

Face Mask-induced Itch: A Self-questionnaire Study of 2,315 Responders During the COVID-19 Pandemic

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Little is known about itch related to the use of face masks. This internet survey study investigated the prevalence, intensity and clinical characteristics of itch related to the use of face masks by the general public during the COVID-19 pandemic. A total of 2,315 replies were received, of which 2,307 were included in the final analysis. Of the respondents, 1,393 (60.4%) reported using face masks during the previous week, and, of these, 273 (19.6%) participants reported having itch. Subjects who reported sensitive skin and atopic predisposition, and those with facial dermatoses (acne, atopic dermatitis or seborrhoeic dermatitis) were at significantly higher risk of itch development. The highest rating of itch for the whole group on the Itch Numerical Rating Scale was 4.07 ± 2.06 (itch of moderate intensity). Responders who wore masks for longer periods more frequently reported itch. Almost 30% of itchy subjects reported scratching their face without removing the mask, or after removing the mask and then scratching. Wearing face masks is linked to development of itch, and scratching can lead to incorrect use of face masks, resulting in reduced protection.

Key words: itch; COVID-19; face mask.

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In 1897, Jan Antoni Mikulicz-Radecki, a Polish surgeon who practiced in Cracow, Krolewicz and Wrocław, was the first to introduce cotton face masks for use during surgery (1). Contemporary surgical masks are designed for healthcare workers, mainly surgeons, and are used to prevent the exhalation of pathogens into the surgical field (2, 3). Although there is some controversy, face masks are believed to provide protection from human-to-human respiratory viral transmission (4, 5). It has been suggested that they may effectively control influenza (6). The use of face masks by the general public, especially in Asian countries, became ubiquitous in 2003 during the SARS pandemic, and then in 2009 during the spread of H1N1 influenza (7). Recently, the World Health Organization (WHO) announced the pandemic of coronavirus (SARS-CoV-2) responsible for coronavirus disease 2019 (COVID-19) (8). The use of face masks increased and wearing face masks became common, not only in Asia,

SIGNIFICANCE

The aim of this study was to evaluate the prevalence, intensity and clinical characteristics of face mask-induced itch during the COVID-19 pandemic in the general public wearing face coverings. A Google® Forms Internet survey was filled out by 2,315 Polish students. Of the people who wore face masks (three layers surgical, cloth and respirators), almost 20% reported itch. Sensitive skin, atopic predisposition and facial dermatoses significantly predisposed users to development of itch. The vast majority of subjects reported itch of moderate intensity, and almost 30% of itchy subjects reported scratching their face without removing the mask or taking off the mask and then scratching, which would markedly affect the effectiveness of face masks.

but also in Europe. Some countries introduced obligatory covering of the mouth and nose for the general public (9, 10). In general, during the COVID-19 pandemic people have been using face masks more commonly and for longer periods.

It is well documented that personal protective equipment (PPE), which is mostly used by healthcare workers, can harm the skin (11–13). However, there is little research into itch related to the use of face masks (13, 14). Itch, described as a sensation leading to scratching, is an important common symptom in both dermatological and systemic disorders (15). In addition, elderly people, especially those with dry skin, frequently experience itch (16). Itch negatively influences psychosocial status (17).

The aim of the current study was therefore to assess the prevalence and intensity of itch in the general public, related to wearing face masks during the COVID-19 era. The study also reports the clinical characteristics of face mask-induced itch.

MATERIALS AND METHODS

A questionnaire survey was constructed, based on interviews with 10 students, who expressed their opinion on wearing face masks (MS, JCS). All the domains determined to be important were captured and used in developing the questionnaire. The questionnaire was assessed by 2 independent experts, who provided comments on the correct wording and understanding of each question (LM, RBB). Particular attention was given to itch-related questions. A numeric rating scale (NRS) was used to assess the worst intensity of itch (WI-NRS) during the previous 7 days (18). The final version of the questionnaire comprised 21 questions (16 single-choice and

5 multiple-choice questions), addressing the following issues: demographic data, attitudes to face mask use, type of masks used, mean daily duration of use, presence of itch due to face mask use, descriptive characteristics of itch sensation, consequences of face mask-induced itch (scratching), modalities applied to relieve itch, etc. Moreover, self-assessment of sensitive skin and atopic predisposition (personal and/or family history of disorders such as atopic asthma, atopic dermatitis, pollinosis) were considered. The survey was created using Google® Forms and posted with a brief invitation letter on numerous Facebook® groups mainly for students and young people in Poland, inviting people to complete the survey. Young people were selected as a target group as they represent an active, mostly healthy, population with no age-disturbed skin barrier. Data were collected over a period of 48 h (between 12 April, 10.00h and 14 April 2020, 10.00h) just before to the date (16 April 2020) when the government of Poland made wearing a mask covering the mouth and nose mandatory for the public when outdoors in public space.

