

The impact of masks on the condition of facial skin in the time of the COVID-19 pandemic

Katarzyna Śliwakowska¹, Julia Radwańska¹, Joanna Czuwara²

¹Medical University of Warsaw, Żwirki i Wigury 61, 02-091 Warsaw, ²Department of Dermatology, Medical University of Warsaw, Koszykowa 82A, 02-008 Warsaw, Poland

Corresponding author: Katarzyna Śliwakowska, MD, E-mail: katarzyna.sliwakowska96@gmail.com

ABSTRACT

Background: The aim of the study was to determine the effects of wearing masks on skin and dermatological diseases in the face among the participants of the survey conducted. **Material and Methods:** The respondents completed a questionnaire containing 22 single or multiple choice questions. Participation in the survey was voluntary and anonymous. The survey data was used only in this study. **Results:** The condition of facial skin, as assessed by the respondents, worsened in 69% of those using surgical masks. Regardless of the frequency of mask changing, adverse effects occurred in 60% of the respondents. The most common mask side effects reported by respondents were acne (in 75.7%) and skin exfoliation. More than 47% of pandemic respondents showed interest in skin care. **Conclusion:** Surgical masks better protect against COVID-19 virus penetration into the upper respiratory tract compared to cotton masks, while they increase the risk of adverse reactions on facial skin. Therefore, there is an increase in public awareness of the need for proper skin care with the use of protective masks.

Key words: Covid-19; Mask; Restrictions; Facial skin; Skin lesions

INTRODUCTION

The new COVID-19 disease, induced by the SARS-CoV-2, causes an acute respiratory infection. Due to the rapid spread of the virus and an alarming increase in morbidity and deaths worldwide, WHO declared a pandemic on March 11, 2020 [1,2]. By June 24, 2022, according to data from Johns Hopkins University, there were 542,424,379 cases and 6,326,676 deaths from COVID-19 worldwide, of which 6,012,635 cases and 116,412 deaths were reported in Poland [3]. The restrictions were very diverse, and during the peak of new cases, very restrictive restrictions were introduced: closed shopping malls and public places, and the obligation to wear masks in public places. In schools and universities, full-time classes have been suspended and online teaching has been introduced [4]. The aim of these restrictions was to reduce the number of new cases and to flatten the infection rate curve, allowing the health system to continue to function properly [5]. COVID-19 has caused not only a humanitarian crisis,

but also a socio-economic crisis. The onset of the disease is similar to pneumonia, with fever, dry cough and weakness being the main symptoms. Infection occurs primarily through droplets - as a result of coughing or sneezing, mainly through direct contact with an infected person [6,7]. Sars-CoV-2 virus can be transferred from any surface to the mouth, nose and eyes. In order to protect against the infection, masks were introduced for daily use, a social distance of up to 2 meters was recommended, as well as increased hygiene of hands and face. As a result of the massive use of masks, the number of reported adverse reactions and skin irritation has increased, which from a dermatological point of view constitute the basis of the following study [8].

MATERIALS AND METHODS

Study Design and Participants

The study was conducted from February 6, 2021 to February 12, 2021. The respondents completed an

How to cite this article: Śliwakowska K, Radwańska J, Czuwara J. The impact of masks on the condition of facial skin in the time of the COVID-19 pandemic. Our Dermatol Online. 2022;13(e):e55.

Submission: 28.06.2022; **Acceptance:** 11.07.2022

DOI: 10.7241/ourd.2022e.55

anonymous questionnaire, which contained 22 single or multiple choice answers. 221 people participated in the study and exactly that number of people correctly completed the questionnaire. The exclusion criteria for the study were incomplete questionnaire answers. Participants represented all age groups, with the average age of 25 years. The questionnaire was available on the internet [9] and once completed, the data was sent to researchers to analyze the responses. The questionnaire was used to collect the data, the purpose of which was to identify adverse skin reactions caused by wearing masks during the COVID-19 pandemic.

Type of Questions

The questionnaire included such information as age, gender, place of residence, working conditions, skin type, general diseases and skin diseases. The questions also concerned possible risk factors for adverse effects on masked skin including types of face masks, the average duration of wearing masks and skin care methods.

