

ORIGINAL ARTICLE

Mask-induced skin changes during COVID pandemic: A cross-sectional web-based survey among physicians in a tertiary care teaching hospital

Gaurav Dash MD | Nibedita Patro MD | Binayak Chandra Dwari MD |
Kumar Abhisekh MD

Department of Dermatology, Hitech
hospital, Bhubaneswar, India

Correspondence

Dr Nibedita Patro MD, Department
of Dermatology, Hitech hospital,
Bhubaneswar, Odisha.
Email: nibeditapatro@gmail.com

Abstract

Background: The COVID pandemic has affected the human race both physically and mentally. Mask use remains the standard way of preventing the spread of this virus. The continuous mask use has led to the emergence of various dermatoses like acne, pigmentation, and seborrhea in mask contact areas. The present survey has been undertaken to describe the various dermatoses encountered in the medical fraternity especially doctors, who are frequently exposed to prolonged mask use.

Aims: To estimate the frequency of various cutaneous manifestations seen among doctors following mask use via web-based online questionnaire survey.

Methods: It was a cross-sectional web-based study conducted at a tertiary care teaching institute from June 2021 to August 2021. All the doctors of the hospital completing the questionnaire were included in the study with informed consent.

Results: A total of 178 participants completed the survey. The most common complaint was increased sweating (55.6%) followed by acne (34.3%) and oily skin (34.3%). Significant association was found between skin changes and duration (>6 h/day) of mask use, increasing number, and type of mask (N 95) used (p value <0.05).

Conclusion: The knowledge of various mask-induced/aggravated dermatoses will help formulate proper precautionary protocols enhancing efficient mask usage for prolonged periods.

KEYWORDS

acne, COVID, cutaneous changes, doctor, healthcare worker, mask, skin changes

1 | INTRODUCTION

The world was hit by coronavirus, SARS-CoV-2 (COVID-19) in 2019, and the pandemic is continuing to affect humanity till date. The use of a mask is still one of the most effective ways to prevent transmission. Doctors having the responsibility of first-line care provider have to use personal protective equipment for a prolonged time to provide continuous and effective health care in this pandemic.

Prolonged use of mask has led to an aggravation of multiple facial dermatoses like seborrhea, acne, and rashes.¹ Existing literature on the various cutaneous manifestations seen among healthcare workers following mask use is limited and lacking in case of doctors. The present questionnaire-based study focuses on the skin changes encountered among doctors who are well versed with the scientific terms and are believed to be effective mask users for prolonged periods.

The study aims at identifying the various cutaneous changes and contributing factors associated with prolonged mask use among doctors.

2 | MATERIALS AND METHODS

A cross-sectional web-based study was conducted at a tertiary care teaching institute from June 2021 to August 2021. The doctors (interns, residents, and faculty) from the institute were invited to participate in the study. The information was collected in an online questionnaire format as provided in Annexure 1. All the doctors completing the questionnaire were included in the study, and electronic informed consent was obtained. The study was approved by the institutional ethical committee of Hi-Tech medical college & hospital, Bhubaneswar, with approval no. HMCH/IEC/2021/106 dated 03/07/2021. Statistical analysis was performed using SPSS; version 17.0 software. $p < 0.05$ was considered significant.

3 | RESULTS

A total of 178 participants, age ranging from 22 to 68 years, completed the survey. The male (103) to female (75) ratio was 1.4: 1. Most of the doctors (101) belonged to the age group of 25–35 years.

3.1 | Basic working setup

The common working setup of doctors participating in the survey was the out-patient department (OPD) in 122 (69.7%), in-patient department (IPD) in 87 (49.7%), COVID care units in 57 (32.6%), casualty in 42 (24%), and the intensive care unit (ICU) in 31 (17.7%) doctors, respectively. No significant association was found between skin changes in different working setups.

