

# The Prevalence and Related Factors of Acne Exacerbation and Face Mask Wearing during the COVID-19 Pandemic

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**Background:** Acne is one of the most common skin adverse effects associated with face mask wearing, which was initially reported among healthcare workers but later found in the general population.

**Objective:** To explore the prevalence and possible related factors of acne exacerbation from face mask wearing during the coronavirus disease 2019 (COVID-19) pandemic.

**Materials and Methods:** The present research was a cross-sectional analytic study. Data were collected by surveying the general population who wore masks regularly.

**Results:** The prevalence of face mask-related acne was 223 participants (49.6%). Gender, occupation, type of face mask, mask-wearing method, reuse of masks, mask cleaning method, cosmetic usage, attitudes about skincare, and risks of acne were not significantly associated with acne. The major risk factors for acne exacerbation were being younger than 30, wearing a mask more than four hours per day, and at least five days per week. Wearing a mask at least five days per week showed a higher risk of acne 3.26 times compared to wearing a mask less than five days per week (AOR 3.26, 95% CI 1.36 to 7.84,  $p=0.005$ ). People under the age of 30 were 1.96 times more likely to develop acne than those over the age of 30 (AOR 1.96, 95% CI 1.34 to 2.87,  $p<0.001$ ).

**Conclusion:** The present study illustrated the significant relationship between face mask wearing and acne exacerbation. Face mask wearing duration and age are factors associated with acne exacerbation.

**Keywords:** Acne; Face mask; Acne-related factors; COVID-19

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Coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was officially announced by the World Health Organization (WHO) as a pandemic disease in March 2020<sup>(1)</sup>. COVID-19 spreads among people via small droplets containing the virus from an infected person's mouth or nose, when they cough, sneeze, speak, or breathe<sup>(2)</sup>. Studies demonstrated that face mask usage could reduce COVID-19 transmission substantially<sup>(3,4)</sup>. Therefore, the Ministry of public Health in many countries have advised people to

always wear masks in public. Especially, healthcare workers (HCW) who work closely with patients, must wear masks throughout their working hours, which consequently increases the risk of adverse skin reactions from wearing the mask, including itching, rash, acne, and pressure-related skin problems<sup>(5-7)</sup>. In the early stages of the pandemic, studies have shown that mask-induced acne was more common in HCW<sup>(5-8)</sup>. Later, acne exacerbation was reported more often in the general population due to the necessity to wear masks for longer periods of time, like HCW<sup>(9,10)</sup>. These phenomena occurred in Thailand as well. Although there is no official mandate, Thai people usually wear masks in public. In addition, many of them wear two-layer masks to increase their confidence in preventing infection. Acne is not only a skin disease but also a mental health problem, causing people to feel anxious, stressed, and lacking in self-confidence, affecting work and social life. Therefore, the purpose of the present research was to focus on the prevalence and related factors of acne exacerbation from face mask wearing. The results of the present study may shed light on the causes and lead to ways to prevent mask-

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induced acne while wearing a mask is still important to prevent disease transmission.

## Materials and Methods

The present research was a cross-sectional analytic study. Data were collected by surveying the general population aged 18 to 60 years who wore masks regularly, using online social media with those willing to participate through self-reporting and answering the questionnaires via Google form. Four hundred fifty participants were required, based on a previous study<sup>(11)</sup>.

The structure of the questionnaire was designed to determine the occurrence of acne at the time of responding in people who regularly wore masks. The severity grading of acne was assessed by participants based on the Leeds revised acne grading system in the questionnaire<sup>(12)</sup>. Mild acne symptoms are mostly presented with comedones, inflammatory papules, and pustules with less than 10 lesions. Moderate acne symptoms consist of inflammatory papules with more than 10 lesions or inflammatory nodules with less than five lesions, while severe acne symptoms consist of inflammatory papules and pustules or nodulocystic lesions or sinus tract. A self-answered questionnaire included basic demographic data such as age, gender, general condition, and occupation. The details of mask usage consisted of the type of face mask, mask-wearing method, mask-wearing duration (days) per week, mask-wearing duration (hours) per day, mask reuse, and mask cleaning method. The details of cosmetic usage included moisturizer cream, sunscreen, and makeup with foundation. The questionnaire also included specific questions about the frequency of facial cleaning per day and attitudes about skincare and the risks of acne.

## Statistical analysis

All data in the questionnaire were categorized and analyzed by using the IBM SPSS Statistics, version 22.0 (IBM Corp., Armonk, NY, USA). Demographic data and personal behavior of wearing masks and the occurrence of acne were analyzed by using descriptive statistics such as frequency and percentage. Chi-square or Fisher's exact test was used to compare the percentages between those with or without acne group with acne-related factors.

