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Original Article

Complications of personal protective equipment in the general population through the dermatologists' eye: A questionnaire-based study

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Abstract

Background Due to the COVID-19 pandemic, usage of personal protective equipment (PPE) has increased. They are known to cause skin complications, as documented by observations in the healthcare workers. However, the data regarding the same remains unexplored in the general population. This study is aimed to fill this knowledge gap.

Methods A questionnaire-based survey was conducted with 121 dermatologists, noting how often they have observed PPE related skin conditions.

Results Majority of them (81.8%) reported a rise in cases like contact dermatitis, dry hands, contact urticaria, cuts on the nose and ears, which was attributable to PPE. A flare of pre-existing dermatoses like acne, seborrheic dermatitis, hair loss, rosacea, and skin infections were also reported.

Key words
COVID-19: Pandemic; Personal protective equipment (PPE); Cutaneous side effect of PPE.

Introduction

Personal protective equipment (PPE) is equipment that protects one's body against health or safety risks at work.[1] During the COVID-19 pandemic, there has been a rise in the usage of personal protective equipment like masks, face shields, gloves and hand sanitizers. These alter the milieu of normal skin physiology. Many authors have reported outcomes like contact dermatitis, urticaria, dryness or tightness with the use of gloves and desquamation or ulceration of the nasal bridge with prolonged use of tight-fitting masks.[2-8] These studies have mostly concentrated on these issues among health care workers. Hence recommendations are placed as well for them.[9,10] However, with increased usage of PPE in the general public, we need to explore this further in the general population. We intend to collect this information indirectly from practising dermatologists enquiring if they have noted any rise of these complications among general patients in their day-to-day practice.

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Methods

This was a cross-sectional, questionnaire-based study. Institutional ethics committee approval was obtained before the study. A pretested, structured online questionnaire was sent to dermatologists who had completed their MD,

DNB or Diploma in dermatology and were practising in India. Only the consenting and willing doctors were asked for responses; these responses were coded and analysed.

Results

A total of 121 dermatologists answered the questionnaire. Most of them 56 (46.3%) practised at medical college hospitals and 38 (31.4%) at private clinics, and the rest of them in both sectors. The majority of doctors (57; 47.1%) had 1-5 years of experience, followed by 35 (28.9%) who were in the field for more than ten years. Before the pandemic, nearly half of them (58; 47.9%) treated 21-50 out-patients per day and 37 (30.6%) had more than 50 patients every day. The number of cases reduced drastically to less than 20 cases/ day during the pandemic as reported by more than half of the doctors (57%).

Complications related to the use of personal protective equipment in the general population were noted by 99 (81.8%) doctors. A few skin conditions were seen exclusively after the advent of PPE usages like cuts and pigmentation on the nose and retro auricular area. Seventy-five (62%) dermatologists reported cases of erosions and post-inflammatory pigmentation over the nose. The frequency, however was rare, with the majority being once a week to once a month. Sixty-three doctors (52.1%) noticed cuts over the retro auricular area among who 23 (19%) treated 1-3 cases per week **(Table 1)**.

A few skin conditions were considered to be directly due to PPE usage by the doctors. The frequency of encounters with these conditions are summarised **(Table 2)**. It excludes the cases that the doctor does not consider secondary to PPE usage. Hand dermatitis secondary to sanitizers were treated by 117 (96.7%) dermatologists. Seventy-nine (65.3%) of them

Table 1 Frequency of patients with PPE related complications and the number of dermatologists who reported the same:

Disease/ Frequency	*>5 patients/day*	*1 patient/ day*	*2-3 patients/ week*	*1 patient/ week*	*1 patient/ month*	*Never*
Cuts/PIH on nose	0	2 (1.7%)	12 (9.9%)	26 (21.5%)	35 (28.9%)	46 (38%)
Cuts- retroauricular	0	0	8 (6.6%)	15 (12.4%)	40 (33.1%)	58 (47.9%)
Contact dermatitis due to hand sanitizers	3 (2.5%)	6 (5%)	36 (29.8%)	43 (35.5%)	29 (24%)	4 (3.3%)
Contact dermatitis due to gloves	0	4 (3.3%)	22 (18.2%)	29 (24%)	44 (36.4%)	22 (18.2%)
Contact dermatitis due to soaps & surface cleaners	1 (0.8%)	3 (2.5%)	43 (35.5%)	31 (25.6%)	30 (24.8%)	13 (10.7%)
Contact dermatitis- unknown cause	3 (2.5%)	4 (3.3%)	37 (30.6%)	27 (22.3%)	34 (28.1%)	16 (13.2%)
Contact urticaria	0	1 (0.8%)	7 (5.8%)	10 (8.3%)	29 (24%)	74 (61.2%)
Dryness of hands	12 (9.9%)	7 (5.8%)	24 (19.8%)	15 (12.4%)	18 (14.9%)	45 (37.2%)

Table 2 Frequency of patients with flare of pre-existing dermatosis secondary to PPE and the number of dermatologists who reported the same.