Statistical Analysis of Data

The research data was analyzed using Microsoft Excel. Participants represented all age groups, with the average age of 25 years. The answers provided in the questionnaire were analyzed and expressed as percentages. Data between two independent samples was analyzed by T-test. The χ^2 (chi-square) test of independence was performed to assess statistically significant differences between expected and observed values contained in a contingency table. The significance level of data analysis is 0.05. When the p-value was lower than 0.05, the relationship between individual variables was considered as statistically significant.

ETHICS STATEMENT

This material is the authors' own original work, which has not been previously published elsewhere. The paper reflects the authors' own research and analysis in a truthful and complete manner. Each participant was informed about the purpose of the study and, by filling out an anonymous on-line questionnaire, gave informed consent to voluntary participation in the study. They were also informed about the possibility of opting out at any time. The research was conducted on-line due to the prevailing epidemiological conditions, and the form of the research did not require any interference or a separate consent from the Bioethics Committee. The study data was used only in this study and is not available anywhere.

RESULTS

Type of Mask and Facial Skin Condition

According to the study participants, the skin condition deteriorated in 69% of people wearing surgical masks and in 47% of those wearing cotton masks, whereas only 36% of face shield users reported skin issues. The condition of skin remained unchanged most often among people wearing face shields (57%), less often among those wearing cotton masks (46%) and the least often among participants wearing surgical masks (31%). The skin condition has improved in a very small number of participants. The result of the Chi-squared test performed on this data is 0.047, which proves there is a statistically significant difference in the influence of different types of masks on the condition of the skin (Table 1).

Time of Wearing Masks

Among respondents wearing a cotton mask for 1-2 hours, 52% reported skin deterioration. For those wearing a mask for 2-4 hours, the number was 50%, and in the case of participants wearing a mask for 4-8 hours, the number was 44%. It was noticed that a longer time of wearing a cotton mask does not adversely affect the deterioration of the skin condition. In the case of participants wearing only surgical masks, skin deterioration was reported by 60% of those wearing a mask for 1-2 hours, by 67% of those wearing a mask for 2-4 hours, and by 77% of respondents who wore a mask for 4-8 hours (Table 2). It was noted that the longer the mask was worn, the more frequently the deterioration of the skin occurred. However, the p-value for these variables is 0.11, which is not a statistically significant difference.

Table 1: Assessment of the skin condition and mask type (p = 0.047)

Facial skin condition	Type of mask		
	Surgical mask	Cotton mask	Face Shield
Deteriorated	69%	47%	36%
Unchanged	31%	46%	57%
Improved	0%	7%	7%

Table 2: Deterioration of the skin condition depending on the time of wearing a mask (p = 0.119)

Wearing time	Type of mask	
	Cotton mask	Surgical mask
From 1 to 2 hours	52%	60%
From 2 to 4 hours	50%	67%
From 4 to 8 hours	44%	77%

The Frequency of Changing Masks

According to the respondents, the frequency of replacement of the masks did not significantly affect the condition of the skin (p -value = 0.112). Regardless of the frequency of changing masks, the condition of the skin deteriorated in the majority of respondents (from 50% to 63%). A significant part of the respondents declared no changes in the assessment of their skin condition (from 25% to 42%). The skin condition improved in a small number of respondents, although 25% of respondents who changed their masks more than 3 times a day noticed an improvement of skin condition (see Table 3).

New Skin Lesions and Type of Skin

The collected results show the relationship between new skin changes appearing since the introduction of the mask obligation and the skin type of the respondents (Fig. 1).

Combination skin occurred in 40% of respondents. The most common new skin lesions among those participants included acne (48%) and skin exfoliation (35%). Less frequent were itch (13%) and erythema (10%) and the rarest was herpes (1%).

Normal skin occurred in 15% of respondents. Definitely the most common new skin lesion was skin exfoliation

(63%). Other skin lesions were rare: itch (3%), acne (9%), herpes (6%) and erythema (3%).

Dry skin occurred in 19% of respondents. The most common new skin lesions among those participants included skin exfoliation (42%) and acne (41%), similar to respondents with combination skin. Less frequent new lesions were itch (10%), herpes (7%) and erythema (17%).

Oily skin occurred in 17% of respondents. The most common new skin lesion was acne, which was reported by the majority of those participants (76%). A less frequent new lesion was skin exfoliation (22%). Other skin lesions were rare: itch (11%), herpes (8%) and erythema (8%).

