

A Cross-sectional Study on Cutaneous Side-effects Associated with Mask Usage among Doctors during COVID-19 Pandemic

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ABSTRACT

Introduction: The Coronavirus Disease-2019 (COVID-19) pandemic has brought major changes in people's lifestyle, especially in healthcare workers. Healthcare workers caring for COVID-19 patients are spending long hours wearing Personal Protective Equipment (PPE). There are reports of adverse skin reactions secondary to wearing PPE, especially face masks. However, it is essential to wear the protective equipment.

Aim: To assess the proportion of doctors who report adverse skin reaction after the use of face masks and enlist the skin reactions reported. Also to study the relationship between certain suspected factors and occurrence of skin reactions.

Materials and Methods: This was a cross-sectional study conducted using a questionnaire containing both open and closed ended questions which was distributed through online platform. The questionnaire contained details on the type of mask, duration

of usage, frequency of change and dermatological manifestations experienced. Sample population constituted doctors who were willing to participate in the study. IBM Statistical Package for the Social Sciences (SPSS) version 17.0 was used for analysis of data.

Results: The male to female ratio among the 220 doctors studied was 1:1.59. Maximum number of doctors (56.4%) wore N95 masks. Total 33.63% of them used one new mask every day and 60.90% of them used the mask for more than 6 hours continuously on a day. Acne was the most commonly reported problem accounting for 48.2%. Doctors using N95 masks reported acne more commonly.

Conclusion: N95 masks were the most commonly used masks. Total 88.18% of the doctors reported cutaneous manifestations. Acne was the most common dermatological problem reported. It was associated with the use of N95 masks and longer duration of use of N95 masks.

Keywords: Acne, Coronavirus disease-2019, Dermatological manifestations, Healthcare workers

INTRODUCTION

Coronavirus Disease-2019 (COVID-19) is an ongoing global pandemic caused by Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-COV-2) which was first isolated from Wuhan, China in December 2019 [1]. During this pandemic period, globally, people have started becoming more serious regarding their personal protection and thus the use of face masks among them has increased considerably. Healthcare workers in particular have been exposed to the regular use of Personal Protective Equipment (PPE) such as N95 masks and others like gloves, goggles, and gowns.

The usage of mask causes various cutaneous side-effects such as acne, facial itching, allergic and irritant contact dermatitis [2,3]. The use of face masks has been associated with various dermatological findings in the facial area such as itching, redness and associated excoriation and abrasion [4-8]. Itching in the facial area is common among individuals with facial dermatoses, such as sensitive skin, acne, seborrheic dermatitis, atopic predisposition, allergic contact dermatitis, and atopic dermatitis [8]. Various other dermatological findings, such as dryness, burning, acne, and swelling in the face due to irritants and allergens used while production of masks is also seen [6,9]. It was documented that formaldehyde and other preservatives are present in N95 and surgical masks [10]. It was also reported that there were cases of allergic contact dermatitis due to formaldehyde in surgical masks [7].

Long-term mask use can cause dermatoses, such as allergic contact dermatitis, irritant contact dermatitis, frictional dermatitis, abrasions, acne, seborrhoea, and/or the increase of existing dermatosis that previously exist on the face [9]. Friction, moisture and mechanical pressure all have a role to play in the pathogenesis of skin lesions associated with the use of mask [4]. It was shown that mechanical

damage to the skin, maceration, abrasion, erythema, desquamation, itching, and acne were seen due to the long-time use of the masks, more so in healthcare personnel [5,10].

It is thus important to know the exact prevalence of these adverse effects to devise proper preventive measures. Thus, the aim of the present study was to assess the proportion of doctors who reported adverse skin reaction after the use of face masks and enlist the skin reactions. Also to study the relationship between certain suspected factors and occurrence of skin reactions.

MATERIALS AND METHODS

A questionnaire-based cross-sectional study was conducted among the doctors at Osmania Medical College, Hyderabad, Telangana, India, between January 2021 to April 2021. Clearance from Institutional Ethics Committee was obtained (IEC Letter Ref.No.IEC/OMC/2021/M.No.(08)/Acad-99).

Inclusion criteria: All doctors working in the hospital during the study period who gave consent were included in the study.

Exclusion criteria: The participants who didn't respond to the study and who didn't give consent were excluded from the study.