Disease/ Frequency	*>5 patients/ day*	*1 patient/ day*	*2-3 patients/ week*	*1 patient/ week*	*1 patient/ month*	*Never*
Acne	10 (8.3%)	10 (8.3%)	43 (35.5%)	25 (20.7%)	25 (20.7%)	8 (6.6%)
Seborrhea	9 (7.4%)	3 (2.5%)	19 (15.7%)	28 (23.1%)	21 (17.4%)	41 (33.9%)
Miliaria	0	3 (2.5%)	14 11.6%)	24 (19.8%)	26 (21.5%)	54 (44.6%)
Hairfall	12 (9.9%)	7 5.8%)	24 (19.8%)	15 (12.4%)	18 (14.9%)	45 (37.2%)
Rosacea	0	0%	5 (4.1%)	17 (14%)	25 (20.7%)	74 (61.2%)
Infections	0	3 (2.5%)	8 (6.6%)	16 (13.2%)	25 (20.7%)	69 (57.0%)

reported 1-3 cases per week. Contact dermatitis secondary to gloves was reported by all out of which 51 (42.2%) doctors who had 1-3 cases per week. Similarly, contact dermatitis due to excessive use of soaps and surface cleaners was reported by 108 (89.3%) dermatologists. Furthermore, increased cases of contact dermatitis were reported by 86.8%, with no identifiable cause. Dryness was also common, with 38 (31.4%) doctors treating 2-3 patients per week. Contact urticaria was reported less often, i.e., by 47 (38.8%) dermatologists.

A flare of pre-existing dermatoses was also reported like acne by 113 (93%), seborrhoea (80; 66.1%), hair fall (76; 62.8%) and miliaria (67; 55.4%). Infections like warts/ molluscum or pyoderma attributable to autoinoculation were reported by 52 (43%) doctors. A flare of rosacea was noted by 47 (38.8%).

Less often reported cutaneous adverse effects included cuts over the cheek observed by 5 dermatologists, hesitation cuts suggestive of suicidal ideation by 4 and cuts over the groin by 2 dermatologists. Cuts over the chin, cuts over the axilla, irritation over the nape of the neck and blisters over the back was reported by 1 dermatologist each.

Discussion

Covid 19 was recognised as a public health emergency by the World Health Organisation in January 2020 and declared a pandemic in March 2020.[11] Though the development of vaccines has given some hope, it is not proven to prevent infection, the vaccines reduce COVID related mortality.[12] In the interim, personal protective equipment and measures such as social distancing, hand hygiene and respiratory etiquette help in reducing the transmission of the virus.[11] The use of PPE carries a risk of cutaneous barrier dysfunction, which results in new cutaneous dermatoses or aggravation of pre-existing ones.[11]

This incidence of PPE related skin complications was estimated to be 97% among healthcare workers (HCWs).[3] It is unknown in the general population. We identified that 87% of doctors responded that they have come across PPE related skin complications among the general population. In a study by Lan *et al*. they also noted that the most common site involved was the nasal bridge (437; 83.1%). However, the incidence of cuts on the nasal bridge was less commonly noted in the general population. This could be because most healthcare workers wear tight-fitting N95 masks, goggles and face shields for at least 6 hours continuously, unlike the general population.[3] Dryness/tightness (370; 70.3%) and desquamation (327; 62.2%) were the other common issue in HCWs reported earlier.[3] A similar data was seen by Mushtaq *et al*., who reported contact dermatitis to soap in 57 (56.44%) patients, sanitizers in 39 (38.61%) and included HCW and the general public.[11] In our study, we found that the frequency of hand dermatitis and dryness in the general population

was high, attributable to hand sanitizers and soaps rather than gloves. Lan *et al*. also postulated that more frequent hand hygiene measures increase the risk of skin damage rather than the prolonged wearing of gloves.[3]

During the Severe Acute Respiratory Syndrome outbreak, Foo *et al*. reported mask related side effects like acne (65; 59.6%), facial itching (56; 51.4%) and rash (39; 35.8%) in HCWs.[2] During the current COVID-19 outbreak as well, in HCWs, acne, rosacea and perioral dermatitis were seen in 10 patients.[11] Higher incidence of a flare in existing conditions like acne was commonly seen in our study as well. It could be secondary to occlusion, friction, and sweating. Hot and humid microclimate and occlusion of pilosebaceous glands may lead to a flare of acne.[2]

Two dermatologists reported patients with tinea faciei attributable to mask. Similar cases have been reported earlier by Agarwal *et al*., who reported 7 cases of non-familial tinea faciei after mask usage.[13]

Two doctors responded that they have seen cuts in the groin area. This may be attributed to increased sweating and maceration along with friction. In a review article by Goyal *et al*., it was hypothesised that occlusion of skin and subsequent sweating by using bodysuits causes an increase in dermatophytosis, intertrigo and miliaria.[9]

Though not evaluated in our study, some skin diseases may occur less frequently when PPE is used. There may be a level of protection against the causative reason (like occupational exposure or sun exposure), which may prevent or reduce a pre-existing skin condition.

Health care workers have been taught the due precautions to prevent or treat PPE related skin side effects. But the same is not true with the general population, where the usage of PPE has substantially increased as well.[9,10] The general public have access to PPE that may be sub-standard, leading to higher complications. Padula *et al*. rightly stated that the benefits of using PPE far outweigh the risks, and the following precautionary measures can be implemented[6]. Before wearing masks, it is advisable to cleanse the face with a pH balanced cleanser to reduce bacterial/ viral surface contamination and then pat the skin dry. The emphasis on moisturisers cannot be undermined, especially to reduce friction injury over the prone areas.[10] However, the use of petrolatum or mineral oil is not advised. If feasible, the mask can be removed for 15 minutes for every 2-hour usage to reduce the side effects.[6]

Limitations The reported side effects are based on the subjective assessment of 121 dermatologists and was not a direct population-based study. The severity of the disease could not be assessed.

Conclusion

Various skin complications were noted in the general population using PPE, emphasising the need for awareness of skincare and correct techniques of using PPE. Studies looking at the physiological and pathological changes may help evaluate the reasons for these changes and thus formulate a plan to avoid them in the future.

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