Reddened skin occurred in 9% of respondents. There was no new skin lesion among those participants that occurred with a particularly increased frequency. Respondents with this skin type reported the following changes: skin exfoliation (40%), acne (29%), erythema (24%), itch (14%) and herpes (5%).

The results also need to be presented by comparing the frequency of specific skin lesions with relation to the type of skin of the respondents. Itch occurred with a similar frequency in all groups, most often with reddened skin (14%) and most rarely among participants with normal skin (3%). The presence of acne was highly variable. It was most common among respondents with oily skin (76%) and occurred most rarely among participants with normal skin (9%). In the remaining groups, it occurred with a similar frequency (from 29 to 48%). Skin exfoliation was very common in all groups, compared to the other skin lesions. It occurred in 63% of participants with normal skin and 22% of respondents with oily skin. Herpes was very rare in each group (from 1% to 8%). Erythema was significantly more common among respondents with reddened skin (24%) whereas among those with any other skin type (From 3% to 10%).

Table 3: Assessment of the skin condition and the frequency of changing masks ($p = 0.112$)

Facial skin condition	Frequency of changing mask			
	More than 3 times a day	From 2 to 3 times a day	Once a day	Once every 2 or 3 days
Deteriorated	50%	61%	63%	55%
Unchanged	25%	36%	34%	42%
Improved	25%	3%	3%	3%

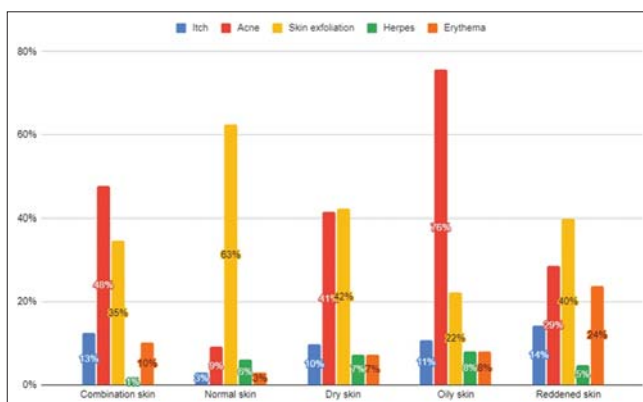


Figure 1: Assessment of new skin lesions and type of skin.

New Skin Lesions and Mask Type

Acne was reported as a new lesion, occurring most frequently regardless of the mask type, with skin exfoliation and itch occurring less frequently (Table 4). The type of mask used had no significant effect on the occurrence of specific skin lesions (P -value = 0.086). In respondents using a surgical mask, acne (38%), skin exfoliation (22%) and itch (7%) occurred. New skin lesions of each type have been reported among

participants using cotton and FFP3 masks, the most common of which was acne (56% and 48%), as well as among respondents wearing surgical masks.

Place of Residence

The frequency of herpes was compared with the place of residence of the respondents. In each group, the majority of respondents did not report the occurrence of herpes. There is also evidence that the more frequently recurring herpes occurs, the fewer people experience it (Table 5). The place of residence has no influence on the frequency of herpes outbreaks or its recurrences (p-value = 0.214).

The place of residence was compared with the assessment of the change in skin condition (Table 6). Regardless of the place of residence, the greatest number of respondents reported deterioration of skin condition (from 46% to 71%). Unaffected skin condition was reported by a smaller number of respondents (from 20 to 46%), while improvement of skin condition was reported by individual persons (from 0% to 6%). Data analysis showed that the place of residence had no significant effect on the skin condition of the respondents (p-value = 0.189).

The third comparative analysis considering the respondents' place of residence referred to the

occurrence of new skin lesions (Table 7). By far the most common skin lesions were acne and skin exfoliation. Itch, herpes and erythema were rare among the respondents. Comparing the data to the analysis of data from point 3.4 titled "New skin lesions and type of skin", it can be noted that the impact of new specific skin lesions depended primarily on the type of skin of the respondents and not their place of residence (p-value = 0.206).

