

Original Article

Impact of mask wear on the skin of clinical year medical students during the COVID-19 pandemic: A cross-sectional study

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ABSTRACT

Objectives: Use of facial masks since the onset of the COVID-19 pandemic has led to a new type of mechanical acne termed Maskne. Long-term wear of masks can increase skin damage leading to *de novo* onset of, or worsening of pre-existing facial dermatoses such as acne, rosacea, and dermatitis. We have encountered numerous studies on the effects of mask wear on skin of health-care professionals, mainly COVID-19 first responders, but there seems to be scarce literature on the effects of mask wear in medical students. The objective of the study was to investigate how mask wear during the COVID-19 pandemic has influenced the skin condition of clinical year medical students from Georgian Medical Universities.

Materials and Methods: A cross-sectional study was conducted online through a survey among 152 clinical year medical students (4th, 5th, and 6th years) of Georgian Medical Universities, from February 27, 2022, to April 18, 2022. Participants were asked a series of questions focusing on their mask habits such as type of mask worn, duration of wear, frequency of changing the mask, and about their skin condition before and after mask usage.

Results: From a total of 151 respondents, of which 69.5% ($n = 105$) were female and 30.5% ($n = 46$) were male, with majority of participants from the 5th year 48.1% ($n = 62$), followed by 4th year 30.5% ($n = 46$) and 6th year 28.5% ($n = 43$), 51.4% ($n = 76$) of students experienced acne/rosacea or had their pre-existing acne/rosacea worsen since they started wearing masks. The top three common manifestations are closed comedones 65.8% ($n = 52$), pustules 43% ($n = 34$), and papules 26.6% ($n = 21$). However, there was no statistically significant relationship between the type of mask used and the daily duration of wear on facial dermatoses.

Conclusion: Widespread use of masks may flare up acne in some medical students causing a negative impact on their self-confidence. One of the limitations of our study is the small sample size. Furthermore, information from the participants related to hereditary and acne exposome factors that may contribute to the development of, or worsening of acne was not carried out, and no follow-up was performed. The data were collected through an online survey only, without a physical examination in person of the participants' skin. Therefore, the details reported are up to the participants' discretion. Further research in this area needs to be carried out with a bigger sample size and with the diagnosis of mask acne confirmed by a medical professional. It is important to diagnose and treat this new age dermatological condition in a timely manner to prevent lasting adverse effects on skin condition.

Keywords: Facial dermatoses, COVID-19, Acne, Dermatitis

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INTRODUCTION

With the identification of the novel coronavirus SARS-CoV-2 in 2019 and the declaration of the pandemic in March 2020, the COVID-19 disease has spread across the globe, making lockdowns, social distancing, and mask wearing the new norm. Wearing a mask has been found to be extremely beneficial in combating this disease and can be used to protect oneself when in contact with an infected person or worn to control the source of infection hence preventing further transmission.^[1] Despite all the advantages of mask use, long-term use of masks has led to an increase in skin damage and worsening of pre-existing skin disorders such as acne, rosacea, dermatitis, and the incidence of acne, termed as “Maskne” is the most frequently reported.^[2-4] Maskne is a type of mechanical acne, caused due to mechanical injury as a result of long-term mask use.^[5] Frequency of Maskne has exponentially risen in the current times due to masks now being accepted as the “new normal.”^[6]

In a study conducted in 2020, the results showed that wearing a face mask for more than 4 h/day was associated with a higher risk of adverse skin reaction. Mask usage for more than 8 h/day reflected a much greater risk of an adverse skin reaction and reuse of face masks increased the risk of face mask related skin reactions up to 1.5 times.^[4] In yet another study conducted in 2021, they observed worsening acne and rosacea in patients after 6 weeks of mask and quarantine.^[2] Nodular acne was prevalent in healthcare workers wearing N95 for longer periods, especially over cheeks, chin, and perioral area.^[7]

In accordance with the existing literature and our own subjective observation, we hypothesize that an increased mask use has caused worsening of acne and new breakouts in its wearers, therefore to evaluate this hypothesis and the extent of acne in the same population, we conducted a cross-sectional study in clinical year students (4, 5, and 6 years) of Georgian Medical Universities. There is a distinct lack of the literature in this field, especially with our target demographic, therefore with this study, we aim to bring a greater degree of awareness in combating this adverse dermatological manifestation.

