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Research Article

Analysis of Risk Factors Associated with Maskne in the Era of the COVID-19 Pandemic

Salsabila Az-Zahra[*1] , Nelva Kamilah Jusuf[2]
[1]*Undergraduate Program of Medicine, Faculty of Medicine, Universitas Sumatera Utara, Medan, 20155, Indonesia*
[2]*Department of Dermatology and Venereology, Faculty of Medicine, Universitas Sumatera Utara, Medan, 20155, Indonesia*

Abstract
Background: The necessity to always use a mask in the era of the COVID-19 pandemic has given rise to a new term called maskne. Maskne is the appearance of acne that is triggered by wearing a mask. It usually occurs specifically in the area covered by the mask, focused on the cheeks, chin, and nose. **Objective:** This study aims to determine the risk factors associated with the occurrence of maskne. **Methods:** A cross-sectional study was conducted on the Faculty of Medicine students, Universitas Sumatera Utara class 2018. This study uses primary data from questionnaires and observation of respondents' face photos. **Results:** Based on statistical analysis, 99 out of 221 respondents (44.8%) experienced maskne. Bivariate analysis shows p-values <0.05 for gender, duration of mask use, and previous acne history. On the other hand, it was obtained p-value >0.05 for the type of mask and mask changing habit. **Conclusion:** Based on multivariate analysis, the p-value <0.05 for gender indicates that gender is the most dominant risk factor in the incidence of maskne. Furthermore, there is a significant association between gender and the occurrence of maskne. Females are twice as likely to experience maskne.

Keywords: acne, COVID-19, mask, maskne, risk factors

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1. Introduction

Coronavirus Disease 2019 (COVID-19) is a respiratory infectious disease caused by Severe acute respiratory syndrome coronavirus 2 (SARS-COV-2) of the Coronaviridae family [1]. The rapid transmission of SARS-CoV-2 from human to human occurs through direct contact and droplets. These droplets can spread when an infected person sneezes, coughs, sings, talks, and even breathes [2]. Indonesia confirmed the first COVID-19 case on March 2, 2020 [3], and since then, the positive confirmed cases of COVID-19 in Indonesia have continued increasing. The use of a mask is an obligation in daily activities to prevent the transmission of COVID-19, especially if we are around other people. However, a mask must be worn correctly and meet the standards. The mask must cover the entire surface of the nose, mouth, and chin without the slightest gap between the face and the mask that can be a way for the virus to enter and exit [4]. However, the prolonged and continuous use of masks triggers a new problem called maskne, mask-acne, or mask-induced acne. Maskne is defined as acne that emerges due to friction between skin and mask after prolonged use of the mask [5]. In their article, Hayat et al. [6] remark that maskne is a term that refers to the onset of acne or breakouts due to prolonged use of masks. Based on the etiology, maskne is classified into mechanical acne, which appears locally due to pressure or friction. Acne can appear in various forms, such as open or closed comedones or inflammatory lesions like papules, pustules, and nodules [7].

Maskne is reported in both healthcare professionals and general populations. The prevalence of maskne in the healthcare professionals population is 53.1% [8] and 43% in the general population [9]. Continuous use of a mask for an extended period will trigger acne by involving four factors: increased sebum production, colonization of *Cutibacterium acnes*, inflammation, and hyperproliferation of epidermal follicles [10].

* Corresponding author at: Undergraduate Program of Medicine, Faculty of Medicine, Universitas Sumatera Utara, Medan, 20155, Indonesia.
E-mail address: salsabila499@gmail.com

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In addition, several risk factors involved in the occurrence of maskne include gender, duration of mask use, type of mask used, and previous history of acne [8, 11, 13]. Therefore, this research intends to analyze the risk factors associated with maskne.

2. Methods

This research is an analytic-observational study with a cross-sectional approach conducted in July-November 2021. This study used the total sampling method, and the respondents were students of the Faculty of Medicine, Universitas Sumatera Utara, Medan class 2018 who consistently wear masks in their daily activities. Data were taken using a validated questionnaire and included photos of the respondents' faces for observation. The data were analyzed bivariate using chi-square and multivariate using logistic regression to determine the risk factors associated with the incidence of maskne. This study has accepted ethical clearance from the Research Ethics Committee of Universitas Sumatera Utara.