3.2 | Duration of mask use per day

There was a significant association ($p = 0.009$) found between skin changes among doctors using mask for more than 6 h/day in 124 (69.7%) as compared to the doctors using mask for less than 6 h/day in 54 (30.3%) doctors (Table 1).

3.3 | Type and number of mask use

Most of the participating doctors in our study preferred using N95 mask (169 [94.9%]), most commonly being the fold flexible type in 165 (94.3%) followed by cup type in 16 (9.1%) and valve type in 7 (4%) doctors. 41% of doctors were using surgical mask. Cloth mask use was seen in 11.2% of doctors. Most of them were using double layer of mask (97 [54.5%]) followed by single layer in 74 (41.6%)

TABLE 1 Association of skin changes with the duration of use of mask

Skin change	Duration		Total
	<6	6 or more	
Present	49	91	140
Absent	5	33	38
Total	54	124	178

Note: p value = 0.009.

doctors. Few were using triple layer (7 [3.9%]). Number ($p = 0.020$) and type ($p = 0.04$) of mask used were found to have statistical association with mask-induced cutaneous changes (Tables 2 and 3).

3.4 | Symptoms

Most of the participants were asymptomatic (96 [53.9%]). The most common symptom at the site of mask contact was itching in 59 (33.1%) followed by stinging and burning sensation in 22 (12.4%) doctors each (Table 4). Most of the symptoms appeared between the 1st and 6th month of continuous mask used in 50 (61%), and some appeared within 1 month of mask used in 42 (51.2%) doctors. Among other non-cutaneous symptoms were pain behind the ear in 106 (59.6%) followed by discomfort in breathing in 94 (52.8%), headache in 52 (29.2%), pain in the nose in 56 (31.5%), and dizziness in 24 (13.5%) doctors (Table 4).

3.5 | Skin changes in the face

The most common complaint was increased sweating in 99 (55.6%) followed by acne in 61 (34.3%) and oily skin in 61 (34.3%) doctors, respectively. No skin changes were observed in 22.5% of cases (Table 5).

3.6 | Site and type of acne

Among the 178 study participants, 61 (34.3%) experienced acne. The common sites were the cheek (58.7%), chin (38.8%), bridge of nose (34.7%), and mandibular area (19%). Most of them had inflammatory papules (60.7%), followed by comedones (52.5%), pustules (46%), and nodules (13.11%). No prior history of acne was found in most (64.5%) of them. Duration, type, and the number of mask use could not be statistically associated with acne. ($p > 0.05$).

3.7 | Use of cosmetics

The use of various cosmeceuticals like sunscreen, moisturizer, and face wash was found in 44 (24.7%), 49 (27.5%), and 90 (50.6%) doctors, respectively. Most of them used face wash 2–4 times a day

TABLE 2 Association of skin changes with the number of mask

Skin changes	No. of mask use at a time			Total
	Double	Single	Triple	
Present	69	64	7	140
Absent	28	10	0	38
Total	97	74	7	178

Note: p value = 0.020.

TABLE 3 Association of skin changes with the type of mask

Type of mask	Skin change		Total
	Present	Absent	
N95	132	37	169
Surgical	44	14	58
Cloth	30	5	35

Note: p value = 0.04.

TABLE 4 Symptoms with mask use

Symptoms at site of mask	Number	Percentage (%)
Itching	59	33.1
Stinging	22	12.4
Burning	22	12.4
Nil	96	53.9
Other symptoms		
Headache	52	29.2
Local pain on the nose	65	31.5
Local pain behind ear	106	59.6
Discomfort in breathing	94	52.8
Dizziness	23	13.5

(44.9%). We could not find any significant association between the use of cosmeceuticals and skin changes ($p > 0.05$).