MATERIAL AND METHODS

An online cross-sectional study was conducted and shared through social media platforms among the clinical year medical students of year 4, 5, and 6 in Tbilisi, Georgia, between the age group of 18–30 from February 27, 2022, to April 18, 2022. A total of 24 questions were asked. Some of the questions asked were demographic information, gender, age, skin type, what type of mask was used, how often they change their mask, if they have any pre-existing skin conditions or comorbidity, if they follow any skincare routine, and more.

Informed consent was obtained from the participants at the beginning of the survey. The criteria for diagnosis of Maskne are as follows: Onset of acne within 6 weeks of start of mask use, exacerbation of acne at the Ozone, and the exclusion of the differential diagnosis. Statistical analysis was conducted through the Chi-square test.

RESULTS

A total of 152 responses were collected from clinical (4th, 5th, and 6th) year of medical students from Georgia, among which were 69.5% ($n = 105$) females and 30.5% ($n = 46$) males, aged 18–30 years. Number of participants from the 4th year 30.5% ($n = 46$), 5th year 48.1% ($n = 62$), and 6th year 28.5% ($n = 43$).

Mask information

As observed from [Table 1], 80.8% ($n = 122$) of the participants responded that they used a surgical mask, 11.3% ($n = 17$) said that they use an N95 mask, 7.3% ($n = 11$) use a cloth mask, and 0.7% ($n = 1$) said all types of mask. There is no significant relationship between the type of mask used and the incidence of facial dermatoses ($P = 0.3692$).

As shown in [Table 2], 52.3% ($n = 79$) of the respondents stated that they used masks for 4–6 h a day, 32.5% ($n = 49$) said 1–3 h a day, 7.9% ($n = 12$) of respondents said 7–9 h a day, 6% ($n = 9$) said less than an hour a day, and only 1.3% ($n = 2$) of respondents said more than 9 h a day. There is no

Table 1: The effect of mask type on incidence of facial dermatoses.

The type of masks used	Total	Incidence of facial dermatosis				P
		Yes		no		
		n	%	n	%	
Surgical mask	122	59	48.36	63	51.63	
N95	17	7	41.17	10	58.82	
Cloth mask	11	3	27.27	8	72.72	
Use all the masks mentioned above	1	1	100	0	0	

Table 2: The effect of duration of daily mask wear on incidence of facial dermatoses.

Duration of mask wear per day	Total	Incidence of facial dermatoses				P
		Yes		No		
		n	%	n	%	
Less than 1 h	9	0	0	9	100	
1–3 h a day	49	23	46.93	26	53.06	
4–6 h a day	79	39	49.36	40	50.63	
7–9 h a day	12	7	58.33	5	41.6	
More than 9 h a day	2	1	50	1	50	

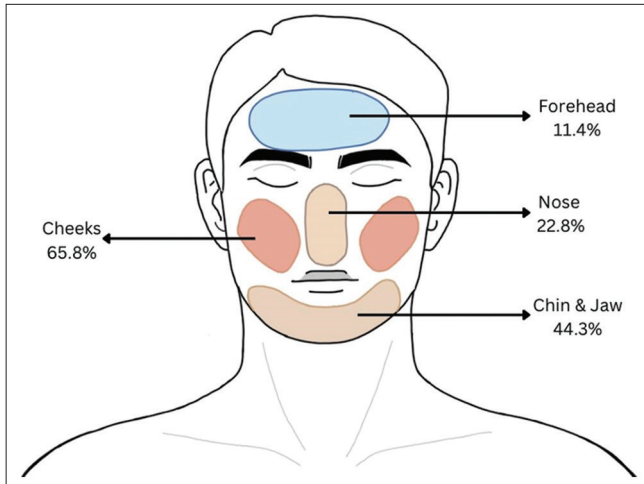


Figure 1: Face map depicting the areas most prone to acne/rosacea as reported by the participants.

significant relationship between the duration of daily mask wear and the incidence of facial dermatoses ($P = 0.0669$).

For the question how many days a week do you wear a mask, 39.1% ($n = 59$) of students responded 7 days, 25.8% ($n = 39$) of students wear the mask 5 days a week, and 21.2% ($n = 32$) of students responded 21.2% ($n = 32$) 6 days a week. About 9.9% ($n = 15$) of students responded 4 days a week, 2.6% ($n = 4$) of the students responded 2 days a week, and 1.3% ($n = 2$) of the students responded that they wear masks 3 days a week.

