Prevalence of acne vulgaris in COVID-19 situation

Sarawut Laokitrungrote and Sunatra Nitayavardhana*

Faculty of Medicine, Department of dermatology, Chulabhorn International college of medicine, Pathum Thani, Thailand
*Corresponding author, Email: sunatra9@gmail.com

Abstract

Acne vulgaris is a common skin disorder affecting about 9.4% of the global population and ranked eighth in the global most prevalent disease.

Coronavirus Disease 2019 (COVID-19) was first recognized in December 2019 and was later declared as a pandemic by the World Health Organization (WHO). WHO has recommended wearing a face mask in areas with a high risk of exposure to COVID-19, widespread transmission, and vulnerable population and areas with high population density. Thus, a face mask in this pandemic is inevitable as it can contribute to potential protective benefits.

One case report and one self-survey study show acne occurrence and exacerbation associate with a facial mask. To study the prevalence and possible associated factors of acne vulgaris which includes the use of face masks in the COVID-19 situation, the authors conducted a self-survey online questionnaire with participants in Thailand (n=921) acne severity and possible associated factors. The authors define March 2020 as a time point for the beginning of the COVID-19 pandemic as in March the situation is significantly acknowledged and concerned by Thai people. Of 921 participants, nine were excluded due to the absence of mask-wearing since March 2020. The prevalence of self-reported acne before and after March 2020 is 84.97 and 88.48%, respectively. Moreover, the authors assess possible associated factors of acne by categorized the participants into 2 groups; unchanged or better acne group and worse acne group, defined by a severity level (IGA score) comparing between before and after March 2020. The odds ratio and p-value are calculated to compare possible associated factors between the 2 groups. The statistically significant associated factors include age, gender, acne family history, and type of mask.

Keywords**:** *acne vulgaris, COVID-19, Mask*

1. Introduction

Coronavirus Disease 2019 (COVID-19) was first recognized in December 2019 and was later declared as a pandemic by the World Health Organization (WHO). The use of facial protective masks is part of a comprehensive package of the prevention and control measures that can limit the spread of certain respiratory viral diseases, including COVID-19. This situation leads to a higher rate of mask-wearing, which is reported to be associated with skin reaction that causes some degree of burden. Acne vulgaris is a common disorder of the pilosebaceous unit affecting about 9.4% of the global population and ranked eighth in the global most prevalent disease. Acne can occur at any age from neonatal to adulthood. The disease is most commonly found in teenagers with an estimated prevalence of 85% in adolescents and young adults (12-24 years old) and often persists into adulthood but the prevalence progressively reduces (White, 1998; Lynn, Umari, Dellavalle, Dunnick, 2016) with an estimated prevalence of 64% during 20-29 years old, 43% during 30-39 years old, and 26% of women and 12% of men reported to have acne in their 40s (Collier et al. 2008). The prevalence of acne in adolescents is higher in males; however, higher in female adults (Johnson & Roberts 1978; Schäfer, Nienhaus, Vieluf, Berger, Ring, 2001). Acne pathogenesis is multifactorial characterized by four key factors with interrelated mechanisms: increased sebum production, hyperkeratinization and abnormal differentiation of the follicular epithelium, inflammation, and proliferation and biofilm formation of Cutibacterium acnes (Zaenglein, 2018). External factors that have been shown in the literature to influence the occurrence of acne include certain types of food such as intake of dairy products,

hyperglycemic food, whey protein, certain types of drugs, cosmetics, mechanical factors, and climatic conditions and pollutions. (Dréno et al. 2018)

During the SARS outbreak, Tan and Greaves (2006) reported 2 cases of Acne in Healthcare workers in which there was localized exacerbation of acne on the part of the face covered by the N95 Mask. They hypothesized that acne could happen from tropical microclimate or pilosebaceous duct occlusion due to local pressure on the skin (Tan & Greaves, 2004). Also, during the SARS outbreak, a survey in Singapore reported acne to be the most common adverse reaction (59.6%, N = 65) to N95 masks (Foo et al. 2006). Zuo, Hua, Luo, and Li (2020) also conducted a self-report questionnaire survey regarding skin reactions of N95 masks and medial masks among healthcare personnel, and among 101 patients with underlying acne vulgaris, 43.6% (44 patients) has exacerbation. (Zuo et al., 2020)

2. Objective

This study aims to study the prevalence of acne vulgaris and identify the possible associated factors of the mask-related situation.