Simple and multiple, binary logistic regression models were used. Associated clinical factors with p-value less than 0.05 from univariate analysis were selected and entered in multivariate data analysis, by using a backward, stepwise, multiple binary logistic

regression model to determine independent variables related to the acne occurrence during face masks usage. Adjusted odds ratio (AOR) was reported in the case of p-value less than 0.05.

## Statement of ethics

The present study was conducted in accordance with the World Medical Association Declaration of Helsinki. All subjects had given their written informed consent and the study protocol was reviewed and approved by the Ethical Research Committee of Mae Fah Luang University, approval number COE 248/2021, on 30 September 2021.

## Results

Four hundred fifty participants were registered and classified as 44 males (9.8%) and 406 females (90.2%). All participants aged 18 to 60 were divided into two groups, 223 subjects (49.5%) aged 18 to 30, while 227 subjects (50.5%) aged 31 to 60. One hundred eight participants (24%) worked as HCW and 342 participants (76%) worked as non-healthcare workers (NHCW). Information about mask-wearing behaviors is demonstrated in Table 1. Three types of face masks were used the most, surgical masks (84.7%), fabric masks (5.1%), and N95 masks (7.6%). Interestingly, it was found that the majority of participants (78.9%) wore two-layer masks, because of the public health experts' recommendation to provide better protection against the virus with 69.4% who wore two-layer surgical masks, 27.7% who wore a surgical mask covered with a fabric mask, and 2.3% who wore two-layer fabric masks. Most of the participants (79.8%) wore face masks every day. Moreover, 363 participants (80.7%) wore face masks for more than six hours per day. It was also found that 409 participants (90.9%) change their masks every day.

The information about the occurrence of acne, cosmetic usage, and frequency of facial cleaning of participants is presented in Table 2. Acne occurrence was found in 223 subjects (49.6%). One hundred forty-seven subjects (32.7%) experienced the new onset of acne while 76 subjects (16.9%) had previous history of acne and exacerbated during the time of wearing a mask regularly. Most of the cases were presented with mild severity of acne (82.9%), while the moderate and severe forms of acne were presented with 0.9% and 16.2%, respectively. Three-hundred eighty-eight participants (86.2%) were able to answer correctly at least four out of the five questions about their attitudes about skincare and the risks of acne,

**Table 1.** Information on face-mask wearing behavior (n=450)

Information on face-mask wearing behavior	n (%)
<b>Type of mask</b>	
Surgical mask	381 (84.7)
Fabric mask	23 (5.1)
N95	34 (7.6)
Others	12 (2.6)
<b>Mask wearing method</b>	
1-layer mask	95 (21.1)
2-layer masks	355 (78.9)
<b>Characteristics of 2-layer masks (n=353)</b>	
2-layer surgical masks	246 (69.7)
A surgical mask covered with a fabric mask	98 (27.7)
2-layer fabric masks	8 (2.3)
Others	1 (0.3)
<b>Mask wearing duration (days) per week</b>	
1 to 2 days per week	11 (2.4)
3 to 4 days per week	19 (4.2)
5 to 6 days per week	65 (14.5)
7 days per week	355 (78.9)
<b>Mask wearing duration (hours) per day</b>	
1 to 2 hours per day	14 (3.1)
3 to 4 hours per day	29 (6.4)
5 to 6 hours per day	44 (9.8)
More than 6 hours per day	363 (80.7)
<b>Frequency of mask changing (every day)</b>	
Yes	409 (90.9)
No	41 (9.1)
<b>Frequency of fabric mask cleaning (every day) (n=372)</b>	
Yes	239 (64.2)
No	133 (35.8)
<b>Fabric mask cleaning method (n=371)</b>	
Disinfectants	73 (19.7)
Laundry detergent	41 (11.0)
Detergent	108 (29.1)
Soap	52 (14.0)
Other	97 (26.2)

while details of their answers are shown in Table 3.

