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Original Research Article

Clinico-epidemiological study of mask induced acne due to increased mask use among health care workers during COVID pandemic in a tertiary care institute

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ABSTRACT

Background: Acne vulgaris is a self-limiting, multifactorial disorder affecting the sebaceous glands and pilosebaceous follicles. Regular wearing of mask during this COVID-19 pandemic has resulted in increased incidence of acne flare. The objective is to study the incidence and the clinic-epidemiological factors associated with mask induced acne.
Methods: This is a cross sectional web-based survey conducted at Madras medical college and Rajiv Gandhi government general hospital during August 2020. The clinic-epidemiological details were collected from the 215 post-graduates of Madras medical college and Rajiv Gandhi government general hospital in a pre-set questionnaire.
Results: Among 215 study participants, 134 (62.3%) reported mask induced acne. Female gender has a statistically significant association. Itching was the most common complaint. Cheeks, chin and bridge of the nose were the common site of lesions. Comedone and papules were the common presenting lesions. Premenstrual flare and psychological stress had a statistically significant association.
Conclusion: Mask induced acne has various factors like micro-climate theory, hydration of keratin, mechanical occlusion of pilosebaceous unit pores, seborrhoea, ambient high humidity due to sweating involved in its pathogenesis. Although wearing a mask is extremely important to our fight against COVID-19, the general public should be aware of proper and rational mask wearing.

Keywords: Acne, Mask induced acne, COVID-19, N95 mask

INTRODUCTION

Acne vulgaris is a self-limiting, multifactorial disorder affecting the sebaceous glands and pilosebaceous follicles. In addition to the intrinsic factors, there are multiple extrinsic factors that influence the expression of the disease. During this COVID-19 pandemic, India was one of several countries affected by SARS-CoV-2 (COVID-19). Wearing a mask is encouraged for preventing dispersal of droplets during talking, sneezing and coughing. Therefore, it is thought to reduce the risk of environmental contamination by SARS-CoV-2 (COVID-19) based on the precautionary principles. However, long- time mask wearing could increase the flare of acne due to higher temperature and humidity on the surface of facial skin caused by expired air and the perspiration.[1,2] Though some proclaim that mask induced acne is a type of mechanical acne, the mechanical factor alone cannot be justified for the pathogenesis involved in the development of mask induced acne. There are very few articles related to mask induced acne.

The objectives of this study are to study the incidence of mask induced acne due to increased mask use among health care workers and to study the clinic-epidemiological factors associated with mask induced acne. This study is the first of its kind.

METHODS

Study design and participants

This study comprises a cross-sectional web-based survey. The study was conducted from August 2020 to September 2020. The postgraduates of Madras medical college and Rajiv Gandhi government general hospital, Chennai were invited to participate in the study. The number of participants who participated in our study is 215. There were no exclusion criteria.

Procedure

We sent a personal invite to the postgraduates of Madras medical college and Rajiv Gandhi government general hospital, Chennai with information about the study, and the link for the questionnaire. Electronic informed consent was obtained from all the participants. Data was collected during August 2020.

Clinical factors

Detailed clinical history including basic demographic details and occupational details were taken. History of average duration of mask usage per day (in hours); type of mask (most commonly used); history of new onset acne lesions or aggravated acne during this COVID pandemic due to mask usage; symptoms associated with acne; site of acne; type of acne; duration of acne (in months); aggravating factors; history of usage of cosmetic products; history of other issues related to mask were part of the questionnaire. Since this is the first literature on mask induced acne, there are no references for questions related to mask in this questionnaire; however, the questions related to acne and aggravating factors are based on Khunger et al clinic-epidemiological study of adult acne.[3] No scales or scoring system were employed in this study.

Statistical analysis

The data collected were documented in google sheets. Statistical analysis was performed using commercial software (SPSS; version 17.0). P<0.05 was considered significant

Institutional review board status

The study was approved by the institutional ethical committee, Madras medical college, Chennai (No. 47042020).

RESULTS

Participants

A total of 215 participants were included in the study, of which 89 (41.4%) were males and 126 (58.6%) were females. The age group of the participants involved in the study ranges from 24 to 46 and the mean age is 27 standard deviation (SD): 3.14. The mean duration of mask worn per day is 7.6 (SD: 2.52)

Table 1: Regional classification of provocative factors.

Region	Provocative factors
Face	Mask, Support of head with hands, Friction from hands or fingers, Chin straps Football helmets Hockey and wrestling head- and face-guards, Motorcycle face- and head-protectors, Dress or athletic forehead bands Hard or soft hats
Neck	Shirt collars, Backpacks and straps, Turtleneck shirts and sweaters
Shoulders	Football pads, backpack straps, surgical tape Orthopedic casts, tightly tailored shirts
Arms	Orthopedic casts, surgical tape, shirt sleeves
Back	Chairs, bus, car, or truck seats orthopedic braces and casts, bras, confinement to bed Wide belts, backpacks and straps
Chest	Wrestling, football pads, orthopedic casts
Buttocks	Chairs, Bus, car, or truck seats

Acne incidence and gender distribution

Among the 215 study participants, 134 (62.3%) experienced acne. Of those who developed mask induced acne 37 were males and 97 were females whereas among 81 (37.7%) who haven't experienced acne 52 were male and 29 were females (Table 2). It was found that female is at higher risk of developing mask induced acne than males and is statistically significant (p value=0.000).