About 41.1% ($n = 62$) of the students change their mask every day, 31.8% ($n = 48$) of the students change their mask once in 2 days, 13.3% ($n = 20$) of students change their mask once in 3 days, 2% ($n = 3$) of the students change their mask once in 4 days, 3.3% ($n = 5$) of the students change their mask once in 5 days, and 8.6% ($n = 13$) of the students change their mask after more than 5 days.

Skin information

Regarding skin type, 48.3% ($n = 73$) of the students have combination skin, 15.9% ($n = 24$) of the students have oily skin, 12.6% ($n = 19$) of the students have dry skin, 11.3% ($n = 17$) of the students have normal skin type, 8.6% ($n = 13$) of the students have sensitive skin, and 3.3% ($n = 5$) of the students were not sure about their skin type.

Concerning pre-existing skin conditions, 70.9% ($n = 107$) of students had none, 16.6% ($n = 25$) of the students experienced acne vulgaris, 2.6% ($n = 4$) of the students experienced contact dermatitis, 2% ($n = 3$) of the students experienced acne rosacea, 1.3% ($n = 2$) of the students experienced folliculitis, 1.3% ($n = 2$) of the students experienced acne, and 0.7% ($n = 1$) of students experienced psoriasis. About 0.7% ($n = 1$) of the student experienced mild acne scars, 0.7% ($n =$

1) of the students experienced hidradenitis suppurativa, 0.7% ($n = 1$) of the students experienced seborrheic dermatitis, 0.7% ($n = 1$) of the students experienced eczema, 0.7% ($n = 1$) of the students experienced keratosis pilaris, 0.7% ($n = 1$) of the students experienced acne, and 0.7 ($n = 1$) of the students said the skin turned extremely dry 3 months back and still on treatment.

About 88.1% ($n = 133$) of the students do not have any medical conditions, whereas 10.6% ($n = 16$) of the students are having PCOS, 3.3% ($n = 5$) of the students have hypothyroidism, and 1.3% ($n = 2$) of the students have diabetes mellitus.

Skin care

When asked if they use sunscreen regularly, 48.3% ($n = 73$) of the students do not use sunscreen, 25.8% ($n = 39$) said sometimes they use sunscreen, and 25.8% ($n = 39$) said that they use sunscreen regularly.

The students were asked if they follow any skincare routine. A skincare routine is a range of practices that support skin integrity, enhance its appearance, and relieve skin conditions. For example, moisturizing creams, face wash, and sunscreen, 73.5% ($n = 111$) responded yes and 26.5% ($n = 40$) of the students responded that they do not follow any skincare routine.

Some of the skincare products students started using after wearing masks are 52.3% ($n = 79$) said moisturizer (gel or cream), 45.7% ($n = 69$) have started using cleansers (face wash), 29.1% ($n = 44$) said that they do not use any product, and 27.8% ($n = 42$) said that they started using sunscreen. About 17.9% ($n = 27$) have said that they used serum and 17.9% ($n = 27$) have also said that they use face mask (sheet masks), 15.2% ($n = 23$) have said that they use toners/essence, 8.6% ($n = 13$) said that they use eye creams, 7.9% ($n = 12$) said that they use face oil, 6.6% ($n = 10$) said that they use retinoids and also 6.6% ($n = 10$) said that they use exfoliants (AHA/BHA), 2% ($n = 3$) use azelaic acid, 0.7% ($n = 1$) use face clay mask, and 0.7% ($n = 1$) use Unani.

Students have also removed skin care products after starting to use masks, 6% ($n = 9$) toners/essence, 4% ($n = 6$) moisturizers (gel or cream), 4% ($n = 6$) face oil, 2% ($n = 3$) serum, 2% ($n = 3$) retinoids, 2% ($n = 3$) exfoliants (AHA/BHA), 2.6% ($n = 4$) benzoyl peroxide (spot treatment), 1.3% ($n = 2$) cleanser (face wash), 1.3% ($n = 2$) eye cream, 0.7% ($n = 1$) sunscreen, 0.7% ($n = 1$) face mask (sheet mask), and 84.1% ($n = 127$) have removed any of the products from their skin care.