Univariate analysis to compare between acne and non-acne group with the factors related to acne occurrence during the time of wearing mask regularly are presented in Table 4. The study found that being younger than 30, wearing a mask more than four hours a day, and wearing a mask at least five days per week had a significantly higher chance of acne exacerbation ( $p < 0.05$ ) in univariate analysis. Significant risk factors from univariate analysis ( $p < 0.05$ ) were further tested for multivariate logistic regression. The result revealed that those subjects under 30 years of age

**Table 2.** Occurrence of acne after wearing a mask regularly (n=450)

Questionnaire about acne occurrence after wearing a mask regularly	n (%)
<b>Acne occurrence</b>	
Non-acne	227 (50.4)
Acne	223 (49.6)
<b>No history of acne, acne occurred after wearing a mask regularly</b>	
The previous history of acne, acne exacerbation after wearing a mask regularly	76 (16.9)
<b>The severity of acne (n=223)</b>	
Mild: mostly comedones, inflammatory papules, pustules less than 10 lesions	185 (82.9)
Moderate: inflammatory papules more than 10 lesions and/or inflammatory nodules less than 5 lesions	2 (0.9)
Severe: numerous inflammatory papules and pustules and/or nodulocystic lesions, sinus tract	36 (16.2)
<b>Cosmetic usage</b>	
<b>Applying sunscreen</b>	
• No	79 (17.6)
• Yes, once in the morning	367 (81.6)
• Yes, twice a day, morning and afternoon	4 (0.8)
<b>Applying moisturizer</b>	
• No	66 (14.7)
• Yes, once in the morning	116 (25.8)
• Yes, twice a day, morning and afternoon	267 (59.3)
• Yes, 3 times a day, morning, afternoon, and evening	1 (0.2)
<b>Applying foundation</b>	
• No	321 (71.3)
• Yes	129 (28.7)
<b>Frequency of facial cleaning</b>	
Once a day	48 (10.7)
Twice a day	386 (85.8)
3 times a day	14 (3.1)
4 times a day	2 (0.4)

**Table 3.** Attitudes about skincare and the risks of acne (n=450)

Attitudes about skincare and the risks of acne		Agree; n (%)	Disagree; n (%)
Q1	Mask wearing increases the risk of acne	409 (90.9)	41 (9.1)
Q2	Applying foundation increases the risk of acne	420 (93.3)	30 (6.7)
Q3	Applying sunscreen increases the risk of acne	220 (48.9)	230 (51.1)
Q4	Applying moisturizer increases the risk of acne	156 (34.7)	294 (65.3)
Q5	Facial cleaning decreases the risk of acne	420 (93.3)	30 (6.7)

were 1.96 times more likely to develop acne from wearing a mask than those subjects over 30 years of age (AOR 1.96, 95% confidence interval [CI] 1.34 to 2.87),  $p < 0.001$ . Duration of wearing mask at least five days per week had a 3.26 times higher risk of acne than the period of wearing mask less than five

**Table 4.** From total (n=450), comparison between acne group (n=223) and non-acne group (n=227) with acne-related factors

Factors associated with acne	Total (n=450); n (%)	Acne group (n=223); n (%)	Non-acne group (n=227); n (%)	p-value*
Female sex	406 (90.2)	207 (92.8)	199 (87.7)	0.067
Age <30 years	223 (49.6)	130 (58.3)	93 (41.0)	<0.001
Health care worker	108 (24.0)	61 (27.4)	47 (20.7)	0.099
Wearing a surgical mask	381 (84.7)	191 (85.7)	190 (83.7)	0.566
Wearing 2-layer masks	355 (78.9)	179 (80.3)	176 (77.1)	0.477
Wearing 2-layer surgical masks	236 (66.5)	120 (67.0)	116 (65.9)	0.822
Wearing a surgical mask covered with a fabric mask	98 (27.6)	54 (30.2)	44 (25.0)	0.276
Wearing a mask at least 5 days per week	420 (93.3)	216 (96.9)	204 (89.9)	0.003
Wearing a mask for more than 4 hours per day	407 (90.4)	208 (93.3)	199 (87.7)	0.043
Daily cleaning of fabric mask	239 (64.3)	120 (67.0)	119 (61.7)	0.279
Cleaning the fabric mask with disinfectant	41 (11.1)	25 (24.0)	16 (8.3)	0.077
Cleaning the fabric mask with laundry detergent	108 (29.1)	46 (25.8)	62 (32.1)	0.183
Cleaning the fabric mask with detergent	52 (14.0)	25 (14.0)	27 (14.0)	0.988
Cleaning the fabric mask with soap	97 (26.2)	48 (27.0)	49 (25.4)	0.730
Applying sunscreen	371 (82.4)	190 (85.2)	181 (79.7)	0.128
Applying moisturizer	384 (85.4)	190 (85.2)	194 (85.5)	0.938
Applying foundation	129 (28.7)	56 (28.1)	73 (32.2)	0.098
Cleansing the face more than once a day	402 (89.3)	198 (88.8)	204 (89.9)	0.711
The attitude of skincare to the causes of acne	388 (86.2)	196 (87.9)	192 (84.6)	0.308