3.8 | Aggravating conditions

Acne aggravating conditions were seen in 51 doctors. Obesity was the most common, seen in 22 (12.4%) followed by premenstrual flare in 17 (9.6%), high glycemic food intake in 14 (7.9%), and polycystic ovarian syndrome (PCOS) in 13 (7.3%) doctors, respectively. Among the different skin changes observed, mask-induced acne was statistically associated with aggravating conditions in our study ($p = 0.013$) (Tables 6 and 7).

4 | DISCUSSION

The COVID-19 pandemic continues to prevail worldwide with intermittent spikes in India since January 2020. It is highly contagious and spreads by respiratory route especially aerosols. Healthcare workers

TABLE 5 Cutaneous changes observed during the study

Skin changes	Number	Percentage (%)
Increased sweating	99	55.6
Acne	61	34.3
Oily skin	61	34.3
Redness	38	21.3
Dry skin	12	6.7
Nil	40	22.5

TABLE 6 Aggravating conditions

Aggravating conditions	Number	Percentage (%)
Obesity	22	12.4
Premenstrual flare of acne	17	9.6
High glycaemic food	14	7.9
PCOS	13	7.3
Cosmetics use	6	3.4
Oral/Topical steroid	0	0
Nil	127	71.3

especially doctors as first-line care providers are at high risk of acquiring the disease as they are in constant contact with patients. It is recommended by the world health organization (WHO) to wear personal protective equipment (PPE) especially face masks, eye shields, gloves, and full-body gowns for protection. This is the most effective way to curb COVID-19, but such practices for the prolonged duration by doctors have led to a new set of cutaneous manifestations like erythema, papules, pustules, and pigmentation in mask-wearing areas especially along with the areas of contact.¹

An online questionnaire-based study was done among doctors. The mean age of the participating doctors was 31.13 years with a range from 22 to 68 years comparable with the study by Foo et al.¹ where it was 32.4 years ranging from 20 to 63 years. In our study, males (57.9%) outnumbered females (42.1%) in contrast to previous studies by Aravamuthan et al.² where 41.4% were males and 58.6% were females.

The prevalence of skin changes in the form of increased sweating, acne, oily face, dry face, redness was 77.5% in our study as compared to 95.1% prevalence found by Hu K et al.³ The most common complaint was increased sweating (55.6%) followed by acne (34.3%) as compared to findings by Purushottam et al.⁴ (67.6% sweating and 56% acne). Different studies have documented acne at the rate of 59.6% (Foo et al.), 56.8% (Mallick et al.), and 56% (Purushottam et al.) out of all skin changes.^{1,4,5} The most common site affected with acne in our study was the cheek (58.7%) followed by chin (38.8%), and predominant lesions were papules and comedones similar to findings by Aravamuthan R. et al.² The significant association of aggravating conditions like obesity, premenstrual flare, PCOS, and high glycemic intake to mask-induced acne in our study was similar to that observed by Aravamuthan R et al.² Although it cannot be directly associated, the presence of aggravating conditions may predict the occurrence of mask-induced acne.

TABLE 7 Association of mask-induced acne with aggravating condition

Acne	Aggravating condition		Total
	Present	Absent	
Present	30	47	77
Absent	22	79	101
Total	52	126	178

Note: p value = 0.013.

According to studies, prolonged mask use for 8–12 h/day led to more chances of skin changes.⁶ In our study, prolonged usage of mask for more than 6 h/day revealed a higher risk of a mask-induced cutaneous manifestations ($p = 0.009$). The increasing number of mask ($p = 0.02$) and type of mask ($p = 0.04$) worn were also found to have statistical association with mask-induced cutaneous changes. Among different types of masks, N95 masks have lower air movement which is good for protection but led to more cutaneous manifestations.⁷ Antonio Scarano et al.⁸ found N95 respirators less preferable as compared to surgical mask. In our study, the most preferred mask was N95 (94.9%), commonly fold flexible type followed by surgical mask (41%). The surgical mask was used as second layer protection by many doctors using double-layer protection.

