ORIGINAL ARTICLE

The Prevalence of Adverse Skin Reactions Associated with Face Mask Wearing among Students in Malaysia.

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Abstract

Background: Outdoor mask wearing has been mandatory for all Malaysians since its implementation by the Malaysian government due to Covid-19 outbreak. Although wearing a face mask has been shown to reduce the risk of virus transmission, this practice has also been associated with a variety of facial skin problems.
Methods: This study aims to determine the prevalence of adverse skin reactions associated with the practise of wearing face masks. A cross-sectional study was conducted among undergraduate students at University of Cyberjaya from September 2021 to December 2021. Data were collected through a self-administered online questionnaire which assesses students' perceptions on (i) attitude towards face mask utilisation, (ii) proper practice of face mask use, (iii) adverse skin reactions, and (iv) factors influencing face mask use.
Results: Most respondents were female (76%) and aged between 18 to 22 years old (70%). Most participants wore face masks for less than 4h per day (61%) and 50% of the participants wore surgical face masks. 66.3% participants complained of adverse skin reactions. Acne was the most common (75%), followed by oily skin (62%) and facial itching (55%). The incidence of adverse skin reactions was found higher among females (69.8%), wearing face masks for longer durations (71.1%) and wearing surgical face masks (67.3%).
Conclusion: Majority of the participants demonstrated good practice face mask utilisation. This study provides an opportunity to raise public awareness about facial mask hygiene so that interventions can be implemented to reduce the occurrence of adverse skin reactions.

Keywords: *Adverse skin reactions, Face mask, Covid-19, Students' perceptions*

Introduction

COVID-19 is a highly contagious disease caused by the new strain of coronavirus (SARS-CoV-2) that is transmitted through respiratory droplets and indirect contact with contaminated objects or surfaces. The exponential increase in COVID-19 cases caused by the rapid spread of the virus has prompted the World Health Organization (WHO) to declare a Public Health Emergency of International Concern on January 30, 2020 [1].

To combat the epidemic, the Malaysian government enforced the use of personal protective equipment (PPE), specifically medical face masks, in crowded places on August 1st, 2020, and imposed a RM1000 fine on those who failed to comply, in addition to other recommendations such as social distancing, hand hygiene/sanitisation and vaccination.

For this study, it was of interest to investigate the prevalence of face mask use in public, as it has become the new norm. Although wearing a face mask has been shown to reduce the risk of virus transmission, this practice has also been associated with a variety of facial skin problems [2,3]. Pertaining to the evaluation of adverse skin reactions associated with face mask-wearing, available data seem to be limited, with current studies focusing primarily on the adverse skin reactions in relation to potential causal factors such as age, gender, and underlying facial conditions, with the type and duration of face masks used. In addition, most of these articles focused on healthcare professionals, with only a few focusing on college students [4-9]. Kumar et al. (2020) and Duong et al. (2021) also studied the adequacy of knowledge, practice, and attitude toward the use of face masks, but they did not link their findings with adverse skin reactions [10,11]. Therefore, the scope of this study is to concentrate on the relation of poor practice of face mask-wearing with the manifestation of facial skin disorders.

This study aims to determine the practice of face mask-wearing, estimate the prevalence of mask-related adverse skin reactions, and to investigate certain factors associated with adverse skin reactions among university students in University of Cyberjaya (UoC), a private university in Malaysia.

Materials and Methods

Study design

A cross-sectional study was conducted among the undergraduates of UoC between September and December 2021, for a period of four months.

Study Participants

Convenience sampling was used in this study. The survey link was distributed to the students through online platforms such as WhatsApp and emails. Respondents were Malaysian undergraduates, who were at least 18 years old, able to comprehend the questionnaire. Respondents who refused to participate in the study or did not complete the online survey will be categorised as non-respondents. The sample size was determined based on 4068 estimated population size. With a margin error of 0.07, this study required a minimum of 195 participants. After adding an additional of 10% of participants for any incomplete responses, a total of 215 participants were required for the study to produce statistically significant results.

Data collection

Data was collected online via Google form using a validated questionnaire from previous research. [12] The content validity for the duration of face mask wearing and adverse skin reactions was confirmed through the literature review by Chaiyabutr et al. (2020) [12]. Both attitudes toward face mask utilization and proper practice of face mask utilization are validated references from Tadesse et al. (2020), with Cronbach's alpha of 0.78 and 0.89, respectively [13]. A preliminary test confirmed the face validity.

