Clinico-Epidemiological Study of Mask Induced Acne (MASKNE) among University Students During COVID-19 Pandemic

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ABSTRACT

Background: At the end of 2019, Wuhan, China, became the center of the COVID-19 coronavirus (SARS-CoV2) infectious illness pandemic. The first incidence in Egypt was reported on March 2, 2020. The (WHO) quickly proclaimed the outbreak a global pandemic. In addition to other measures to prevent the spread of this extremely contagious illness, the Egyptian Ministry of Health required the use of facial masks by the general populace. In both the general public and healthcare workers, it has been observed that wearing facial masks on a regular basis and for an extended period of time has caused the development of numerous skin issues and facial dermatitis, including new-onset acne and flare-ups of pre-existing acne.

Objective: Determine the incidence of maskne among universities.

Subjects And Methods: A total of 1011 university students were enrolled. Questionary.

Results: 565 (55.9%) were females and 446 (44.1%) were males, and the predominant age group was 22.33 ±1.79 years old. The majority of participants wore a mask for less than 4 hours 355 (47.8). The surgical masks were the most frequently used masks, 307(41.4%). 408 (96.7%) of 422 participants had a previous family history of acne. 181 (95.3) participants were smokers and had acne. Cigarettes were the commonest type. The majority of our participants who received COVID vaccination developed acne538 (97.8). The majority of our participants who had regular cycles developed acne 352 (96.2).

Conclusion: At the end, the findings of our study indicated a substantial correlation between the use of face masks often and the development of a fresh outbreak of acne.

Keywords: Maskne, Face Mask, COVID-19, Acne.

INTRODUCTION

The 2019 coronavirus illness (COVID-19) has been reported since December of this year and has expanded internationally. It is required to wear personal protective equipment (PPE), notably face protective masks, due of the high incidence of COVID-19 transfer and the tendency for airborne infection; not only among health care providers, but also among the public and students. The use of face masks has risen dramatically and become an everyday clothing accessory during the ongoing COVID-19 pandemic [1].

Although wearing protective masks is critical for avoiding the spreading of such an infectious disease, it can have negative impacts on the skin's health. Long-term mask use can cause contact dermatitis, pigmentation, papules, pustules, and erythema along the contact regions [2].

Maskne is a new term created during the COVID - 19 era to describe breakouts including acne that results from wearing a mask [3].

The clinical criterion for "maskne" is the emergence of acne within 6 weeks of initiating regular face mask wear or the aggravation of acne over the masked region. The O-zone is the name given to the unique pattern that is seen on the face. It's critical to rule out other possible maskne differential diagnoses, such as perioral dermatitis, seborrheic dermatitis, malassezia folliculitis, and acne rosacea [4].

Although the precise cause of maskne is unknown, some ideas suggest that it may be caused by a condition of follicular occlusion, which is closely linked to microbiome dysbiosis (heat, pH, and moisture from biofluids) and mechanical stress (pressure, occlusion, and friction). Increased mask-wearing time has an impact on both of these. For individuals at risk for acne (active young people, seborrhea, genetic predisposition), tropical climates and outdoor exposure (increased perspiration) are risk factors [5].

It has also been explained that the possible factors of this pattern of this localized outbreak are the raise in humidity and temperature in the mask covering area. High temperatures have been shown to have an impact on sebum production rates. Additionally, it is hypothesized that squalene levels in the skin may rise with increased humidity. In addition, it was reported that the raise in humidity and excess sweating may lead to the swelling of the epidermal keratinocytes, thus such alterations can cause acute follicular obstruction in addition to exacerbation of acne [6].

Despite the fact that maskne is not a fatal illness, it has a significant impact on a person's psychological state. Acne-prone adolescents (students) and adults have increased rates of anxiety, with low self-esteem as well as a degree of depression than those who do not have acne. So accordingly, students have high risk for maskne with prolonged wearing mask [7].

As concluded, the exact explanation of the pathogenesis of acne flare in the areas covered by mask

remains unknown. It is also noted that the prolonged wear of the protective masks not only causse acne but may tempt the touch of the breakouts as it may itch and annoy the subject [8].

The aim of this study was to determine the incidence of maskne among university students and to assess possible risk factors to avoid acne outbreaks due to mask wearing.