Skin Care

Most female respondents improved hygiene and skin care (50.6%), slightly less reported the same hygiene level (46.6%) and only 2.8% participants admitted reduced skin care. Among men, the most frequently noted response was their consistency in hygiene and care of skin (50%), increased care was noted in 30%, while reduction in care was noted in 3%. In total, half of the respondents did not change their skin care habits (50%), less than half replied that they increased their skin care (47.27%) and a very small proportion of the respondents revealed they paid less attention to skin hygiene (Table 8). Statistical analysis proved that the gender of the respondents did not have a significant influence on the quality of skin care (p-value = 0.128). Nevertheless, female respondents demonstrated a more diligent approach to skin care.

DISCUSSION

Impact of Masks on Facial Skin Condition

Skin condition of the respondents was significantly different depending on the type of mask used. The reason for this was probably the difference in the construction of the masks and the way they were used. Both the surgical and cotton masks adhere tightly to the

Table 4: New skin lesions and mask type

New skin lesion	Type of mask		
	Cotton mask	Surgical mask	FFP3 mask
Itch	7%	15%	14%
Acne	38%	56%	48%
Skin exfoliation	22%	19%	26%
Herpes	0%	9%	12%
Erythema	0%	13%	21%

Table 5: The frequency of herpes and place of residence

Frequency of herpes	Place of residence				
	Country	City<50.000	City 50.000-100.000	City 100.000-500.000	City>500.000
Never	63%	71%	70%	46%	70%
Once a year	20%	10%	20%	23%	14%
From 2 to 3 times a year	14%	5%	10%	23%	13%
More than 4 times a year	3%	14%	0%	9%	3%

Table 6: Facial skin condition and place of residence

Facial skin condition	Place of residence				
	Country	City<50.000	City 50.000-100.000	City 100.000-500.000	City>500.000
Deteriorated	51%	57%	80%	74%	49%
Unchanged	46%	38%	20%	26%	45%
Improved	3%	5%	0%	23%	6%

Table 7: New skin lesions and place of residence

New skin lesion	Place of residence				
	Country	City<50.000	City 50.000-100.000	City 100.000-500.000	City>500.000
Itch	3%	10%	0%	23%	10%
Acne	49%	48%	60%	51%	38%
Skin exfoliation	14%	14%	40%	29%	19%
Herpes	3%	10%	10%	17%	1%
Erythema	3%	14%	0%	20%	9%

Table 8: Skin care during the pandemic

Skin care	Gender of respondents		
	Women	Men	Summary
More care	50,6%	34,1%	47,27%
Unchanged	46,6%	63,6%	50%
Less care	2,8%	2,3%	2,73%

face, thus disrupting the natural microflora around the mouth. The use of a face shield guarantees physiological air flow and ventilation, therefore face shields did not adversely affect the condition of the skin.

A surgical mask is made of a 3-layer polypropylene non-woven fabric, which is impermeable to water and limits the flow of warm, exhaled air. Its BFE bacterial filtration degree is > 98%, therefore it closely isolates the area of the mouth of the upper respiratory tract from the external environment [10]. BFE means the effectiveness of bacterial filtration and it is a measurement of the resistance of the respirator material to the penetration of bacteria.

When a surgical mask is worn over the face, humidity and temperature underneath increase as a result of breathing. This creates optimal conditions for the development of microorganisms, which results in deterioration of the skin condition due to wearing the mask.

Cotton masks are usually single-layer, but their mechanism is similar to the operation of surgical masks. Due to the type of material and the single-layer nature, they offer better humidity transfer, reducing the negative impact on the condition of the skin. The study of Darnall et al. reported an increase in the incidence of new skin lesions among healthcare workers [11]. Compared to the data from our study, the results are consistent and the frequency of these changes is at a similar level. A face shield is made of plastic, without porosity. It creates unfavorable conditions for the development of microorganisms. On the other hand, it does not provide any mechanical barrier to virus transmission. Another type of mask is the n95 with a metal strip on a nasal clip. During their use, friction occurs at the points of contact with the mask:

nose, behind the ears and on the edges of the mask in contact with the face. The constant friction leads to post-inflammatory hyperpigmentation, and the pressure of the metal clip can lead to ulceration of the bridge of the nose [12]