Table 2: Incidence of mask induced acne.

Gender	Participants who developed mask induced acne	Participants who haven't developed mask induced acne	Total N (%)
Males	37	52	89 (41.4)
Females	97	29	126 (58.6)
Total N (%)	134 (62.3)	81 (37.7)	215 (100)

Of those who developed acne, 67 (50%) had new onset acne and 67 (50%) had aggravated acne. The age group of those who developed mask induced acne ranges from

24 to 46 and the mean age is 27 standard deviation (SD):3.14.

Type of mask

Type of mask has no association with the mask induced acne and the incidence was found to be the same among those using N95 and surgical mask (p value>0.005).

The mean duration of mask worn per day among those who developed mask induced acne is 7.5 (SD:2.46). Duration of mask worn per day had no statistical difference between the participants who developed mask induced acne and who haven't.

Duration

The duration of acne varied from minimum of 1 week to 11 years.

Symptoms

The most common symptom was itching (n=51;38%) followed by stinging (n=46;34%) and burning sensation (n=36; 27%); asymptomatic in 32 individuals (24%) (Table 3).

Table 3: Symptom distribution.

Symptom	N	Percentage (%)
Itching	51	38
Stinging	46	34
Burning	36	27
Asymptomatic	32	24

Site of acne

The most common site of lesions among those individuals who developed mask induced acne include the cheek (n=101,75%); chin (n=56; 43%) and bridge of nose (n=39; 29%) (Table 4).

Table 4: Site distribution.

Site	N	Percentage
Cheek	101	75
Chin	56	43
Bridge of Nose	39	29
Mandibular region	38	28
Forehead	25	19
Temple	9	7
Trunk	3	2

Type of acne

Of those 134 individuals who developed mask induced acne, majority reported popular (n=60; 45%) and come done (n=55;41%) like lesions (Table 5).

Aggravating conditions

Among the study individuals, regular use of cosmetics was present in 35 individuals.

Table 5: Lesion distribution.

Type of lesions	N	Percentage (%)
Comedones	55	41
Papular	60	45
Pustular	39	29
Nodulocystic	10	7

Among those who developed mask induced acne. Premenstrual flare was seen in 36 females. Associated conditions such as obesity was observed in 14; hirsutism in 10; high glycaemic food intake in 35. 61 individuals reported psychological stress. After applying cross tabs between these associated factors and acne development, it was found that individuals with premenstrual flare and psychological stress had statistically significant association with the development of mask induced acne (Table 6).

Table 6: Aggravating conditions.

Aggravating conditions	N	P value
Premenstrual flare	36	0.000
Obesity	14	0.194
Hirsutism	10	0.012
Psychological stress	61	0.000
High glycaemic foods	35	0.018
Cosmetic product use	35	0.048

DISCUSSION

India is one of several countries affected by SARS-CoV-2 (COVID-19). The outbreak in India started in March 2020. There were 66,85,082 confirmed cases, 9,19,023 active cases, 56,62,490 discharged cases and 1,03,569 deaths in India as on 6th October 2020.[4] During this COVID-19 pandemic, a number of healthcare workers infected with SARS-CoV-2. Apart from SARS-CoV-2 infection, healthcare workers were also affected in other physical and psychological ways. Skin disorders were seen as a consequence to various steps taken to curb the transmission of SARS-CoV-2.

N95 masks were recommended by the ICMR (Indian council of medical research) and the world health organization (WHO) for use when healthcare workers came into contact with confirmed or suspected COVID-19 patients. They provided at least 95% filtration against oil-free particles and needed to be worn tightly against the face to be effective. It was not surprising to see acne occurring in the regions of the face covered by the masks.

Acne is a multifactorial disease; no single agent explains its cause. The sum of many factors acting in concert determines whether the manifestations will be mild or severe. The intrinsic contributors to causation include inheritance, seborrhea (comedogenic and toxic substances are present in sebum) and androgen status (in females, lower circulating levels of testosterone account for less oiliness).

To these factors may be added extrinsic factors that influence the expression of the disease. These include emotions (acne is exacerbated by stress), exposure to topical acnegenic substances (cosmetics, grooming agents, soaps, shampoos, and sunscreens variably contain substances that can cause comedones in patients with acne), ingestion of acnegenic drugs (corticosteroids or iodides), and hot, humid climates (tropical acne).