The questionnaire consists of five (5) sections covering, (i) sociodemographic, (ii) duration and type of face mask, (iii) adverse skin reactions, (iv) the attitude toward face mask utilisation, and (v) proper practice of wearing a face mask. For the section on attitude toward face mask utilisation, respondents were asked to answer eight (8) questions on a 5-point Likert scale to describe their level of agreement. A total score of more or equal to the total average score (20) was considered a positive attitude, and vice versa. Each correct response in this section was scored 1, while incorrect responses was scored 0. The correct response >13 out of 17 questions (> 80%) was regarded as good practice, whereas anything below was considered poor practice. In this study, adverse skin reactions are defined as having one or more of the following skin reactions which include acne, facial itching, pain on the mask border, reddish rash, dry skin, and oily skin.

Statistical Analysis

Data analysis was performed using JASP .14.1.0 software. Results for descriptive analysis were presented in frequency (n) and percentage (%) for categorical variables. Multiple logistic regression was performed to determine the association between all the measured factors and adverse skin reactions. *P*-value <0.05 was considered statistically significant.

Ethical consideration

This study received ethical approval from the University of Cyberjaya (CRERC Reference number: UOC/CRERC/ER/311). All participants gave informed consent. The confidentiality and anonymity of participants were protected.

Results

A total of 196 students participated in this study, for a response rate of 91.2%. There were 47 (24%) male and 149 (76%) female participants. Majority of the participants were between 18 and 22 years old, 137 (70%). There were four types of face masks documented as most frequently used in the study population: surgical mask (n=98, 50%), surgical mask with cloth covering (n=64, 33%), N95 mask (n=27, 14%), and cloth face mask (n=7, 3%). Most of the participants, 120 (61%) wore face masks for less than 4 hours per day, while 22 (11%) wore them for more than 8 hours per day. The majority of participants, 195 (99%) showed a positive attitude towards face mask utilisation. There were 122 (62%) participants who believed that they have proper practice of face mask utilisation, while 74 (38%) participants stated the opposite (Table 1).

The prevalence of adverse skin reactions by demographic characteristics are presented in Table 2. Out of 196 participants, 130 (66.3%) reported of having adverse skin reactions associated with wearing face masks. Majority of the reported cases were from female participants, 104 (69.8%) in comparison to male, 26 (55.3%). Out of 120 participants who wore face masks for less than 4 hours per day, 76 (63.3%) claimed that they had adverse skin reactions. Meanwhile, 54 (71.1%) out of 76 participants who wore face masks for more than 4 hours per day reported of having adverse skin reactions. In relation to the type of masks, most of the participants reported of experiencing adverse skin reactions upon using the surgical face mask, 66 (67.3%) and surgical mask with cloth covering, 42 (65.6%). None of the tested variables, including socio-demographic characteristics, duration of mask use, mask type, attitude, and practice, were statistically related to adverse skin reaction.

Regarding the proper practice of face mask utilisation, the majority of responses demonstrated good practice (Table 3). Majority of the participants, 191 (97.5%) did not remove their face masks if there is a need to talk to the patient. More than half of the participants, 112 (57.1%) did not keep a used mask in a bag for later use. Nearly all participants wear face masks in public places and hospital premises, 195 (99.5%) and

194 (99%) respectively. More than half of the participants, 131 (66.8%) clean their hands before wearing a mask, and the vast majority, 193 (98.5%) identify the inside and outside of the mask prior to wearing it. More than half of the participants, 139 (70.9%) clean their hands after removing the mask, and 111 (56.6%) never re-use single-use masks.

Figure 1 depicts the common types of adverse skin reactions experienced by the participants. Acne was the most frequent adverse skin reaction reported in this study (75%), followed by oily skin (62%) and facial itching (55%). Pain on the mask's border, rashes and dry skin were all below 30%.

Discussion

This study reported the incidences of adverse skin reactions arising from the usage of face masks in daily life. The present study indicates that more than half of the participants (66.3%) experienced adverse skin reactions related to wearing face mask. Our findings are similar to the study by Techasatian et al. (2020) which found that the prevalence of face mask-related adverse skin reactions was 54.5% [5].