The questionnaire contained closed ended questions and one open ended question, framed in English language. Questions regarding mask usage, the type of masks used, frequency of re-usage of masks, number of hours of continuous usage, side-effects experienced, treatment taken, pre-existing skin conditions etc. The questionnaire was reviewed by a dermatologist, a public health expert and a statistician. The questionnaire was also pilot tested among doctors before the start of the study. The questionnaires were distributed using google form application.

Before the doctors could answer the questions, they had to give the consent for the study. A total of 220 doctors responded and the data was analysed.

STATISTICAL ANALYSIS

The data was entered in Microsoft Office Excel 2007 and IBM Statistical Package for the Social Sciences (SPSS) version 17.0 was used for analysis. Categorical data is expressed in the form of frequencies and percentages. Continuous data is expressed in the form of mean and standard deviation. Chi-square test was used to find if there was statistically significant difference between categorical variables. The p-value <0.05 was considered to be statistically significant.

RESULTS

The present study was conducted among 220 doctors working in a tertiary care centre. The age of the study population ranged from 21 to 70 years with a mean age of 34.64±11.20. Majority of the study population were females (61.37%) and male to female ratio was 1:1.59 [Table/Fig-1].

Age distribution	Male n (%)	Female n (%)	Total n (%)
21-30 years	23 (10.45%)	35 (15.90%)	58 (26.36%)
31-40 years	31 (14.10%)	72 (32.74%)	103 (46.81%)
41-50 years	17 (7.72%)	21 (9.55%)	38 (17.28%)
51-60 years	9 (4.09%)	5 (2.28%)	14 (6.37%)
61-70 years	5 (2.27%)	2 (0.90%)	7 (3.18%)
Total	85 (38.63%)	135 (61.37%)	220 (100%)

[Table/Fig-1]: Age and gender distribution of the study population.

It is evident that maximum number of doctors used N95 masks, accounting for 56.4% of the study population, followed by a combination of N95 mask and surgical mask (19.5%); 8.2% wore surgical masks and only 6.8% wore cloth masks [Table/Fig-2].

Type of mask	Number (%)
N95 mask	124 (56.4%)
Surgical mask	18 (8.2%)
Cloth mask	15 (6.8%)
N95+Surgical mask	43 (19.5%)
N95+Cloth mask	6 (2.7%)
Surgical+Cloth mask	4 (1.8%)
Respirator+N95 mask	10 (4.6%)

[Table/Fig-2]: Types of masks used by the study population.

Total 33.63% of doctors used one new mask every day and 4.09% used two new masks per day. Maximum number of doctors (34.54%) used one mask per day but it was rotational reuse of mask, 9.09% used the same mask for more than four days [Table/Fig-3]. Total 134 (60.90%) of the population used the mask for more than 6 hours continuously on a day followed by 77(35%) who wore them continuously for 3-6 hours.

Frequency of changing mask	No. of doctors (%)
2 New masks/Day	9 (4.09%)
1 New mask/Day	74 (33.63%)
Rotational reuse (1 Mask/day)	76 (34.54%)
1 Mask for 2 days continuously	23 (10.46%)
1 Mask for 3 days continuously	18 (8.19%)
1 Mask for 4 days or more continuously	20 (9.09%)
Total	220 (100%)

[Table/Fig-3]: Frequency of changing masks among the study population.

Acne was the most common symptom that was reported and accounted for 48.2% of the study population followed by oily skin, accounting for 40.4%. Only 11.8% of the population did not report any cutaneous symptoms [Table/Fig-4].

Symptoms	n (%)
Acne	106 (48.2%)
Oily skin	89 (40.4%)
Itching	82 (37.3%)
Redness	69 (31.4%)
Chapping of lips	46 (20.9%)
Trauma/erosion	33 (15%)
Burning sensation	32 (14.5%)
Dyspigmentation	31 (14.1%)
Dryness of skin	22 (10%)
Wheals	16 (7.3%)
Perioral rash	11 (5%)
No symptoms	26 (11.8%)

[Table/Fig-4]: Frequency of dermatological manifestations reported by doctors.

A total of 106 patients reported to have acne. Of these 106 patients, 99 (93.39%) used N95 masks. Chi-square test showed that acne was more common in the study population who wore N95 mask and it was found to be statistically significant (p-value <0.00001). There was no significant relationship between the duration of usage and occurrence of any dermatological problem [Table/Fig-5].