Tropical acne is a well-known entity which occurs in hot and humid climates. It is particularly common in soldiers and affects mainly the trunk and buttocks.[5]

Mills et al proposed the name "acne mechanica" for aggravation of the disease induced by an extrinsic factor that clearly intensifies acne, namely mechanical forces. Among these are pressure, tension, friction, stretching, rubbing, pinching, or pulling, or almost any type of mechanical stress on the skin.[6]

Mills and Kligman in their study established three important conclusions. First, mechanical factors play an intensifying role in at least 15% of cases needing treatment by a physician. Second, mechanical stresses have the capacity to precipitate lesions in direct proportion to the severity of the disease. Mild acne, notably the comedonal type, is scarcely or not at all influenced by such stresses. Conversely in high inflammatory acne, relatively moderate stress may provoke crops of intensely inflamed papules and nodules. The presence of severe acne is a clear signal of vastly increased susceptibility to aggravation of the disease by mechanical forces. Third, the exacerbations take the form of inflammatory lesions, pustules, papules, and even nodules. Physical forces do not induce comedones. Regional classification of acne mechanica based on Mills and Kligman's article is given in Table 1.

Tan et al reported two patients of localized exacerbation of acne on the part of the face covered by the N95 mask during the SARS period.[7]

Han et al reported five patients with acne initial attack due to long-time mask wearing among the general population.[8] According to Han et al no significant correlation between skin lesion numbers and mask wearing time. The most reported symptoms were itching sensation and excessive seborrhoea. The most common signs were comedones, papules on cheek and nose, instead of nodules or cysts on forehead, submaxillary and neck.

Donning of N95 masks over prolonged periods of time creates a humid "tropical" skin microclimate conducive to a flare-up of acne. Alternatively, the flare-up could have been a consequence of simple pilosebaceous duct occlusion due to local pressure on the skin from the close-fitting masks.

Sweating produces hydration of keratin, which is known to reduce the pilosebaceous duct exit size and so increase obstruction to sebum flow, another important factor in acne. The obstruction, however, caused, may favour the colonisation of the duct by *Corynebacterium* acnes, the chief microbe associated with acne lesions. Release of C. acnes enzymes may then help to produce the inflammation of acne.

The higher temperature has a close correlation with the flare of acne, which can be explained by the effect of higher temperature on the sebum excretion rate. The sebum excretion rate varies directly when local temperature changes and sebum excretion increases by 10% for each 1C rise. Furthermore, squalene could become significantly more in surface lipid when the temperature increases.[9]

The ambient high humidity precipitating acne is mainly due to poral occlusive effect of skin hydration and irritation to the upper parts of the pilosebaceous duct. In addition, sweat and increased humidity might cause swelling of epidermal keratinocytes, thus affecting the keratinocytes of the pilosebaceous follicle and causing acute obstruction and acne aggravation.[10] Moreover, changes in both surface sebum composition and skin hydration could contribute to disruption of the skin barrier, leading to bacterial microflora imbalance.

Long-time mask wearing during COVID-19 pandemic may lead to an increased flare of acne, but what should be noticed is that the patients with acne may be tempted to touch their face following removal of mask for itch and annoying pimples, which could increase the risk of COVID-19 transmission through respiratory route.[11]

Prophylactic measures against acne mechanica are very worthwhile, for the inflammatory lesions are often violent enough to leave scars in their wake. Finally, mechanical stress can sometimes evoke follicular inflammatory reactions in patients without acne.

The surgical mask and N95 mask should be replaced every 4 hours and 3 days, respectively. Washing hands before wearing and after removing the mask is recommended. The patients should control the time of mask wearing and put two layers of gauze inside the mask to reduce the amount of water vapour exhaled from the mouth and the perspiration. The patients with oily skin need to wipe their face with a wet towel containing moisturizing ingredients regularly. It is also suggested to apply cleansing products and emollients containing oil control ingredients. By employing these

nonpharmacologic manoeuvres, the condition of mask-related acne might be relieved. However, the patients should consult dermatologists for topical or oral medication if the acne lesions sustain or aggravate.

Although wearing a mask is extremely important to our fight against COVID-19, the general public should be aware of proper and rational mask wearing.

The limitations of this study include small sample size; percentage of individuals requiring treatment were not calculated; role of fabric mask in the mask induced acne has not been studied. A wide population-based study has to be carried out to know more about mask induced acne.

CONCLUSION

Mask induced acne is a multifactorial disease. Various factors like micro-climate theory, hydration of keratin, mechanical occlusion of pilosebaceous unit pores, seborrhoea, ambient high humidity due to sweating play an important role in the pathogenesis of mask induced acne. Female predominance, itching, site of the lesions, and aggravating factors like premenstrual flare, psychological stress have to be kept in mind while evaluating a case of mask induced acne. To worsen further, individuals with mask induced acne are tempted to touch their face following removal of mask for itch and annoying pimples, which could increase the risk of COVID-19 transmission through respiratory route

Although wearing a mask is extremely important to our fight against COVID-19, the general public should be aware of proper and rational mask wearing.

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