3. Results

Two hundred twenty-one students of the Faculty of Medicine, Universitas Sumatera Utara class 2018, were included as respondents for this study. The characteristics of the respondents are presented in table 1.

Table 1. Characteristic of respondents

Variable	Frequency (n)	Percentage (%)
Gender		
- Female	146	66,1
- Male	75	33,9
Duration of Mask Use		
- >3 hours/day	115	52
- ≤3 hours/day type of mask	106	48
Type of mask		
- Fabric mask	4	1,8
- Surgical mask	173	78,3
- N95	18	8,1
- Double mask	26	11,8
Changing Masks Regularly		
- Yes	127	57,5
- Sometimes	66	29,9
- No	28	12,7
Previous Acne History		
- Yes	156	70,6
- No	65	29,4
Maskne		
- Yes	99	44,8
- No	122	55,2
Total	221	100

The results showed the 221 respondents, 66.1% respondents were female. Compared to the duration of daily mask use, respondents who wear a mask more than 3 hours per day are predominant, a sum of 115 respondents (52%). The types of masks used by the respondents also varied, dominated by surgical masks with 173 users (78.3%), followed by 18 N95 mask users (8.1%), and only four respondents who were fabric mask users. In addition, 26 respondents used double masks (11.8%).

Table 2. Distribution area of maskne

Area of Maskne	Frequency (n)	Percentage (%)
Cheeks	62	62,6
Nose	6	6,1
Chin	27	27,3
Cheeks and chin	3	3
Nose and chin	1	1
Total	99	100

More than half of the population (57.5%) is used to changing masks regularly. 70.6% of respondents said they had a previous history of acne vulgaris. The prevalence of maskne in the student of Faculty of Medicine class 2018 at the Universitas Sumatera Utara was 44.8% (99 people) out of a total of 221 respondents, with the cheek area as the most common location for maskne.

Table 3. Proportions of respondents with and without maskne based on gender, duration of mask use, type of mask, mask changing pattern, and previous acne history

Variable	Maskne				*p*- value
	Yes		No		
	n	%	n	%	
Gender					
Female	75	75,8	71	58,2	0,006
Male	24	24,2	51	41,8	
Duration of mask use					
>3 hours/day	61	61,6	54	44,3	0,010
≤3 hours/day	38	38,4	68	55,7	
Type of mask					
Cloth mask	1	1,0	3	2,5	0,660
Surgical mask N95	81,7	81,8	92	75,4	
Mask			11	9,0	
Double mask	10	10,1	16	13,1	
Changing mask regularly					
Yes	53	53,5	74	60,7	0,268
Occasionally	35	35,4	31	25,4	
No	11	11,1	17	13,9	
Previous acne history					
Yes	77	77,8	79	64,8	0,035
No	22	22,2	43	35,2	

Table 3 shows that respondents who experienced maskne are dominated by females, as 75 people (75.8%). The statistical analysis results obtained the p-value and prevalence ratio (PR) were 0.006 and 2.245 (PR>1), respectively, so it could be concluded that there was a significant association between gender and the incidence of maskne. Therefore, the female gender was a risk factor for the occurrence of maskne. The data shows that 61.6% of respondents who wear masks with a duration of more than three hours per day experience maskne. From the statistical analysis results, the *p*-value was 0.010 and PR=2,021, which suggests a significant association between the duration of wearing masks and the occurrence of maskne, where wearing masks with a duration of more than three hours is a risk factor for the occurrence of maskne.

The results of data analysis regarding the types of masks and the incidence of maskne show that respondents who wore surgical masks and experienced maskne had the highest number, namely 81 people (81.8%). Meanwhile, respondents who wore double masks and experienced maskne were ten people (10.1%), respondents who wore N95 masks and experienced maskne were seven people (7.1%), and respondents who wore fabric masks and experienced maskne only one person (1%). Accordingly, the statistical test results obtained a *p*-value of 0.662 (p>0.05), suggesting no significant association between the type of mask and the occurrence of maskne.

From table 3, it can be seen that respondents who have a habit of changing their masks after being used for a specific duration and experiencing maskne are 53 people (53.5%), respondents who only change their masks occasionally and experience maskne are 35 people (35.4%). In comparison, the respondents who never changed their masks and experienced maskne amounted to 11 people (11.1%). From the statistical test results, the p-value of 0.268 (p>0.05) means no significant association between the habit of changing masks and the emergence of maskne.