Several studies have observed an increased skin temperature, moisture (from respiration), and decreased hydration mostly over the cheeks, perioral area, and chin due to prolonged usage of face masks (>6 h).⁹ As a result, there is increased sebum excretion in the mask-wearing areas (sebum excretion rate is directly proportional to the rise in temperature/humidity). All these along with repeated friction and pressure of the mask being in constant contact with the skin for prolonged periods irritate the upper part of the pilosebaceous duct, blocking it and resulting in mask acne. These factors also lead to the altered skin barrier.¹⁰ Oily skin, redness/rashes, and dry skin were seen in 34.3%, 21.3%, and 6.7%, respectively, in our study. Similar findings were observed by Hu K et al. (16.4%, 24.6%), Foo et al. (35.8% rashes), and Purushottam et al. (redness-39%).^{1,3,4} Sometimes, it is also associated with increased skin sensitivity, irritation, and itching over the face. In our study, these symptoms were seen in 33.1% as compared to 27.9% observed in different studies.^{1-3,11} Itching may occur due to an altered skin barrier or may be due to an allergic reaction to the mask material (formaldehyde, preservatives, and adhesives) or other parts of the mask-like metal clip and rubber straps.^{12,13} Burning and stinging were seen in 12.4% each in our study as compared to 27% and 34% seen in the study by Aravamuthan R. et al.² Usually, antihistamines are recommended for mild skin reaction. Low potent topical steroid and tacrolimus can be tried. If there is severe adverse skin reaction, dermatologist consultation is warranted.¹⁴ Proper face washing with a mild cleanser followed by the application of moisturizer before and after mask usage maintains the integrity of skin barrier. Washing the face preferably twice daily clears dirt, sebum, bacteria, and excessive sweat.^{15,16} Facial makeup should be kept to minimal although use of cosmetics and face wash had no association with the mask-induced acne in our study.

Among other symptoms in our participating doctors, most had pain behind the ear (59.6%) followed by discomfort in breathing (52.8%), pain over the nose (31.5%), and headache (29.2%). This was similar to findings by Purushottam et al. where there was pain over the nose (30%), pain behind the ear (45.2%), and discomfort in breathing (58.2%).⁴ This is mostly due to the tight-fitting N95 masks often worn by doctors to ensure better protection. The retro-auricular area and nose are mostly affected due to repeated friction by the ear ropes of the facemask. There is also a creation of hypercapnic hypoxic environment leading to cardiorespiratory stress and metabolic shift thus discomfort in breathing and headache. The application of cushion dressing in the pressure areas of the mask may help in reducing the friction thus preventing pressure injuries.¹⁷ Mask with ear straps of the mask which can be positioned over the crown of the head should be preferred to reduce contact with the ears. Doctors should take short mask-free breaks like 15 minutes every 2–3 h to prevent mask-related cutaneous manifestations as well as other symptoms like headache and pressure area.^{3,18}

Mask remains an integral part of patient care in hospital settings during this COVID pandemic. Our study enumerates the various mask-induced/aggravated dermatoses. To the best of our knowledge, such incidences among doctors have not been described in the literature and the findings from this study will add to the prevailing data from prior studies.

5 | LIMITATIONS

Skin manifestations following mask use were purely subjective and were not verified by the investigators (dermatologists) as this was an online questionnaire-based study.

6 | CONCLUSION

Extended use of personal protective equipment (PPE) has increased the frequency and severity of common dermatologic conditions in healthcare workers. The prevalence of face mask-induced dermatoses during the COVID-19 pandemic in our study was 77.5%. The most frequently seen were increased sweating and acne. The different risk factors including duration of continuous face mask use for more than 6 h/day, type and layer of the mask, and associated aggravating conditions should be considered while treating the various conditions and affecting mask-induced cutaneous changes. General awareness of the various mask-induced cutaneous manifestations will help dermatologists in developing future precautionary guidelines regarding the proper use of a mask to prevent skin changes.

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