

THE DERMATOLOGICAL EFFECTS OF PERSONAL PROTECTIVE EQUIPMENTS USED DURING COVID 19 PANDEMIC: A CROSS SECTIONAL SURVEY

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ABSTRACT

AIM: To study the cutaneous adverse effects of the personal protective tools on the general population.

INTRODUCTION: The COVID-19 global pandemic has mandated the use of personal protective equipment to protect the healthcare workers and the general public from contracting the virus. However, these tools and equipment can have certain dermatological or cutaneous effects on the skin. We aim to study these effects through this study.

MATERIAL AND METHODS: A cross sectional study was carried on the family members of healthcare workers working at Rajarshi Dashrath Autonomous State Medical College, Ayodhya, Uttar Pradesh.

A semi open ended pretested questionnaire was developed using google forms and was distributed by social media applications & sites.

RESULTS: Out of the 394 responses received 55.1% were male and 44.9% females; the maximum cutaneous adverse effects were reported with the use of masks (77%) followed by sanitizers(56.7%) and soaps(46.7%). Dryness of skin (75.37%) was the most common adverse effect followed by contact dermatitis(50.2%).

CONCLUSION: In the present study, we reported the cutaneous findings due to the usage of personal protective equipment among the general population which can be used as scoping base to devise equipment with these considerations to make it more user friendly and acceptable to the general population.

Keywords: Dermatological effects, COVID 19, PPE, Cutaneous adverse effects, General population

INTRODUCTION :

Coronavirus has been the perpetrator of two pandemics: severe acute respiratory syndrome and Middle East respiratory syndrome followed by the present global pandemic of COVID 19.^[1] A novel coronavirus called SARS-CoV-2 is responsible for COVID-19 respiratory illness that was first identified in Wuhan, China in December 2019. The virus is believed to be acquired from zoonotic source^[1] and spreads through direct transmission via respiratory droplets when an infected person

talks, coughs, or sneezes and contact transmission with contaminated surfaces or objects, and from person to person through close contact.

The COVID-19 pandemic has led to increased use of personal protective equipments (PPE) such as masks, gloves, face shields, and gowns by not only the healthcare workers, but also the general public. While these protective tools (PT) are essential for preventing the spread of the virus, they can also have dermatological or cutaneous effects on the skin.

MATERIALS AND METHODS:

Study Design: A cross sectional observational study was done. Study population were the family members of healthcare workers working at a Government Medical College in Ayodhya ,Uttar pradesh. i.e. the general population.

Sample size and Data collection: Ethical clearance was obtained from the institutional ethical committee of the Government Medical College, Ayodhya. The semi open ended pretested questionnaire was shared online with the participants of the study via social media applications & sites over a time period of two weeks from July 1, 2021 to July 15,2021. Voluntary response sampling technique was used for the data collection.

Minimal sample size “n” for random sample at 95% confidence level (CL) and absolute precision(d) of 5 at $p=0.05$ was computed to be (Epi Info 7) 384.

Tools: Google forms was used to capture the answers. The online form consisted of a brief introduction and purpose of the study and the informed consent of the participants. The participants who gave consent were directed to a set of questions comprising of socio-demographic details, COVID 19 related practices and the specific questions related to the dermatological effects experienced on using the personal protective equipments .

The reminders were sent after 2 days twice. The participants whose responses were not complete were excluded from the study. The information collected was kept confidential and anonymity of the participants was maintained.

Statistical analysis: Statistical analysis was performed using SPSS statistic 23.0 (IBM SPSS statistics, New York, United states). Appropriate simple descriptive tabulations and tests of significance like chi square test were used. For identifying determinants , univariate odds- ratio estimation was used.

RESULTS:

In our study, there were 394 participants of which 55.1% males and 44.9% females. The mean age of the study participants was 24.01 years and the range was 17-57 years.