About 53.6% ($n = 81$) of the students wash their face twice a day, 23.2% ($n = 35$) of the students wash their face once a day, 21.9% ($n = 33$) of the student wash thrice a day, and 1.3% ($n = 2$) wash their face on alternate days.

When asked if they started to experience acne/rosacea or if their pre-existing acne/rosacea worsened since they started wearing masks, 51.4% of the students responded yes, whereas 48.6% of the students responded that they did not have such an experience.

Symptoms

About 65.8% ($n = 52$) stated that they have closed comedones (whiteheads), 43% ($n = 34$) of students have pustules, 26.6% ($n = 21$) of the students have papules, 25.3% ($n = 20$) of the students have open comedones (blackhead), 24.1% ($n = 19$) of the students experience itching, 0.9% ($n = 11$) of the students have nodules, 12.7% ($n = 10$) of the students have erythema (redness), 12.7% ($n = 10$) of the students have cysts, 3.8% ($n = 3$) have beard dandruff, 1.3% ($n = 1$) have telangiectasia, and 13.9% ($n = 11$) stated that they do not have any skin symptoms.

Most of the students, 65.8% ($n = 52$), stated that they experience acne/rosacea on the cheeks, some students on the chin and jawline at 44.3% ($n = 35$), then the forehead at 11.4% ($n = 9$), and 22.8% ($n = 18$) on the nose (T-zone) [Figure 1].

About 40.8% ($n = 31$) of the students have been experiencing acne/rosacea for more than a year, 32.9% ($n = 25$) of the students for 2–6 months, 15.8% ($n = 12$) of the people for over a month, and 10.5% ($n = 8$) of the students for 7–12 months.

When asked how often students bleach/dye their skin, 94.9% ($n = 75$) of the students responded that they have never bleached/dyed their skin, 3.8% ($n = 3$) responded every year, and only 1.3% ($n = 1$) said that they bleach or dye their skin every 6 months.

COVID-19

About 51.9% ($n = 41$) of the students stated that they had tested positive for COVID-19, compared to 48.1% ($n = 38$) who did not. About 10.5% ($n = 4$) of the students stated that their acne/rosacea is worsened after COVID-19 infection.

DISCUSSION

Mandated wearing of facemasks since the onset of the COVID-19 pandemic has led to the new subtype of acne mechanica, popularly coined as “Maskne.” Maskne is an umbrella term that may not be associated with acne only, but other facial dermatoses as well.^[8] While there is an abundance of literature available on the effect of personal protective equipment on the skin of front line healthcare workers during the COVID-19 pandemic, the information available on this subject related to medical students is comparatively scarce.

About 51.4% ($n = 76$) of our participants had reported new acne or exacerbation of the previous acne since wearing

masks. About 59.2% of these participants were female compared to 33.3% of males. Vural’s study on Turkish medical students reported a similar trend where females were 2.361 times more at risk of developing AV lesions than men.^[9] Aravamuthan and Arumugam and Altun and Demir also reported a female predominance in acne development due to mask wear among health-care professionals.^[10,11]

Multiple mechanisms can contribute to the disruption of the skin barrier due to mask wear. These include friction and sweating, local temperature rise causing an increase in sebum production, increased skin humidity that can increase the amount of skin squalene, increased skin pH, and transepidermal water loss (TEWL).^[12,13] TEWL, skin dehydration, and increased sebum production are known pro-comedogenic factors promoting *Cutibacterium acnes* multiplication and inflammatory immune responses, leading to the development of papules and pustules. Friction may also lead to increased levels of interleukin-1 α , which is involved in the pathogenesis of this condition.^[8] In our study, the most common symptoms reported were closed and open comedones, pustules, papules, itching, and erythema with the predominant site being the cheeks 65.8% ($n = 52$) followed by the chin 44.3% ($n = 35$). This is in accordance with the study carried out by Vural where lesions were most common on the cheeks (51%) and chin (45.5%).^[9] These areas are described as the Ozone or U-zone that is in contact with the mask.^[14]