The percentage of respondents with a previous history of acne who experienced maskne was predominant, namely 77.8% (77 people). Accordingly, based on the analysis results, a p-value of 0.035 and PR=1.905 leads to a significant association between a previous history of acne and the incidence of maskne, and a previous history of acne is a risk factor for the occurrence of maskne.

Table 4. Multivariate analysis of risk factors associated with maskne

Variable	Maskne				pvalue	OR	95% CI	
	Yes		No				Lower limit	Upper limit
	n	%	n	%				
Gender								
Female	75	51,4	71	48,6	0,025	1,985	1,091	3,610
Male	24	32,0	51	68,0				
Duration of mask use								
>3 hours/day	61	53,0	54	47,0	0,028	1,858	1,068	3,231
≤3 hours/day	38	35,8	68	64,2				
Previous acne history								
Yes	77	49,4	79	50,6	0,081	1,737	0,935	3,227
No	22	33,8	43	66,2				

The logistic regression analysis results of all independent variables with a p-value below 0.25 are detailed in table 4. Based on the analysis results, it was found that gender was the risk factor that played the most statistically significant role in the incidence of maskne, with a p-value=0.025 and an OR=1,985. This number shows that the female gender plays twofold as significant in causing maskne as the other independent variables.

4. Discussion

The analysis results in table 3 show that females are a risk factor for the occurrence of maskne. The results of this study are in line with a study conducted by Chaiyabutr et al.[11], where the risk of developing maskne is higher in women than men. This result can be caused because women tend to use cosmetic products when wearing masks, which will cause an occlusive effect [9]. In addition, women have skin that is more easily irritated than men's skin[14]. Rosner[8], in his research, also explained that the incidence of maskne was much higher in people who wore a mask with a duration of more than three hours. The longer the duration of wearing the mask, the higher the tendency for a humid and hot condition to form in the facial skin area. Humid and hot areas of the skin will trigger an accumulation in sebum production. This change in sebum production can impair the integrity of the skin barrier, disrupt the balance of normal flora, and cause clogging of pores which can eventually manifest into acne [7], [15]. Thus, the use of masks should be given a break of about 15 minutes to prevent maskne [16].

The type of mask used did not significantly affect the occurrence of maskne. This result is in line with Kurt's study [17], which explained that there was no significant association between the use of a 1-layer mask and the use of more than 1-layer masks in causing maskne. However, another study [12] stated that N95 masks are twofold potential to cause maskne as surgical masks because N95 masks exert more significant pressure on the skin and have lower air permeability. The insignificant results in this study can be caused by the unbalanced number of users of each type of mask, where surgical mask users dominate respondents while N95 masks and cloth masks were very few.

There is no significant association between the habit of changing masks and the incidence of maskne. This result is in line with research conducted by Kurt [17], which states that there is no difference in the incidence of maskne between groups of people who do not change masks and groups of people who change masks. However, people who have a previous history of acne are at greater risk of developing maskne. This result is supported by another study [18] which found a significant association between a previous history of acne and the occurrence of maskne.

The most dominant location of maskne is in the cheek area, which was experienced by 62 of 99 respondents (62.6%). This result is similar to a study conducted by Lin et al. [19] and Yaqoob et al. [18], where it was also reported that the cheeks were the most dominant area that experienced maskne. However, these results contradict the study conducted by Jiajia et al.[20] and Singh et al. [21] who reported that the location that experienced the most maskne was the nose area.

5. Conclusion

Gender, duration of mask use, and a previous history of acne were found to have a significant association with the occurrence of maskne, while the type of mask and mask-changing habits were not significantly related. Female gender was identified as a crucial risk factor for maskne. In light of these findings, it is recommended to take preventive measures such as allowing mask breaks every three hours while still adhering to COVID-19 health protocols and avoiding the excessive use of cosmetic products when wearing a mask to reduce the risk of maskne.

6. Data Availability Statement

The datasets generated and analyzed during the current study are not publicly available due to privacy and ethical considerations but are available from the corresponding author upon reasonable request.

7. Ethical Statement

This study was approved by the Research Ethics Committee of Universitas Sumatera Utara. The research was conducted from July to November 2021 using a cross-sectional analytic-observational design..

8. Author Contributions

All authors contributed to the design and implementation of the research, data analysis, and finalizing the manuscript.

9. Funding

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10. Conflict of Interest

Authors declares no conflict of interest.

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