On analyzing the responses, submitted by the study participants we found that the maximum adverse dermatological effects were reported with the use of masks (77%), followed by sanitizers (56.7%), soaps (55.3%), gloves (46.7%), face shields (37.1%) and least with PPE (34.2%) shown in Table 1

Table 1. The percentages of the study population dermatologically affected, unaffected by the use of personal protective equipments.

S.No.	Personal protective equipment used	Percentage reporting adverse cutaneous effects	Percentage with no complaints	Percentage which never used the personal protective equipment
1	Mask	77%	23%	0
2	Sanitiser	56.7%	43.3%	0
3	Gloves	46.7%	51.5%	1.8
4	Soaps/cleansers	55.3%	44.7%	0
5	Face shield	37.1%	60.8%	2.1
6	PPE overalls	34.2%	0	65.8

Adverse cutaneous effects were reported to all types of the protective equipments used. Following were the skin problems reported by the subjects. (Table 2)

Use of sanitizer- Responses showed that the dryness of hands was the most common adverse event (32%) followed by skin peeling(8.1%), burning sensation (6.3%), red rashes with itching(3.3%), red rashes without itching (2.5%), only itching(2%) , post inflammatory hyperpigmentation (1.3%)

Use of masks- Cuts/pain behind the ear where the mask string/loop comes in contact with the skin was the most common skin problem reported (24.9%), followed by itching (15.5%),acne on face (14.2%), rashes on face (8.6%), cuts/pain on the border of masks where it came in contact with the skin (6.1%), pigmentation (5.3%) post inflammatory hyperpigmentation (0.8%).

Use of Gloves: The most common cutaneous problem reported was dryness of hand (27.9%), followed by peeling of skin (7.4%), itching(6.3%), red rashes with itching (2.5%), excessive sweating (0.9%), red rashes without itching (0.8%), post inflammatory hyperpigmentation (0.3%).

Use of soaps/cleansers: dryness of skin (47.7%) was the commonest adverse effect reported followed by itching (4.1%), itching with rashes (2.1%).

Use of PPE overalls : excessive sweating (27.4%),itching (3.3%), generalized rashes with itching (3.2%) were reported among subjects who used overalls.

Use of face shields : itching and sweating (19%) followed by cuts where the face shield band came in contact with the skin (6.9%), acne with itching (4.3%), pigmentation where the face shield band came in contact with the skin (3%), acne without itching (2.8%).

Table 2: Maximum reported adverse cutaneous effect to different PPEs by the study population

Personal protective equipment used	Maximum reported adverse cutaneous effect
Mask	Cuts/pain behind the ear where the mask string loop comes in contact with the skin
Sanitiser	Dryness of hands
Gloves	Dryness of hands
Soaps/cleansers	Dryness of hands
Face shield	Itching and sweating
PPE overall	Excessive sweating

DISCUSSION:

Personal protective equipments (PPE) or protective tools (PT) such as sanitizers, masks, gloves, soaps/cleansers, face shield, PPE overalls have become a ubiquitous aspect of daily life since the outbreak of the COVID-19 pandemic.

Although the frontline healthcare workers face the major brunt of the disease, but it is to be remembered that their family members too get exposed and they have to take equal precautions. Many of them are essential field workers which mandates the use of PPEs. While it is an effective way to reduce the transmission of infectious diseases, prolonged use of PPE can lead to several cutaneous adverse effects on the skin. Some of the common effects are:

Contact dermatitis: Prolonged use of gloves, masks, and face shields can cause irritation or inflammation of the skin, known as contact dermatitis. This occurs due to the mechanical rubbing or pressure of the equipment on the skin, as well as the accumulation of sweat and moisture under the equipment.

Acne: Wearing masks for extended periods of time can cause irritation, redness, and acne around the mouth, chin, and cheeks. This condition is known as "maskne" or "acne mechanica." as it creates a warm and humid environment that promotes the growth of bacteria on the skin.