Variables	Acne present	p-value
Type of mask	N95	99
	Others	7
Duration of mask	<3 hours	5
	3-6 hours	44
	>6 hours	96

[Table/Fig-5]: Relationship between the type and duration of mask usage with development of acne. p-value <0.05 was considered to be statistically significant

A total of 109 (49.54%) of the doctors did not seek any treatment for their symptoms as they did not consider it as an issue. Eighty two (37.27%) of the doctors started frequently removing their masks following the symptoms. Twenty four (10.90%) doctors had reported to have severe side-effects for which they sought dermatologist advice. Five (2.27%) of the doctors underwent self-treatment with various topical applications such as moisturisers, clindamycin gel, lip balms, tretinoin cream, calamine lotion and vaseline [Table/Fig-6].

Management methods	No. of doctors
No treatment sought/Made no other alternatives	109 (49.55%)
Removed masks frequently following symptoms	82 (37.27%)
Self-treatment	5 (2.27%)
Dermatologist consultation	24 (10.91%)

[Table/Fig-6]: Management of dermatological conditions in the study population

DISCUSSION

The new coronavirus poses various novel challenges for all health care professionals working in the frontline during this pandemic, with adverse effects secondary to PPE kits being one of them. Among the PPEs, masks hold the highest level of importance since the transmission of the virus is mainly by respiratory route. Since masks have become very important in day-to-day life and since there are reports that it is associated with various dermatological manifestations [3], this study was done to assess the proportion of side-effects among the doctors who are frequent mask users.

Out of 220 doctors, 194 (88.18%) doctors reported to have suffered some sought of cutaneous manifestation. Similar findings were also reported by a study conducted by Lan J et al., in China where the incidence was reported to be 97% [6]. Among the cutaneous manifestations that were reported, the most common was acne, accounting for 48.2%. Studies conducted by Foo CCI et al.,

Rosner E, and Techasatian L et al., have reported the occurrence of acne as 53%, 40% and 60%, respectively [2,11,12]. However, in a study conducted by Hu K et al., acne was reported in only 1.5% [13]. The possible mechanisms of development of acne include, increased temperature following mask usage, increased sebum excretion rate, increased sweating and humidity leading to swelling of keratinocytes resulting in occlusion of the pilosebaceous unit [14]. In a study done by Dogan EI and Kaya F it was found that rash, drying and peeling, burning, swelling and numbness, oily skin and acne formation increased proportionately with the duration of use of the mask; however, this increase was not statistically significant [15]. In another study conducted by Han C et al., it was seen that the acne patients admitted wearing masks for more than 4 hours per day over 2 months [14]. The study also recommended that N95 masks and surgical masks should be replaced every 3 days and 4 hours, respectively.

Other common manifestations in the present study were oily skin, itching and redness accounting for 40.4%, 37.3% and 31.4%, respectively. Lan J et al., also reported itching as one of the common symptoms and it accounted for 52.5% in their study [11]. Pruritis and greasy skin were the common manifestations after acne in the study conducted by Chaiyabutr C et al., [16]. Variations in the manifestations could be attributed to the different geographic allocations and climatic conditions of the participants.

The present study showed that acne was more common in people who wore N95 masks. Donning of these masks over a period of time creates a humid "tropical" skin microclimate conducive to a flare up of acne [17]. The sebum excretion rate varies directly when local temperature changes, and sebum excretion increases by 10% for each 1° C rise [14]. Alternatively, the flare up could be due to simple pilosebaceous duct occlusion due to local pressure on the skin from the close fitting masks [17]. Cloth masks are associated with lesser adverse skin reactions. However, they are not recommended for the healthcare workers, particularly those in high risk situations [12].

For reducing the incidence of acne among the mask users, the following measures can be undertaken. The surgical mask and N95 mask could be replaced every 4 hours and 3 days, respectively. Hand hygiene before donning the mask and after doffing should be recommended. The patients could be advised to control the time of mask wearing and they can try using two layers of gauze inside the mask to reduce the amount of water vapour exhaled from the mouth and perspiration. Patients with oily skin may be asked to wipe their face with a wet towel containing moisturising cream regularly [14].

Limitation(s)

Clinical examination of the study population was not possible as this was an online questionnaire based study. The questionnaire did not have questions related to the previous skin condition of the patient before the pandemic.

CONCLUSION(S)

The present study showed that usage of N95 face mask was associated with many cutaneous adverse effects with acne being the most common problem. Longer duration of mask usage was associated with more dermatological problems. However, it was not statistically significant. It is time to devise new innovations in mask technology to overcome these issues, as the pandemic is here to stay a little longer.

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