The results are influenced by the structure of the masks and the number of layers in both surgical and cotton masks. The poor condition of the skin, resulting from the increase in humidity and temperature under the masks, develops over time. A surgical mask made of three layers of polypropylene non-woven material reduces the flow of air and moisture more significantly compared to a single-layer cotton mask, which creates conditions for the development of microorganisms that worsen the condition of the skin. Such conditions occur when people wear a dirty, moist mask for a significant part of the day. Microbes are among the fastest-dividing organisms. There is a variation between different species. *Staphylococcus aureus* propagates in about 20 minutes [13], whereas *clostridium* spp. even in 10 minutes [14]. Among the microorganisms inhabiting human skin, there are also anthropophilic fungi that develop within a few days. A study by Hongal et al. conducted among healthcare workers shows that over 90% of respondents noticed the effect of wearing masks on their skin and occur more often than changes caused by gloves and gown [15].

Surgical masks are a constant risk factor for facial skin deterioration. The time of wearing the masks, but not the frequency of their change, affects the occurrence of undesirable changes (Table 3) [16]. Wearing a mask for a long time creates an ideal environment for the development of bacteria on the skin, especially in the case of moist porous materials. However, respondents wearing a mask for a maximum of 2 hours a day and respondents replacing it less than once a day noticed deterioration in the condition of their facial skin. Although masks are worn for a small part of the day (usually up to two hours), the fact that they are not replaced every day and put back on the next day causes a gradual reduction in skin quality. If moisture has

already penetrated the fibers of the mask, it is easier for contaminants to adhere and accumulate, which creates environmental conditions favorable for the development of microorganisms. A disposable mask should be replaced after each use. After removal, a reusable mask should be thoroughly washed in water at 65 ° C and disinfected with an agent containing 70% alcohol due to the risk of bacterial growth between its fibers.

New Skin Lesions

Itch was noticed by 3% to 13% of respondents depending on the type of skin. It was most often reported by participants with reddened skin (14%) and least often by those with normal skin (3%). Such individuals have preserved homeostasis, thus limiting microbial growth [17]. Pruritus is one of the common effects of prolonged wearing of masks. It can be felt even after removing them. Acne was reported by 76% of those complaining about oily skin, while it was least frequently observed among respondents with properly moisturized skin [18]. People in the first group experience clogging of the sebaceous glands due to increased sebaceous gland activity and colonization of the hair and sebaceous apparatus by *Cutibacterium* (*Propionibacterium*) acne bacteria. Another study by Nishi et al. also shows that acne is the most common new skin lesion, also among the respondents who mostly wear n95 masks [19]. It is the skin environment that is conducive to the development of acne. A study of Techasatian et al was carried out to evaluate the effect of masks on the condition of the skin. Its results showed that acne pruritus and rash were the most common new skin lesions. The results of this study were consistent with the aforementioned ones as respondents equally often reported these symptoms [20]. A study of Veena et al. shows that respondents have reported allergic reactions caused by face masks with a similar frequency as itching. It was also noticed that 30% of participants developed new skin lesions, which is consistent with the results of our research [21].

Excessive peeling of the epidermis was reported by 62.5% as a new skin lesion in respondents with properly moisturized skin. On the other hand, this symptom was least frequent among respondents with oily skin. As a result of wearing masks, the homeostasis of the stratum corneum is disturbed, and the skin becomes irritated and dry. The cause is a disruption of the hydrolipid barrier of the epidermis and an increase in the population of microorganisms on the skin, hence, exfoliation of the epidermis is one of the mechanisms of the body's response to irritants.

Daily mask use causes irritation of the facial skin. Humidity and sweat exacerbate these complaints, which can result in itch. Wearing face masks is linked to the development of itch. What is more, scratching can lead to incorrect use of face masks, resulting in reduced protection [17]. Inflammatory mediators that are stimuli for nerve receptors located in the skin causing itch are histamine, prostaglandins, serotonin and neuropeptides. The prolonged activity of irritants, microorganisms, abrasions as well as wounds also lead to abnormal peeling of the epidermis. Based on this and the previous conclusions, FFP3 and surgical masks provide the best barrier between the external environment and the isolated space.