In this study, acne was the most reported adverse skin reaction associated with face masks. Similarly, Foo et al. (2006) and Techasatian et al. (2020) found that acne was the most frequent adverse skin reaction associated with face masks, at 59.6% and 39.9%, respectively [5,14]. Wearing a face mask can contribute to the occurrence of acne because it can irritate the skin and prevent oil production from the glands, thereby increasing the risk of acne breakouts. According to Yaqoob et al. (2021), the use of face masks is correlated with a high incidence of acne eruption. The local pressure on the skin from a close-fitting mask may lead to the obstruction of the pilosebaceous duct resulting in either the emergence or exacerbation of acne [6]. In addition, friction from the close-fitting mask may damage the follicular ostia to cause chronic irritation, apart from being worsened by heat and humidity [15].

There were 4 different types of face masks reported in this study and surgical mask was found to be the most frequent face mask worn by the students. Ironically, the incidence of adverse skin reactions was found higher among participants those who wore surgical face masks (67.3%). Comparable findings were reported by Techasatian et al. (2020) that stated surgical mask was documented as the most frequently used in the study population (63.15%) and associated with a higher risk of adverse skin reaction compared to cloth masks [5]. Different types of face masks have varying levels of effectiveness in preventing respiratory virus infections. The N95 mask is extremely effective at filtering airborne particles, preventing at least 95% of very small (i.e., 0.3 micron) particles from passing through and it is recommended for healthcare workers who have close contact with patients. Meanwhile, surgical masks are disposable, loose-fitting face masks that protect the users from the surrounding environment and for use in general medical settings by healthcare workers. On the other hand, cloth masks are non-medical face coverings made from various types of cloth. Even though cloth masks are not recommended for healthcare workers and in high-risk situations, they are at least as effective in preventing respiratory diseases compared to not wearing a mask, and this type of mask is appropriate for the general public in public places because they pose a lower risk of developing adverse skin reactions compared to surgical masks. Meanwhile, our study was not statistically significant as compared to study done by Techasatian et al. (2020) [5]. This might be due to the difference in sample size resulting in a difference in outcomes as evidenced by our study which only consists of 196 participants while Techasatian et al. (2020) consists of 833 participants.

The duration of time spent wearing a face mask was also associated with an increased risk of skin

reaction. In the present study, there was a high prevalence of adverse skin reactions among participants who wore face masks for more than 4 hours per day. This finding is consistent with the findings of Techasatian et al. (2020), who found that wearing a face mask for more than 4 hours per day can increase the risk, and that wearing a face mask for more than 8 hours per day was associated with an increased risk of adverse skin reaction [5]. Lan et al. (2020) suggested that exposure for more than six hours per day constituted a risk factor for the development of adverse skin reactions than those worn for a shorter period probably due to excessive humid internal environment and long exposure to allergic reaction to the mask material [16]. Therefore, taking frequent short mask-free breaks is essential for skin health. However,the duration of time developing adverse skin reaction for prolonged face mask wearing was not statistically significant with Lan et al. (2020). This might be due to the environmental conditions such as climate during the study was done. The study by Lan et al. (2020) was done from January 2020 to February 2020 in Hubei,China during the winter (Li et al., 2021) [17]. Meanwhile,our study was done from September 2021 till December 2021 in tropical weather with averaging 30°C (Malaysia - Weather in Malaysia ,2021) [18].

Overall, majority of the participants demonstrated a proper practice of face mask usage, including wearing masks in public places and while speaking to others, never reusing single-use masks, and washing their hands before wearing a mask. These outcomes probably reflected the participants level of educational as university students who have knowledge and awareness about the importance of face mask use in public places. However, there is still a small percentage of participants who do not have good practice on face mask utilisation. In the present study, 43.4% of the participants claimed to have re-used the disposable face masks more than once. Previous studies have reported similar habit where Tekalegn et al. (2020) found that among the 368 healthcare workers from Ethiopia, 87.8% of them used disposable face masks more than one time [19]. A cross-sectional descriptive study in Hong Kong found that 35.4% of the subjects reused face masks for an average of 2.5 days. This phenomenon of reusing face masks may have resulted from a lack of face mask supplies, as the COVID-19 crisis led to a high demand for face masks worldwide [20]. To our knowledge, there is lack of data regarding the association of general poor practice of face mask and adverse skin reactions, but our study found no significant association for this. Correlating each specific practice of face mask instead of the grading of practice might have more considerable results, as this previous study found mask reuse did not increase the risk of skins reactions, while reuse with cleaning alleviated the risk [13].