SUBJECTS AND METHODS
Setting:
This was a cross-sectional study including survey that was created to evaluate the incidence of mask-induced acne and the contributing factors that contribute to its development in the student population at Misr University for Science and Technology (MUST) and other universities (Ain Shams, 6 October, etc.) in Egypt. The study was carried out between November 2021 and November 2022 during the COVID-19 epidemic.

A Participant selection:
Our study depended upon an online self-administered survey questionnaire that was used in order to collect data. The survey was distributed to university students through several social media platforms as Twitter, WhatsApp, and Facebook. Participants aging from 18-27 years old were included. Participants with any unfulfilled data were excluded from the study. The calculated sample size was 1011 respondents with a 95% confidence level and a margin error of 5%.

Inclusion criteria:
- Medical and non-medical Students.
- Both sexes.
- All nationalities.
- Age group: 18-27 years.
- Students who wore masks > 6 weeks.

Exclusion criteria:
- Age < 18 or > 27 years.
- Subjects who were on systemic therapy that may induce acne as isotretinoin or corticosteroids.
- Subjects consuming special diets capable of reducing inflammation (e.g., keto-diet).
- Subjects infected by SARS-CoV-2.
- Immune-compromised patients.
- Subjects who never wear a mask.

Twenty multiple choice questions were included in the poll, and they were organized into four main categories as follows:
(1) Demographic information, such as place of residence, age, gender, and profession.
(2) Information about mask use, such as the type of mask used, how often it was worn each week, how long it was worn each day in hours, how often it was changed, whether a face shield was worn in conjunction with the mask, and whether facial products like cleansers, moisturizers, and sunscreen were applied.
(3) The underlying skin condition and any unfavorable skin-related effects, like a history of acneor, other skin issues, the appearance of fresh zits, or flare-ups during the epidemic.
(4) Information regarding participants' acne, such as the type and location of acne on the face, associated symptoms (itching, dry skin, greasy skin, moisture, heat, and excessive facial sweating), and methods used to treat acne (medical consultation, over-the-counter remedies, periodically taking off the mask, moisturizer and/or cleanser use), as well as the impact of mask-induced acne on participants' occupations.

Ethical approval:
The Ethics Committee of Misr University for Science and Technology and Ain Shams University has authorized this work. After receiving all of the information, each student signed their consent. The Helsinki Declaration was followed throughout the course of the investigation.

Statistical analysis
The SPSS version 26, was used to accomplish these calculations. Qualitative data were expressed as numbers and percentages. Quantitative data were expressed as mean and standard deviation. Chi Square test was used to compare categorical variables and t-test was used to compare continuous variables. P-values lower than 0.05 were regarded as statistically significant.

RESULTS
Mean age of the studied students was 22.33 ±1.79 years, 55.9% were females, 70.3% were in medical schools, and 39.2% were in grade 5 (Table 1).

Table (1): Sociodemographic chractersitics of the studied cases (n=1011)

	n=1011	%
Age/years		
Mean±SD	22.33±1.79	
Gender		
Male	446	44.1
Female	565	55.9
College		
Physical therapy	49	4.8
Pharmacy	51	5.0
Dentistry	96	9.5
Nursing	11	1.1
Medicine	504	49.9
Engineering	92	9.1
Economy	6	0.6
Art	12	1.2
Commerce	72	7.1
Social science	44	4.4
Biotechnology	34	3.4
Law	40	4.0
Medical	711	70.3
Theoretical	300	29.7
Educational level		
Grade 1	153	15.1
Grade 2	119	11.8
Grade 3	149	14.7
Grade 4	194	19.2
Grade 5	396	39.2

Of the studied students; 73.4% wore mask. The surgical masks were the most frequently used masks (41.4%). The majority of participants wore a mask for less than 4 hours (47.8%). Among studied students; 47.3% reported reuse mask sometimes. Fifty-four percent of the studied sample took COVID-19 vaccine and 10.7% thought that vaccine have relation with acne eruption (Table 2).

Table (2): Distribution of the studied students according to mask use habits

	N=1011	%
Wear mask	742	73.4
Mask used		
Surgical mask	307	41.4
N95 with valve	154	20.8
Cotton fabric	205	27.6
Others	76	10.2
Mask wearing duration (hours)		
<4	355	47.8
4-8	287	38.7
>8	100	13.5
Reuse mask		
Never	315	42.5
Sometimes	351	47.3
Always	76	10.2
Mask temporarily preservation	n=427	
Put on table	79	18.5
Put in bag	182	42.6
Put in clothes	77	18.0
Others	89	20.8
Took COVID-19 vaccine	550	54.4
Thought that vaccine had relation with acne	108	10.7

Of the studied sample; 41% had positive acne history and 41.7% had positive family history of acne. Skin type distribution among studied sample was mainly 42.9% oily and skin color was mainly (34.4%) type III (Table 3).