3. Method

This study is a cross-sectional, self-administered online survey using online data collection tools; "Google Form." The link and Quick response code (QR code) was distributed via line, Facebook, other social media channels as well as personal contacts and posters. An online survey was used to minimize physical contact during the COVID-19 outbreak. Before data collection, the participants were given the same formal instruction about the research project, the purpose of the study, and an informed consent form.

Inclusion criteria were people aged between 18-60 years old with an agreement to participate in the study and the ability to read and understand the Thai language. The authors excluded the participants who had not worn masks regularly since March 2020 and were unable to complete the questionnaire. The questionnaire included age, gender, acne family history, and type and duration of mask-wearing. Data collection was from July to October 2020.

Statistical analysis

1. Frequencies and percentages were computed for descriptive purposes.
2. Mean, median, range, and standard deviation (SD) were calculated for continuous variables, and an Independent T-test was used to compare continuous variables between groups
3. A Chi-square test was utilized to present statistical differences between groups.
4. Odds ratios (ORs) were calculated using univariate logistic regression analysis, interested factor's odds ratio was calculated using all other factors in the category as references, and their 95% confidence intervals (CIs) were used to quantify the associations between each variable and acne occurrence.

The severity of acne used in the questionnaire is according to the IGA score, and descriptive detail in each severity is explained (Table 1).

Table 1 Severity of acne vulgarise (IGA classification)

Value	Grading	Description
0	Clear	Normal, clear skin with no evidence of acne vulgarise
1	Almost Clear	A few scattered comedones and a few small papules
2	Mild	Easily recognizable less than half of the face is involved. Many comedones and many papule and pustules are present
3	Moderate	More than half of the face is involved, Numerous comedones, papule, and pustules
4	Severe	The entire face is involved and covered with comedones, numerous maulers and pustules, and a few nodules and cyst
5	Very Severe	Highly inflammatory acne covering the face; nodules and cysts are present

4. Result and discussion

The questionnaires were answered by a total of 921 participants; 9 were excluded due to the absence of mask-wearing since March 2020.

The percentage of female and male participants are 65.7%(N=599) and 34.3%(N=313) respectively. The mean ± SD of age is 32.7 ± 9.69 (Table 2).

Table 2 Demographic data of participants

	N = 912	Percent
Sex		
male	313	34.3
female	599	65.7
Age (mean±sd)	32.7 ± 9.69	

Prevalence

The prevalence of self-reported acne before and after March 2020 is 84.97 and 88.48% respectively. To determine the impact of possible associated factors on the occurrence and flare-up of acne in the COVID-19 situation, the participants (N=912) are categorized into 2 groups: the worsened acne group and the unchanged or improved acne group. The participants with at least 1 worse acne severity level (35.1% N=320) comparing before and after March 2020 were categorized as a worsened acne group while the samples with unchanged or improved acne of at least 1 better acne severity level were categorized as an unchanged or improved acne group (64.9%, N=592) (Tables 3 and 4).

Table 3 Severity of acne before and after March 2020

		Acne Severity (After March 2020)					
		0 = Clear	1 = Almost Clear	2 = Mild	3 = Moderate	4 = Severe	5 = Very Severe
Acne Severity (Before March 2020)	0 = Clear	86	27	15	8	1	0
	1 = Almost Clear	15	221	131	30	6	3
	2 = Mild	3	22	179	78	14	1
	3 = Moderate	1	4	6	43	5	1
	4 = Severe	0	0	1	1	7	0
	5 = Very Severe	0	1	1	0	0	1

Table 4 Comparison of acne severity before and after March 2020

Result	**Improved**	55	6.0%
	Unchanged	537	58.9%
	Worsened	320	35.1%

Possible associated factors

Age

Age groups of 18-20 years and 21-30 years have 1.89 (p=0.012) and 1.58 times (p=0.001) odds as compared with other age groups, which may be a positively associated factor (risk factor) for worsening of acne while age groups of 41-50 years and 52-60 years have 0.52 (p=0.005) and 0.46 times (p=0.018) odds as compared with other age groups, which may be a negatively associated factor for worsening of acne (protective factor). These findings are compatible with the fact that the prevalence of acne in a general situation is more common in teenagers, and from this study, the age of adolescents is a positively associated factor for worsening of acne in COVID-19 situation as well (Table 5).