\* Chi-square test and Fisher's exact test were applied to compare between acne and non-acne group

**Table 5.** Comparison between acne group and non-acne group with acne-related factors (Univariate and Multivariate analysis)

Acne-related factors	Crude odds ratio	p-value	Adjusted odds ratio	p-value*
Age younger than 30	2.01 (1.38 to 2.93)	<0.001	1.96 (1.34 to 2.87)	<0.001
Wearing a mask at least 5 days per week	3.48 (1.46 to 8.28)	0.008	3.26 (1.36 to 7.84)	0.005
Wearing a mask for more than 4 hours per day	1.95 (1.01 to 3.76)	0.046		

\* Simple and multiple, binary logistic regression models were used to compare between acne group and non-acne group with acne-related factors

days per week (AOR 3.26, 95% CI 1.36 to 7.84), p=0.005 (Table 5).

## Discussion

Acne is one of the most common skin adverse effects associated with face mask wearing. This was initially reported among HCW but later found more frequently in the general population. The results of the present study demonstrated that face mask wearing had a significant effect on acne breakouts. The prevalence of mask-associated acne was 49.6% in HCW, which was not statistically different from NHCW (p=0.099). It was also found no significant difference between males and females in the occurrence of acne from wearing masks (p=0.067).

Acne was found in 49.6% of all participants, with 32.7% who had no previous acne history while 16.9% had a history of acne. This led to the conclusion that mask-wearing can cause new acne in people who have

never had acne, or an exacerbation of acne in people who had a history of acne. Most of the acne cases (82.9%) suffered from mild severity, while 16.2% had severe acne with inflammatory papules, pustules, and nodulocystic lesions. No risk factors were found to be associated with acne severity.

Recent studies showed that the specific type of mask was significantly correlated with acne breakouts<sup>(11,13)</sup>, while the present study revealed the types of face masks, the mask-wearing method, mask reuse, and mask cleaning method had no effect on acne occurrence. In addition, the present research also studied the relationship between cosmetic usage and acne, which discovered that no increase in the prevalence of acne among people who applied moisturizer cream, sunscreen, or makeup with foundation regularly while wearing mask.

Data from the present study showed two statistically significant factors contributing to acne,

and they were those under the age of 30 had 1.96 times more likely to develop acne from wearing a mask than those over the age of 30 and wearing mask at least five days per week had 3.26 times higher risk of acne than wearing mask less than five days per week.

Wearing mask for extended period of time increases skin temperature and sebum production from sebaceous glands<sup>(14)</sup>. High humidity, sweat, and pressure from wearing masks might cause irritation, swelling of epidermal keratinocytes, and hair follicle occlusion<sup>(15)</sup>. Furthermore, disturbances in the microenvironment result in changes in microbiomes and abnormal growth of *Cutibacterium acnes*, leading to the formation of inflammatory papules and pustules of acne<sup>(16-18)</sup>. All of these are important mechanisms for increasing the prevalence of acne exacerbation from mask-wearing<sup>(19)</sup>.

Two limitations of the present study needed to be acknowledged. First, most of the participants were female, whose hormonal changes may affect the result of face mask-related acne exacerbation. Second, data on the severity of acne were collected from self-answering the questionnaires and was not assessed by a dermatologist.

## Conclusion

The present study illustrated the significant relationship between face mask wearing and acne exacerbation. The type of mask, mask-wearing method, reuse of mask, mask cleaning method, and cosmetic usage were not significantly associated with acne breakouts. The major risk factors for acne exacerbation were being younger than 30, wearing mask more than four hours per day, and wearing mask at least five days per week.

## What is already known on this topic?

There are reports of adverse skin reactions from wearing the mask during the COVID-19 pandemic, including itching, rash, acne, and pressure-related skin problems. Acne is one of the most common problems, initially reported among HCW, later found in the general population. However, there was limited data about the prevalence and related factors of acne exacerbation from face mask wearing.

## What this study adds?

This study shows the prevalence and significant associated factors of acne exacerbation from face mask wearing during the COVID-19 pandemic, including being younger than 30, mask-wearing duration of more than four hours per day, and at least

five days per week. The general population should be made aware of these risk factors.

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## Data availability statement

All data generated or analyzed during the present study is included in this article. Further inquiries can be directed to the corresponding author.

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## Conflicts of interest

All authors had no conflicts of interest.

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