Table (3): Distribution of the studied students according to history and skin type

	n=1011	%
Acne history	415	41.0
Family history of acne	422	41.7
Skin type		
Dry	102	10.1
Mixed	291	28.8
Oily	434	42.9
Others	184	18.2
Skin color		
I	106	10.5
II	193	19.1
III	348	34.4
IV	204	20.2
V	70	6.9
VI	90	8.9

Smoking history was detected among 18.7% of the students, 12.4% were vegan, 16.6% previously followed keto diet and 62 female students had positive history of PCO and 36.2 had regular menses as shown in table (4).

Table (4): History distribution among studied students

	n=1011	%
Smokers	189	18.7
Type of smoke		
Cigarette	85	45.0
Electron cigarette	27	14.3
Vape	40	21.2
Others	37	19.6
Vegan	125	12.4
History of following keto diet	168	16.6
Had history of PCO	62	6.1
Had regular menses	366	36.2

Prevalence of acne among studied students represented 75% of the studied sample. Most common site was (29.8%) at cheek. Of the studied students; 32.1% noticed acne eruption after wearing the mask, 17% had other skin diseases and 31.8% used any type of comedogenic skin care products or medications for acne as shown in table (5).

Table (5): Prevalence of acne and its characters among studied students

	n=1011	%
Irritant acne	758	75.0
Most common sites	n=758	
Nose	72	9.5
Trunk	38	5.0
Forehead	165	21.8
Chin	132	17.4
Cheek	226	29.8
Others	125	16.5
Noticed acne eruption after wearing the mask	325	32.1
Acne appeared after 6 weeks of regular mask wear	279	27.6
Was it considered the 1st episode of acne or you already have acne and it flared with mask	275	27.2
Had other skin diseases	172	17.0
Used any type of comedogenic skin care products or medications for acne	321	31.8

A statistically significant relation was detected between younger age and acne and between male sex and acne (Table 6).

Table (6): Relation between sociodemographic characteristics and presence of acne among studied students.

	Total number N=1011	No acne N=253(25%)	Acne N=758(75%)	Test of significance
Age/years mean±SD	22.33±1.79	22.98±1.59	22.12±1.81	t=6.71 p<0.001*
Gender Male Female	446 565	82(18.4) 171(30.3)	364(81.6) 394(69.7)	χ^2=18.75 p<0.001*
College Medical Theoretical	711 300	174(24.5) 79(26.3)	537(75.5) 221(73.7)	χ^2=0.38 p=0.533
Educational level Grade 1 Grade 2 Grade 3 Grade 4 Grade 5	153 119 149 194 396	51(33.3) 29(24.4) 30(20.1) 50(25.8) 93(23.5)	102(66.7) 90(75.6) 119(79.9) 144(74.2) 303(76.5)	χ^2=8.11 p=0.087

* Significant

A statistically significant relation was detected between wearing mask and acne. Higher acne was detected among surgical mask users (98.7%), cotton fabrics (97.1%) and N95 with valve (90.3%. Higher duration of mask use and taking COVID-19 vaccine were statistically significantly associated with acne as shown in table (7).

Table (7): Relation between wearing mask characteristics and presence of acne among studied students

	Total number N=1011	No acne N=253(25%)	Acne N=758(75%)	test of significance
Wear mask	742	27(3.6)	715(96.4)	χ^2=679.74 p<0.001*
Mask used Surgical mask N95 with valve Cotton fabric Others	307 154 205 76	4(1.3) 15(9.7) 6(2.6) 2(2.6)	303(98.7) 139(90.3) 199(97.1) 74(97.4)	χ^2=21.65 p<0.001*
Mask wearing duration (hours) <4 4-8 >8	355 287 100	20(5.6) 5(1.7) 2(2.0)	335(94.4) 282(98.3) 98(98)	χ^2=7.74 p=0.02*
Reuse mask Never Sometimes Always	315 351 76	11(3.5) 11(3.1) 5(6.6)	304(96.5) 340(96.9) 71(93.4)	χ^2=2.15 p=0.342
Mask temporarily preservation Put on table Put in bag Put in clothes Others	n=427 79 182 77 89	4(5.1) 4(2.2) 4(5.2) 4(4.5)	75(94.9) 178(97.8) 73(94.8) 85(95.5)	χ^2=2.18 p=0.537
Took covid19 vaccine	550	12(2.2)	538(97.8)	χ^2=335.45 p<0.001*

* Significant

A statistically significant relation was detected between mixed skin, dry skin and prevalence of acne and higher acne prevalence was detected among students with skin type II, I and IV (96.9%, 95.3% and 94.4%, respectively) as shown in table (8).