Gender

Males and females have odds of 0.68 and 1.48 times when compared with each other, with a statistical significance (p=0.09 and p=0.09, respectively), meaning that being male may be a negatively associated factor for worsening of acne while being female may be a positively associated. The authors still do not fully understand why being female is a positive factor (risk factor) of worsening acne. However, partially it may be because 92.7% of the participants are adults, and, in the general population, the prevalence of acne in adults is higher in females (Johnson & Roberts 1978; Schäfer et al. 2001). Another explanation is that the female participants accounted for 65.7% of the total participants, which is higher than males, and maybe another factor that contributes to a statistical significance (Table 5).

Acne Family History

The absence of a family history of acne may be a negatively associated factor for worsening of acne, with 0.65 times (p=0.006) odds as compared with other answers (having a family history of acne and not sure whether having or not) and a statistical significance. From the literature reviews, the family history of acne had been reported in 62.9% to 78% of patients (Wei et al. 2010; Dréno, Jean-Decoster, and Georgescu 2016), so it is not surprising that having no family history of acne will be a negatively associated factor for worsening of acne (Table 5).

Type of mask

Cloth mask has 0.71 times odds compared with other types of masks (p=0.023) while medical mask has 1.38 times odds compared with other types of masks (p=0.028), which means that cloth mask may be a negatively associated factor for worsening of acne and medical mask may be a positively associated factor for worsening acne. To the best of our knowledge, there's no theoretical explanation that why medical masks may be a risk factor, and it is an interesting issue to further study (Table 5).

Mask-wearing hour/day

The means ± SDs of mask-wearing hours/day of the worsened acne group and unchanged or improved acne group are 5.9 ± 5.44 and 5.1 ± 3.59 hours, respectively, and every one hour of mask-wearing per day increases 1.05 times odds of worsening acne (p=0.013) (Table 5).

Summary of the possible associated factors

From the study, the statistically significant, positively associated factors for worsening of acne include the age of 18-30 years, female gender, and uses of medical masks while the possible negatively

associated factors include the age of 41-60 years, male gender, absence of family history, and uses of cloth masks (Table 6).

Table 5 Possible associated factor of acne occurrence and a flare-up in the COVID-19 situation

	Worsened Acne (n=320)	Improved or Unchanged (n=592)	OR (95%CI)	p-value
Ages (years)	30.65 ± 8.56	33.81 ± 10.08		
18-20	33 (10.3%)	34 (5.7%)	1.89 (1.11, 3.21)	0.012
21-30	159 (49.7%)	228 (38.5%)	1.58 (1.19, 2.09)	0.001
31-40	90 (28.1%)	198 (33.4%)	0.78 (0.57, 1.06)	0.099
41-50	26 (8.1%)	86 (14.5%)	0.52 (0.31, 0.84)	0.005
51-60	12 (3.8%)	46 (7.8%)	0.46 (0.22, 0.9)	0.018
Gender				
Male	92 (28.7%)	221 (37.3%)	0.68 (0.5, 0.92)	0.009
Female	228 (71.3%)	371 (62.7%)	1.48 (1.09, 2.01)	0.009
Having Acne Family History				
Yes	212 (66.3%)	358 (60.5%)	1.28 (0.96, 1.72)	0.086
Not sure	30 (9.4%)	38 (6.4%)	1.51 (0.88, 2.56)	0.105
No	78 (24.4%)	196 (33.1%)	0.65 (0.47, 0.89)	0.006
Type of mask (most frequently used)				
Cloth Mask	98 (30.6%)	226 (38.2%)	0.71 (0.53, 0.96)	0.023
Sponge Mask	2 (0.6%)	7 (1.2%)	0.53 (0.05, 2.78)	0.416
Medical Mask	214 (66.9%)	352 (59.5%)	1.38 (1.03, 1.85)	0.028
N95	6 (1.9%)	7 (1.2%)	1.6 (0.44, 5.6)	0.400
Mask-wearing hour/day	5.9 ± 5.44	5.1 ± 3.59	1.05 (1.01, 1.09)	0.013

Table 6 Summary of positive and negative associated factors for worsening of acne

	Positively associated factor	Negatively associated factor
Ages (years)	18-30	41-60
Gender	Female	Male
Having Acne Family History	-	No
Type of Mask	Medical Mask	Cloth mask

5. Conclusion

The prevalence of self-reported acne before the COVID-19 situation was 84.97% and slightly increased to 88.48% after March 2020.

Possible statistically significant associated factors to the occurrence and flare-up of acne in this situation include age, gender, acne family history, and type of masks.