Statistical analysis

Completed questionnaires were downloaded for statistical analysis. NRS cut-off points for grouping the respondents with different itch intensity were as follows: 1 to <3 points represent mild itch, 3–7 points moderate itch, ≥ 7 to 9 points severe itch, and ≥ 9 points very severe itch (18). The χ^2 test or Mann–Whitney *U* test were applied to determine the statistical differences between groups, where appropriate. Logistic regression modelling for the dependent variable (itch) was performed, establishing the crucial impacting factors (concomitant medical conditions or mask types as independent variables) and their odds ratios (OR). *p*-values <0.05 were considered significant. Statistica 13.1 software (Statsoft, Tulsa, OK, USA) was used for statistical analysis.

RESULTS

A total of 2,315 Polish students (1861 (80.7%) females and 446 (19.3%) males) completed the questionnaire and submitted their answers, out of which 2,307 were included in the final analysis (8 questionnaires were excluded due to incomplete data). The mean age of the group was 20.2 ± 1.7 years (age range: 18–27 years).

A total of 1,393 respondents out of 2,307 (60.4%) reported that they had used face masks during the previous week. Of these, 273 participants (19.6%) experienced facial itch related to face mask wearing. There was no significant difference ($p=0.3$) between females (20.1%) and males (17.3%). Logistic regression analysis revealed that those who self-reported sensitive skin and atopic

predisposition were at significantly higher risk of itch development (OR 3.40, $p<0.0001$ and OR 2.25, $p<0.001$, respectively) (Table I). Similarly, having atopic dermatitis (OR 1.92, $p=0.0003$), acne (OR 1.29, $p=0.0002$) or seborrhoeic dermatitis (OR 1.30, $p=0.0009$) predisposed subjects to itch. Systemic disorders (diabetes, thyroid disorders) did not influence the risk of itch; however, subjects who reported good health in general constituted a group with significantly lower risk of development of itch (OR 0.93, $p<0.0001$) (Table I).

The worst intensity of itch (WI-NRS) was assessed as 4.07 ± 2.06 points (range 0–10 points), with a median value of 4 points. This indicated itch of moderate severity. In the majority of respondents (64.5%) itch was of moderate intensity, 23.4% reported mild itch, and 8.8% reported severe itch. Very severe itch was reported by only 3.3% of participants (Fig. 1). Respondents frequently described the itch as tingling (37.4%), burning (26.3%), pinching (18.3%) or stinging (9.1%). Of the participants, 9.9% reported having itch all the time while using face masks, more than half (55.6%) experienced short episodes of itch, and 13.2% reported long episodes of itch. Even after removing the face mask 7.7% reported the presence of itch, and 13.6% noticed itch mostly when they removed the mask.

Respondents presented different attitudes when they experienced itch during face mask wearing. Of the subjects, 18.7% reported scratching their face without removing the mask, 9.9% took their masks off and then scratched the skin, and 6.2% took the mask off and did not use it for some time.

There was no significant difference in frequency of use of surgical masks, cloth masks and respirators between respondents with and without itch. However, a significant difference was found in use of half-face and full-face respirators ($p=0.01$ and $p=0.02$, respectively)

Table I. Medical conditions affecting itch development (as an effect) during use of face masks

Variable	Coeff.	SE	<i>p</i> -value	OR (95% CI)
Sensitive skin	1.2246	0.1634	0.0000	3.4029 (2.4706, 4.6870)
Atopic predisposition	0.8125	0.1368	0.0000	2.2536 (1.7234, 2.9469)
Atopic dermatitis	0.6548	0.1815	0.0003	1.9248 (1.3485, 2.7473)
Acne	0.2583	0.0701	0.0002	1.2947 (1.1285, 1.4854)
Seborrhoeic dermatitis	0.2599	0.0782	0.0009	1.2969 (1.1125, 1.5117)
Diabetes mellitus	0.0877	0.0967	0.3644	1.0917 (0.9032, 1.3195)
Thyroiditis	0.0216	0.0325	0.5048	1.0219 (0.9589, 1.0890)
Healthy subjects	-0.0754	0.0172	0.0000	0.9274 (0.8967, 0.9592)

Coeff.: coefficient; SE: standard error; OR: odds ratio; CI: confidence interval. Significant values are shown in bold.