Table (8): Relation between skin type, color and presence of acne among studied students.

	Total number N=1011	No acne N=253(25%)	Acne N=758(75%)	test of significance
Skin type				
Dry	102	6(5.9)	96(94.1)	
Mixed	291	4(1.4)	287(98.6)	χ^2=174.77
Oily	434	175(40.3)	259(59.7)	p<0.001*
Others	184	68(37)	116(63.0)	
Skin color				
I	106	5(4.7)	101(95.3)	
II	193	6(3.1)	187(96.9)	χ^2=191.71
III	348	97(27.9)	251(72.1)	p<0.001*
IV	204	105(51.5)	99(48.5)	
V	70	35(50)	35(50)	
VI	90	5(5.6)	85(94.4)	

* Significant

A statistically significant relation was detected between prevalence of acne and the following; positive acne history (97.1%), positive family history of acne (96.7%), smokers (95.8%), vegan diet (94.4%), history of following keto diet (95.8%), had history of PCO (100%), had regular menses (96.2%), had other skin diseases (96.5%) and used any type of comedogenic skin care products or medications for acne (98.4%) as shown in table (9).

Table (9): Relation between history and presence of acne among studied students.

	Total number N=1011	No acne N=253(25%)	Acne N=758(75%)	test of significance
Acne history	415	12(2.9)	403(97.1)	χ^2=183.80 p<0.001*
Family history of acne	422	14(3.3)	408(96.7)	χ^2=181.92 p<0.001*
smoker	189	8(4.2)	181(95.8)	χ^2=53.56 p<0.001*
Type of smoke				
Cigarette	85	4(4.7)	81(95.3)	
Electron cigarette	27	0	27(100)	χ^{2MC}=2.51
Vape	40	3(7.5)	37(92.5)	p=0.474
Others	37	1(2.7)	36(97.3)	
Vegan	125	7(5.6)	118(94.4)	χ^2=28.68 p<0.001*
History of following keto diet	168	7(4.2)	161(95.8)	χ^2=46.73 p<0.001*
Had history of PCO	62	0	62(100)	χ^2=22.06 p<0.001*
Had regular menses	366	14(3.8)	352(96.2)	χ^2=137.42 p<0.001*
Had other skin diseases	172	6(3.5)	166(96.5)	χ^2=51.24 p<0.001*
Used any type of comedogenic skin care products or medications for acne	321	5(1.6)	316(98.4)	χ^2=138.05 p<0.001*

* Significant

DISCUSSION

Several students during COVID-19 were subjected to a new developed skin condition as a reaction to prolonged wear of protective masks. In our study, females predominated over males 565 (55.9 %). The mean age was 22.33±1.79 year. These results agreed with Indonesian study conducted by **Christopher et al.** [9], the majority of participants were females, with 134 (67%) being under the age of 25. In our study, we found that the dominant participants were in medical college 711(70.32%) since they were interested in participating in a questionnaire related to the medical field.

With 307 (30.36%), surgical masks were most frequently used as masks. Given that surgical masks are useful and affordable, this is to be expected. In a study carried out in Thailand, 526 (63.15%) surgical masks were employed, **Techasatian et al.** [10] came to similar conclusions. The KN95 and N95 were the most popular mask types in research carried out in Lahore [3], and New York, respectively, because those investigations were directed at healthcare professionals. In our study, we found that 205 (20.27%) of the participants used fabric masks, while 307 (30.36%) of those who reported new-onset acne utilized surgical masks. Conversely, 16.3% of participants who used fabric masks and 114 (87.8%) individuals who wore surgical masks reported aggravating their preexisting acne. In the study of **Hayat et al.** [3], they discovered that 12 (14%) users of N95 masks, 25 (30%) users of surgical masks, and 48 (56%) users of KN95 masks; all reported having acne in general.