Place of Residence

Nowadays, significant air pollution is observed in large cities around the world. Internal combustion cars, industry and farms emit large amounts of CO₂ and harmful chemicals into the atmosphere [22]. In large cities, there is a high population density and a small amount of "green spaces", which causes a drastic deterioration of air quality. In theory, this should lead to the development of new skin lesions and adversely affect the overall condition of the skin. Table 5 compares the frequency of herpes outbreaks depending on the place of residence. The frequency of occurrence is at a similar level, regardless of the place of residence. Therefore, worse air quality and a greater population density do not adversely affect the occurrence of this disease. Although the virus is transmitted by airborne droplets between people, the risk does not increase in highly populated centers. On the other hand, in larger cities, the frequency of reporting herpes may be higher due to the greater availability of doctors compared to smaller towns and villages.

The results of skin condition are also similar, regardless of place of residence. Deteriorated skin condition and consistency are the most frequently reported responses. Only individual respondents reported an improvement of their skin condition, which is mainly influenced by the type of masks worn, the time of wearing them and the type of skin of the respondents. The results in Fig. 1 strongly indicate the relationship between the type of new skin lesions and the skin type of individual respondents, whereas air quality had no effect on the condition of the skin.

Specific skin lesions have different pathogenesis. The results of the study show that the place of residence,

the type of masks and the time of wearing them were not strong risk factors for their occurrence. The most frequently reported new skin lesions were acne and exfoliation. Study of Kaur et al shows that acne is the most common new skin lesion since the obligation of wearing masks in urban population in India [23]. Itch, herpes and erythema occurred less frequently with a similar frequency in each group of respondents. The results show that the skin type of the respondents had the strongest influence on the individual skin lesions.

Impact of the Pandemic on Skin Care

According to the majority of those surveyed, the timing of the pandemic affected skin care regimens. Regardless of the type of mask worn on a daily basis, 47% of the respondents declared more attention to the condition of the facial skin and 50% of respondents reported consistency. These results are probably due to the daily legal obligation to wear masks, as opposed to the pre-pandemic state. Those respondents who had to wear a mask during the day were concerned about the condition of their skin, paying more attention to their hygiene. Skin cleansers containing syndets or amphoteric surfactants used by respondents improved dry skin compared with standard soap and water. Lipophilic leave-on products containing humectants reduced skin dryness and reduced pruritus. Products with a pH of 4 improved the skin barrier [24]. Masks rub and irritate the mouth and nose area, thus contributing to the appearance of skin lesions or exacerbation of pre-existing skin symptoms. Mental stress and a difficult-to-predict future due to the pandemic also negatively affected skin condition and created unfavorable circumstances for skin condition.

CONCLUSION

Since the introduction of compulsory mask wearing, deterioration of the skin has been noted due to increased humidity and temperature under the mask. When worn for most of the day, masks lead to the multiplication of microorganisms. A surgical mask restricts air and fluid flow to a greater extent than a single-layer cotton mask, while offering a better protection against COVID-19 virus entry into the upper respiratory tract, as compared to a cotton mask. However, using a surgical mask increases the risk of facial skin side effects. Whereas acne is the most common symptom of wearing masks, regardless of skin type, skin peeling and itching are less common. There

is a definite increase in public awareness of the need for skin care and the use of protective masks.

Statement of Human and Animal Rights

All the procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the 2008 revision of the Declaration of Helsinki of 1975.

Statement of Informed Consent

Informed consent for participation in this study was obtained from all patients.