Regarding adverse skin reactions in relation to age and gender, our study reveals a higher prevalence of adverse skin reactions among female students (69.8%) and those aged 23 to 31 (71.2%) which correlates with the study done by Chaiyabutr et al. (2021) who discovered that females and those between the ages of 18 and 30 were more likely to develop skin reactions, with a prevalence of 65.1% and 77.3%, respectively.[13] However, our results regarding association between age and gender with adverse skin reactions were not statistically significant as compared to the study done by Chaiyabutr et al. (2021) [13]. This might be due to the difference in sample size resulting in a difference in outcomes (Hackshaw, 2008) as evidenced by our study which only consists of 196 participants while Chaiyabutr et al. (2021) consists of 1231 participants [21].

Besides, based on our literature review, diet, hormonal imbalance as well as pre-existing skin conditions would influence the outcome of our study. In a study conducted in Jeddah during the COVID-19 Pandemic, 59.9% of participants reported that their acne worsened or flared up after beginning to wear a mask or face shield [22]. The resistance to airflow and gradual increase in

facial heat cause a rapid increase in mask temperature. Consequently, there will be a 10% increase in sebum production, which will increase the likelihood of acne [23].

The limitations of this study include response bias and the narrow list of risk factors for adverse skin reactions. The former is due to the lack of control over how each participant would respond to the online questionnaires. A further prospective observational study could be conducted by including the other potential factors of adverse skin reactions to evaluate the effect of wearing masks and adverse skin reactions. Potential factors include a history of dermatological problems, sleep quality, stress level, external environment, diet and hormonal imbalance.

Conclusion

This study demonstrated a relatively high prevalence of adverse skin reactions associated with face mask use among students in UoC. Based on the findings of this study, it can be concluded that female gender, younger age group, wearing a face mask for an extended period of time, and wearing a particular type of face mask can increase the likelihood of developing an adverse skin reaction. In addition, the majority of students in this study utilised face masks properly on a daily basis and displayed positive attitudes toward face mask use. There could be many causative factors that induce adverse skin reaction and the usage of face mask in public places may continue to persist post-pandemic. Therefore, this study recommends avoiding prolonged face mask use and adopting the proper practice of face mask wearing to maintain the skin hygiene. This study results also suggest choosing a suitable type of face mask to lower the risk of developing adverse skin reaction, particularly for individuals with sensitive skin types who are more susceptible to increased temperature, extreme moisture and frequent friction induced by the masks. Comprehensive training on the proper use of face mask should be made available to the public because knowledge and awareness are significantly associated with the correct application of face mask usage.

Table 1. Baseline characteristics of study samples.

Variable	Total, n (%)
Gender	
Male	47 (24)
Female	149 (76)
Age	
18-22	137 (70)
> 23	59 (30)
Duration of face mask wearing	
< 4 hours	120 (61)
4-8 hours	54 (28)
> 8 hours	22 (11)
Type of face mask	
Surgical mask	98 (50)
Surgical mask with cloth covering	64 (33)
N95 mask	27 (14)
Cloth face mask	7 (3)
Attitude	
Positive	195 (99)
Negative	1 (1)
Proper Practice	
Good	122 (62)
Poor	74 (38)

Table 2. Adverse skin reactions by socio-demographic (N=196)

Sociodemo-graphic factors	Total, n (%)	Adverse skin reaction		OR (CI)	P-value
		Yes, n (%)	No, n (%)		
Gender					
Male	47 (24)	26 (55.3)	21 (44.7)	1.00	0.069
Female	149 (76)	104 (69.8)	45 (30.2)	1.87 (0.95-3.66)	
Age					
18-22	137 (70)	88 (64.2)	49 (35.8)	1.00	0.346
≥ 23	59 (30)	42 (71.2)	17(28.8)	1.38 (0.71-2.71)	
Duration of face mask wearing					
< 4 hours	120 (61)	76 (63.3)	44 (36.7)	1.00	0.266
≥ 4 hours	76 (39)	54 (71.1)	22 (28.9)	1.42 (0.77-2.64)	
Type of face mask					
Surgical mask	98 (50)	66 (67.3)	32 (32.7)	0.65 (0.14-3.06)	0.957
Surgical mask with cloth covering	64 (33)	42 (65.6)	22 (34.4)	0.70 (0.14-3.40)	
N95 mask	27 (14)	18 (66.7)	9 (33.3)	0.67 (0.12-3.64)	
Cloth face mask	7 (3)	4 (57.1)	3 (42.9)	1.00	
Attitude					
Positive	195 (99)	129 (66.2)	66 (33.8)	1.54(0.06-38.33)	1.000
Negative	1 (1)	1 (100)	0 (0)	1.00	
Practice					
Good	122 (62)	82 (67.2)	40 (32.8)	0.90 (0.49-1.66)	0.757
Poor	74 (38)	48 (64.9)	26 (35.1)	1.00	