Most of our participants [355 (47.8)] wore the mask for less than 4 hours. This may be due to the fact our participants were mainly in medical college and used to wearing the mask as they get in contact with patients, and they were very careful and used to change the mask every 4h. Other participants wore masks for more than 8 hours per day [100 (13.5%)]. On the contrary, a Turkish study done by **Özkesici** found that 122 (88.4%) of their studied subjects wore masks for longer than 6 hours, but the limitations of this Turkish study were that it was done on health workers only [11].

In our study, 796 (78.3%) of our subjects had acne after reusing the mask regardless they did it sometimes or always, the majority put their mask on a table and bag and reused it again.
In our study, we found that almost half of the participants 550 (54.4) took the COVID-9 vaccine and the majority of them 538 (97.8) had acne. That was in fact due to fear of vaccination and its side effects. With similar study about the implication of mass COVID-19 vaccination on dermatology by **Sinha et al.** [12], they found that it has been shown that the most successful immunizations result in a mostly Th1 type response that raises IL2, $TNF\alpha$ and $IFN\gamma$ levels. This would entail increased awareness of flare-ups in conditions such as vitiligo, pemphigus vulgaris, lichen planus, psoriasis, atopic dermatitis, and acne vulgaris [12].

In this study, we found that skin type and color are important factors and have a significant relation with acne. In our study, we found that most cases were oily skin 434 (42.9) and people who had Fitzpatrick III, IV. That contradicts research of African American women, which found that the majority of them had Fitzpatrick V or VI owing to having more visible pores than the other groups, and other studies found that participants with dark skin had larger gland pore sizes and sebaceous glands. In addition, they discovered that pore size was inversely linked with skin lightening [13].

In our study we found that subjects with previous history of acne vulgaris were more prone to develop new active acne lesions or exacerbation of pre-existing acne vulgaris and may be linked to their genetic predisposition of development of acne even before wearing face masks.

In tropical regions like Egypt, the relatively high humidity and rising temperatures cause more perspiration beneath the mask, which in turn causes the keratinocytes of the pilosebaceous follicles to swell. This acute blockage may exacerbate acne, increase sebum excretion, and create an ideal environment for the growth of bacteria linked to acne vulgaris, such as Propionibacterium acnes. This hypothesis is reinforced by a similar discovery made by **Narang et al.** in a study done in tropical areas [6].

In our study, we found that participant who was a smoker was more likely to develop acne. 189 (18.7%) of the participants were smokers and 181 of them developed acne. That is consistent with research done by **Schafer et al.** [14], the prevalence of acne among active smokers (40.8%) was greater than in non-smokers, and another study by **Aljaberi et al.** [15] found that smoking contains high levels of arachidonic acid and polycyclic aromatic hydrocarbons, which can activate the phospholipase A2-dependent inflammatory pathway and cause acne.

We found that there was a relation between acne and hormonal changes as 62 participants had polycystic ovary and developed acne. Agree with a study by **Tehrani et al.** [16] who discovered in women with POS about 30 to 85% of women suffer from acne vulgaris throughout adolescence as a result of hyperandrogenism, and androgens may either directly or indirectly modify sebum production.

Face cleansers, emollients, and self-used treatment were employed by the majority of our subjects in an attempt to treat their face acne, according to our study, which revealed that of the 321 participants who used comedogenic skin care products, 316 (98.4%) of them had acne due to them. In general, self-treatment and skin care techniques were more popular than visiting a dermatologist. This may have been brought on by the challenges of receiving medical care while under lockdown and the anxiety associated with possible COVID-19 cases. This is comparable to **Rosner**'s study, which was carried out in New York City and also mentioned the use of creams and lotions to

prevent skin disintegration [17].

STUDY LIMITATIONS
This study has some limitations. Firstly, the diagnosis is only based on a questionnaire, not through direct physical examination. Secondly, some participants just filled out the form without reading it.

CONCLUSIONS
Final analysis of our study's findings revealed a statistically significant correlation between the wearing face masks frequently and the development of newly developed acne and the flare-up of existing acne. It was also discovered that a few of the measured associated factors can cause acne to flare up or develop new lesions. Therefore, certain recommendations should be applied routinely to stop acne from developing or getting worse. Our recommendation for maskne is to avoid the prolonged reuse of the same mask, to avoid using unprescribed skin care products that may irritate the skin, and to maintain the course of therapy that your dermatologist has prescribed for you.

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