Allergic reactions: Some people may have allergic reactions to the materials used in protective equipment such as latex gloves or elastic bands.

Dryness and itching: Frequent hand washing and sanitizing, as well as wearing gloves, can lead to dry and itchy skin due to the removal of natural oils from the skin.

Pressure sores: Prolonged use of face shields or goggles can cause pressure sores on the skin, especially around the nose, forehead, and ears.

In our study, we found that the maximum adverse dermatological effects were reported with the use of masks (77%), followed by sanitizers (56.7%), soaps (55.3%), gloves (46.7%), face shields (37.1%) and least with PPE (34.2%) which is similar to previous studies.^{[2][3][4][5]}

In another study the adverse effect was more to masks (53.46) than gloves(49.92%).^[6] In a study conducted at Turkey adverse effect was more to masks(97.1) than gloves(96.8%).^[7] High incidence was also reported by a study conducted at Morocco, where 57% adverse effects were reported to the surgical masks and respirators 45% to gloves, 23% after wearing a face shield, and 11%.^[8] The results of different studies have also proven the presence of skin-related problems occurring due to the use of gloves, surgical/N95 masks, which are reported to be used more frequently.^{[8][9][10][11][12][13][14][15][16]}

In our study, dryness of skin (73.6%) was the most common symptom owing to the frequent measures of hand hygiene taken. Other studies also reported dryness as the most common symptom with the use of gloves, sanitiser and soaps/cleansers.^{[2][4][7][17]}

In a study by Kiely et al. the most frequently reported symptom was dry skin (75.37%) with the use of gloves which is almost equivalent to our study.^[18]

Pressure injuries, including erythema and erosion, was the most common skin reaction due to the use of masks which was consistent with other studies.^[4] The skin behind the ears is known to be susceptible to pressure injuries due to repetitive friction caused by the ear loops of face masks^[19] and this observation was supported by our study. Long-term use of the N95 mask is a predisposing factor for the development of pressure injury on the nasal bridge and the dorsum of the nose.^{[8][10]} However, in our study it was not clear whether the respondents used surgical masks, cloth masks or N95 masks.

The pressure injuries at the contact areas due to the use of mask may be attributed to their use for long hours, the tight fit on the face, and decreased tissue tolerance due to increased moisture in the areas under the mask.^{[10][20][21]}

With the use of PPE overall excessive perspiration was mostly reported by our study participants much similar to another study where perspiration and moisture were the most reported problems by the HCWs related to the use of protective gowns/overall.^[7]

Considering facial dermatoses, the percentage of our study population reported acne(21.3%), facial dermatitis (11.8%), itch (37.7%), pressure injuries (37.9%). One such study reported the total prevalence of facial dermatoses as 55%. It also reported, acne, facial dermatitis, itch and pressure injuries as facial dermatoses, with a pooled prevalence of 31%, 24%, 30% and 31%, respectively.^[22]

The most common skin problem encountered considering the use of all the physical protective measures was contact dermatitis (50.2%) in our study, which is similar to another study from India where the contact dermatitis was the most common adverse effect reported.^[23]

This study was conducted on the general population. Most of the published literature contains data about the adverse skin reactions encountered with the use of PPE in healthcare workers(HCWs). Very few studies have attempted to collect the data regarding adverse skin effects to PPE from both the general population and the healthcare workers^{[5][23][24][25][26][27]} or only the general population.^{[28][29][30][31][32][33][34]} However, the prevalence of adverse dermatological effects in the present study was found to be comparable with HCWs based other studies.

CONCLUSION:

The global pandemic of COVID 19 has necessitated the use of personal protective tools by both HCWs and general population alike. The findings of our study infer that the type of skin problems encountered by the general population due to the use of protective tools(PT) is very much similar to those reported in HCWs based studies in terms of prevalence, type of skin reactions. This study can be supportive in devising personal protective equipments which are more user friendly and have lesser adverse effects.

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