbers are increasing with each passing day. Given the change of hospital dynamics, healthcare workers across all specialties are under immense stress for meeting the needs of new patients alongside running the usual specialty clinics. The skincare of our HCWs should be looked after to safeguard them from being

infected or inconvenienced due to skin damage. Administrative personnel should be involved in promoting education on proper PPE usage, and the daily duration of donning PPE should be restricted to six hours or less. Dermatologists should play an active role in counseling HCWs who are involved with the COVID-19 pandemic in terms of hand hygiene and the proper use of PPE, and should provide the necessary treatment when indicated.

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