Table 3. Proper practice carried out by participants

Proper Practice	Yes, n (%)	No, n (%)
Do you remove mask if there is a need to talk to the patient?	5 (2.5)	191 (97.5)
Do you keep a used mask in a bag for later use, if you are a healthy person?	84 (42.9)	112 (57.1)
Do you wear a mask in public places?	195 (99.5)	1 (0.5)
Do you wear a mask in hospital premises?	194 (99)	2 (1)
Do you clean your hands before wearing a mask?	131 (66.8)	65 (33.2)
Do you identify the inside and outside of the mask before wearing one?	193 (98.5)	3 (1.5)
Do you confirm the metal nose band on the top side?	195 (99.5)	1 (0.5)
Do you place the loop around the ear?	168 (85.7)	28 (14.3)
Do you pull the top and bottom of the mask to extend the folds?	191 (97.5)	5 (2.5)
Do you press the nose band upon wearing the mask?	195 (99.5)	1 (0.5)
After wearing the mask, do you prohibit yourself from touching the mask?	131 (66.8)	65 (33.2)
When wearing the mask, do you prohibit yourself from drinking or smoking?	124 (63.3)	72 (36.7)
Do you remove your mask from your face only by touching the bands?	140 (71.4)	56 (28.6)
Do you avoid pulling the mask up over your forehead or down over your chin?	137 (69.9)	59 (30.1)
Do you dispose your mask when it is soiled or wet?	192 (98)	4 (2)
Do you clean your hands after taking off the mask?	139 (70.9)	57 (29.1)
Do you never reuse single-use mask?	111 (56.6)	85 (43.4)

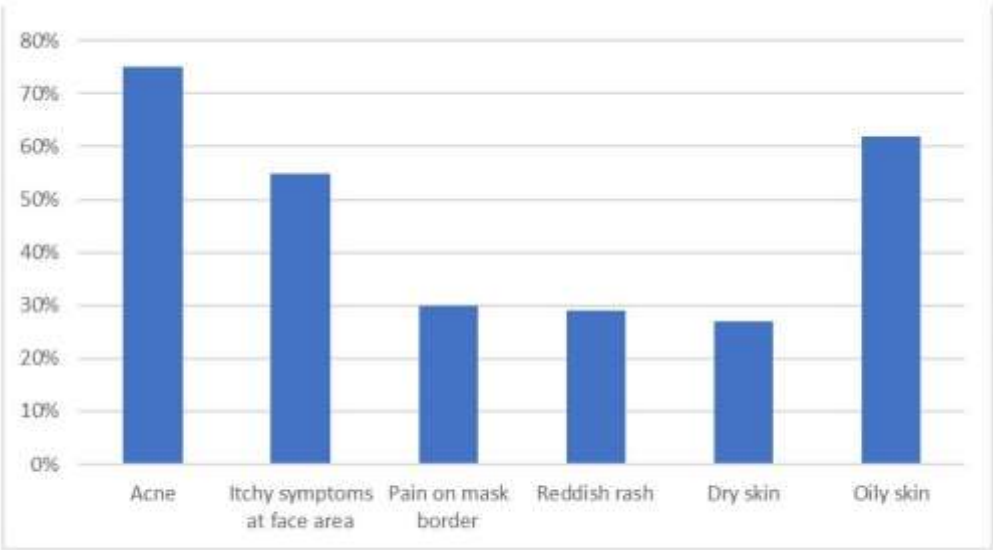

Figure 1. Adverse skin reactions experienced by participants (N=196)

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