REFERENCES

1. Rothan HA, Byrareddy SN. The epidemiology and pathogenesis of coronavirus disease (COVID-19) outbreak. *J Autoimmun.* 2020;109:102433.
2. Hui DS, I Azhar E, Madani TA, et al. The continuing 2019-nCoV epidemic threat of novel coronaviruses to global health - The latest 2019 novel coronavirus outbreak in Wuhan, China. *Int J Infect Dis.* 2020;91:264-266.
3. COVID-19 Map - Johns Hopkins Coronavirus Resource Center. Data from 24.06.2022 Available online: [CrossRef]
4. Summary Lockdown in Poland. Związek Pracodawców I Pracodawców. Data from 24.06.2022. Available online: [CrossRef]
5. Valentowitsch J. Flattening the COVID-19 Curve: The Impact of Contact Restrictions on the Infection Curve in Germany. Die Abflachung der COVID-19 Kurve: Der Einfluss von Kontaktbeschränkungen auf die Infektionskurve in Deutschland. *Gesundheitswesen.* 2020;82:646-8.
6. Mousavizadeh L, Ghasemi S. Genotype and phenotype of COVID-19: Their roles in pathogenesis. *J Microbiol Immunol Infect.* 2021;54:159-63.
7. Ryme D, Douhi Z, Houssaini GS, Elloudi S, Baybay H, Mernissi FZ. A facial ulcer secondary to a non-invasive ventilation mask in COVID-19 pneumonia. *Our Dermatol Online.* 2022;13:221-2.
8. Zara A, Fleming P, Lee K, Lynde C. The COVID-19 pandemic and its skin effects. *Can Fam Physician.* 2021;67:582-7.
9. Questionnaire in the study. Available online: [CrossRef]
10. Chan JF, Yuan S, Zhang AJ, Poon VK, Chan CC, Lee AC, et al. Surgical Mask Partition Reduces the Risk of Noncontact Transmission in a Golden Syrian Hamster Model for Coronavirus Disease 2019 (COVID-19). *Clin Infect Dis.* 2020;71:2139-49.
11. Darnall AR, Sall D, Bay C. Types and Prevalence of Adverse Skin Reactions Associated With Prolonged N95 and Simple Mask Usage during the COVID-19 Pandemic. *J Eur Acad Dermatol Venereol.* 2022 Jun 24. Epub ahead of print. PMID: 35748134.
12. Soundarya s, Sundaramoorthy S. Unmasking the mask: COVID-19 manifestations of PPE kits. *Our Dermatol Online.* 2020;11:e186
13. Smith TJ, Hill KK, Raphael BH. Historical and current perspectives on Clostridium botulinum diversity. *Res Microbiol.* 2015;166:290-302.
14. Mancy A. Chronic dermatophytosis: A clinical, epidemiological, mycological study. *Our Dermatol Online.* 2022;13:36-40.
15. Hongal AA, Sijimol MV, Radhika SR, Revathi TN, Shilpa K, Eshwari L, Somashekar G. Untoward effects on the skin by the use of personal protection equipment. *Our Dermatol Online.* 2021;12:238-43.
16. Biryukov J, Boydston JA, Dunning RA, Yeager JJ, Wood S, Reese AL, Ferris A, et al. Increasing Temperature and Relative Humidity

- Accelerates Inactivation of SARS-CoV-2 on Surfaces. *mSphere*. 2020;5:e00441-20.
17. Szepietowski JC, Matusiak L, Szepietowska M, Krajewski PK, Bialynicki-Birula R. Face mask-induced itch: a self-questionnaire study of 2,315 responders during the COVID-19 pandemic. *Acta Derm Venereol*. 2020;100:adv00152.
 18. Han C, Shi J, Chen Y, Zhang Z. Increased flare of acne caused by long-time mask wearing during COVID-19 pandemic among general population. *Dermatol Ther*. 2020;33:e13704.
 19. Nishi N, Sonappa UK, Rajashekar TS, Hanumanthayya K, Kuppuswamy SK. A pilot study assessing the various dermatoses associated with the use of a face mask during the COVID-19 pandemic. *Our Dermatol Online*. 2021;12:349-53.
 20. Techasatian L, Lebsing S, Uppala R, Thaowandee W, Chaiyarit J, Supakunpinyo C, et al. The effects of the face mask on the skin underneath: a prospective survey during the COVID-19 pandemic. *J Prim Care Community Health*. 2020;11:2150132720966167.
 21. Veena G, Parvathi CN, Umadevi HR, Vinay HR, Vivekananda I. Face mask induced dermatological problems in healthcare providers during COVID-19 pandemic: A questionnaire based study. *Our Dermatol Online*. 2022;13:e16.
 22. Wong TY. Smog induces oxidative stress and microbiota disruption. *J Food Drug Anal*. 2017;25:235-44.
 23. Kaur T, Kaur S. A multi.center, cross.sectional study on the prevalence of facial dermatoses induced by mask use in the general public during the COVID-19 pandemic. *Our Dermatol Online*. 2022;13:1-5.
 24. Lichterfeld-Kottner A, El Genedy M, Lahmann N, Blume-Peytavi U, Büscher A, Kottner J. Maintaining skin integrity in the aged: A systematic review. *Int J Nurs Stud*. 2020;103:103509.

Copyright by Katarzyna Śliwakowska, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Source of Support: Nil, **Conflict of Interest:** None declared.