Furthermore, the incidence and the severity of Maskne are associated with the type of mask worn, duration, and frequency of usage. A higher risk is associated with a duration of wear of more than 4 h/day.^[4] Therefore, frequent breaks from mask wearing are recommended to shorten the duration of contact between mask and skin.^[12] Breaks of 15 min from mask wear are recommended every 2 h for mask-related acne.^[15] Vural found prolonged mask use to be associated with the development of acne vulgaris, $P = 0.001$.^[9] However, our study found no significant relationship between the duration of daily mask wear and the incidence of facial dermatoses ($P = 0.0669$). Han *et al.* reported similar findings in the general population with no significant correlation between acne severity and total duration of wearing masks.^[14] On another note, reusing masks increase the risk of skin reactions up to 1.5 times, so it is advised to replace surgical masks every 4 h and N95 masks every 3 days.^[4,16]

One of the ways to manage and prevent mask acne is to protect the skin barrier and reduce TEWL by moisturizing the epidermis. Moisturizers were the most frequent skincare product added by our participants to their skincare routines since they started wearing masks 52.3% ($n = 79$) followed by cleansers 45.7% ($n = 69$) and sunscreen 27.8% ($n = 42$). In addition, topical acne treatments such as benzoyl peroxide, exfoliants (AHA/BHA), and retinoids have also been added

to the skincare routine, but these may increase the risk of irritation under mechanical occlusion. Instead, hydrogel carrier formulations are recommended to reduce local irritation.^[17,18]

Although some medical students experienced mask acne, our results are not significant enough to say that wearing facial masks may lead to exacerbation of, or new-onset acne, in clinical year students of Georgian Medical Universities. Therefore, our hypothesis is not proven. Similar results have been obtained in a cross-sectional study done in students of the Faculty of Medicine, University of Diponegoro, Indonesia, where there was no significant relationship observed between the use of face masks and the incidence of acne vulgaris.^[19]

Limitations

One of the limitations of our study is the small sample size ($n = 151$). Another limitation is the cross-sectional design of this study where no detailed investigation of the participants' hereditary and acne exposome factors that may contribute to the development of, or worsening of acne was carried out, and no follow-up was performed. Acne exposome is the sum of all the environmental factors influencing the occurrence, duration, and severity of acne. These include six main factors, which are nutrition, medication, lifestyle, psychological, occupation, climate, and pollution.^[20] Several recent publications have demonstrated a link between acne and dairy products, especially skimmed milk, and refined, hyperglycemic carbohydrates. These dietary factors can cause hyperinsulinemia and elevated insulin-like growth factor 1 signaling causing increased androgen levels and increased sebum production which can aggravate acne.^[20,21] Furthermore, stress and lack of sleep are common concerns among clinical year medical students and can increase cortisol levels and inflammation, thereby aggravating acne.^[22] These factors were not assessed in our survey. In addition, hormonal acne, more common in women, usually occurs on the lower half of the face, along the jawline, chin, and perioral region. These regions of the face overlap with the area covered by facial masks, so more thorough investigation needs to be carried out to distinguish mask related acne from hormonal acne.

Moreover, the data were collected through an online survey only, without a physical examination in person of the participants' skin. Therefore, the details reported are up to the participants' discretion. Further research in this area needs to be carried out with a bigger sample size and with the diagnosis of mask acne confirmed by a medical professional.

CONCLUSION

With the beginning of the COVID-19 pandemic in 2020, wearing a mask is now widely accepted as the new normal.

Using a mask is an integral part of prevention of the COVID-19 disease. Although it has multiple benefits, mask wearing has proved to worsen acne and rosacea as reported by various different studies.

Majority of clinical year medical students of Georgia report having new acne or exacerbation of previous acne since wearing masks, with closed and open comedones, pustules, papules, itching, and erythema on the cheeks most frequently reported on the cheeks, chin, and the jawline. Despite these findings, our results are not significant enough to prove our hypothesis. This study was conducted using an online questionnaire; hence, future research should be further aimed at an objective analysis and diagnosis rather than self-reporting techniques to find out the exact type and extent of mask acne.

Acne affects more than just the skin and is an important determinant of a person's identity. With the widespread and normalized use of masks, acne flare-ups have worsened causing a negative impact on a person's self-perception and self-esteem, which are why we believe further research in this field is important to determine the exact causes, the extent of mask acne and ways to combat this new age dermatological problem.

Declaration of patient consent

Patients' consent not required as patients' identity is not disclosed or compromised.

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Conflicts of interest

There are no conflicts of interest.

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