Some of these factors such as age and acne family history are previously shown in the literature to be associated factors of acne and may be associated factors of worsening in this situation as well.

The authors found that the prevalence of worsening of acne is higher in persons who wear a surgical mask. However, there is no exact reason to explain this finding. The surgical mask is made from extra-fine glass fibers or synthetic microfibers covered on both sides by acrylic laid or wet-laid non-woven, which might

cause more friction of the surgical mask compared to a cloth mask. It also has more contact area than the sponge mask and N95, which may contribute to more friction.

Other factors that may influence an increase of acne vulgaris in this situation include environmental factors such as diet, medication, cosmetics, stress and emotions, as well as socio-economic pressures that may be altered in this situation and are not evaluated in this study, which may be a limitation. Also, a self-reported questionnaire design may contribute to less accurate and precise data, and further study with a larger sample size may be needed.

6. Reference

Collier, C. N., Harper, J. C., Cafardi, J. A., Cantrell, W. C., Wang, W., Foster, K. W., & Elewski, B. E. (2008). The prevalence of acne in adults 20 years and older. *Journal of the American Academy of Dermatology*, *58*(1), 56–59.

Dréno, B., Bettoli, V., Araviiskaia, E., Sanchez Viera, M., & Bouloc, A. (2018). The influence of exposome on acne. *Journal of the European Academy of Dermatology and Venereology: JEADV*, *32*(5), 812–819.

Dréno, B., Jean-Decoster, C., & Georgescu, V. (2016). Profile of patients with mild-to-moderate acne in Europe: a survey. *European journal of dermatology: EJD*, *26*(2), 177–184.

Foo, C. C., Goon, A. T., Leow, Y. H., & Goh, C. L. (2006). Adverse skin reactions to personal protective equipment against severe acute respiratory syndrome--a descriptive study in Singapore. *Contact dermatitis*, *55*(5), 291–294.

Johnson, M. T., & Roberts, J. (1978). Skin conditions and related need for medical care among persons 1-74 years. United States, 1971-1974. *Vital and health statistics. Series 11, Data from the National Health Survey*, (212), i–72.

Lynn, D. D., Umari, T., Dunnick, C. A., & Dellavalle, R. P. (2016). The epidemiology of acne vulgaris in late adolescence. *Adolescent health, medicine and therapeutics*, *7*, 13–25.

Schäfer, T., Nienhaus, A., Vieluf, D., Berger, J., & Ring, J. (2001). Epidemiology of acne in the general population: the risk of smoking. *The British journal of dermatology*, *145*(1), 100–104.

Shi, Y., Wang, G., Cai, X. P., Deng, J. W., Zheng, L., Zhu, H. H., Zheng, M., Yang, B., & Chen, Z. (2020). An overview of COVID-19. *Journal of Zhejiang University. Science. B*, *21*(5), 343–360.

Tan, K. T., & Greaves, M. W. (2004). N95 acne. *International journal of dermatology*, *43*(7), 522–523.

Tirupathi, R., Bharathidasan, K., Palabindala, V., Salim, S. A., & Al-Tawfiq, J. A. (2020). Comprehensive review of mask utility and challenges during the COVID-19 pandemic. *Le infezioni in medicina*, *28*(suppl 1), 57–63.

Wang, M. W., Zhou, M. Y., Ji, G. H., Ye, L., Cheng, Y. R., Feng, Z. H., & Chen, J. (2020). Mask crisis during the COVID-19 outbreak. *European review for medical and pharmacological sciences*, *24*(6), 3397–3399.

Wei, B., Pang, Y., Zhu, H., Qu, L., Xiao, T., Wei, H. C., Chen, H. D., & He, C. D. (2010). The epidemiology of adolescent acne in North East China. *Journal of the European Academy of Dermatology and Venereology: JEADV*, *24*(8), 953–957.

White G. M. (1998). Recent findings in the epidemiologic evidence, classification, and subtypes of acne vulgaris. *Journal of the American Academy of Dermatology*, *39*(2 Pt 3), S34–S37.

Zaenglein A. L. (2018). Acne Vulgaris. *The New England journal of medicine*, *379*(14), 1343–1352.

Zuo, Y., Hua, W., Luo, Y., & Li, L. (2020). Skin reactions of N95 masks and medial masks among health-care personnel: A self-report questionnaire survey in China. *Contact dermatitis*, *83*(2), 145–147.