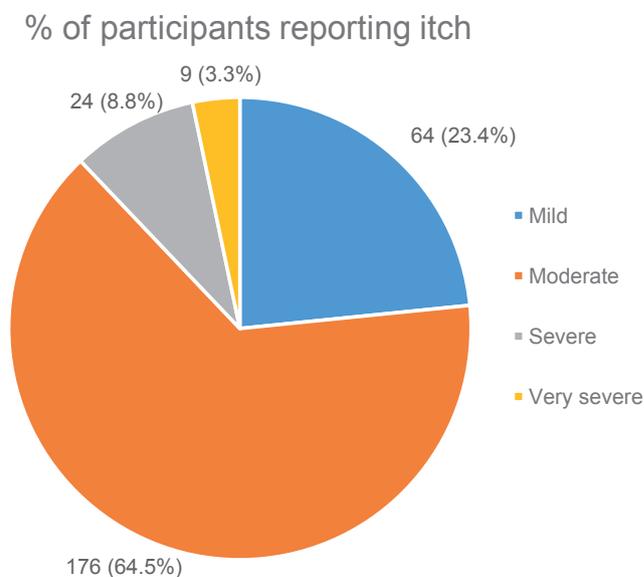


Fig. 1. Intensity of face-mask-induced itch (n = 273).

Table II. Type, duration of wearing, and decontamination of face masks in relation to development of itch

	Total	Itch (<i>n</i> = 273)	No itch (<i>n</i> = 1,120)	<i>p</i> -value
Number of face masks types used* (% of participants in particular sub-group)				
Three layers surgical mask	755 (54.2)	161 (59.0)	594 (53.0)	0.08
Cloth masks	891 (64.0)	179 (65.6)	712 (63.6)	0.54
Respirators (N95 + FFP)	257 (18.4)	60 (22.0)	197 (17.6)	0.09
Half-face elastomeric respirator	16 (1.1)	7 (3.0)	9 (0.8)	0.01
Full-face respirator	8 (0.4)	5 (1.8)	3 (0.3)	0.02
Duration of face masks used per day; number of participants (%)				
Up to 1 h	708 (50.8)	110 (40.3)	598 (53.4)	<0.001
Up to 2 h	1,171 (84.1)	201 (73.6)	970 (86.6)	<0.0001
Up to 3 h	1,290 (92.6)	232 (85.0)	1,058 (94.5)	<0.0001
More than 5 h	56 (4.0)	21 (7.7)	35 (3.1)	<0.001
Number of participants decontaminating their masks (%)	1,026 (73.6)	210 (76.9)	816 (72.9)	0.21

*Some of participants were using several types of face masks.
FFP: filtering face piece. Significant values are shown in bold.

(Table II). Regarding itch reported as a bothersome symptom, logistic regression analysis modelling wearing surgical masks among the other types of masks showed significantly lower risk of development of itch (OR 0.04, $p < 0.0001$, 95% CI: 0.0140, 0.1044). In contrast, use of cloth masks was related to higher risk of occurrence of bothersome itch (OR 2.99, $p < 0.0001$, 95% CI: 2.2845, 3.9140). The correlations above were not documented for other types of face masks (detailed data not shown).

With regards to duration of face mask wearing, itch was more common in the group of respondents using face masks for longer periods during the day ($p < 0.001$ for cut-off point of 5 h). Decontamination of face masks was not related to the occurrence of itch sensation (Table II). Only 30% of respondents reported that they tried to ease their itch. Mean itch intensity (WI-NRS) was significantly higher ($p = 0.048$) in this group in comparison with subjects who did not attempt to alleviate their itch (4.5 ± 2.2 and 3.9 ± 1.9 points, respectively). Applying emollients (53.2%) appeared to be the most common modality used, followed by rinsing with water (23.7%), use of oral antihistamines (15.9%), topical agents recommended by pharmacists/doctors (e.g. containing mild corticosteroids) (6.5%) and cooling using an ice pack (0.7%).

DISCUSSION

Face masks classed as PPE are mainly used by healthcare workers (11–13); the limited research into reactions to face masks published to date are therefore based mainly on this group of professionals (14). To the best of our knowledge the current study is the first to assess itch in the general population induced by wearing face masks, and to evaluate the clinical characteristics of this type of itch.

In the current study approximately 20% of young people wearing face masks reported itch. Foo et al. (11), analysing healthcare workers during the SARS pandemic in 2003 in Singapore, reported that 51.4% experienced itch induced by face masks. Moreover, a recent study from China documented itch due to face masks in 14.9%

of healthcare workers, a burning sensation in 3.7%, and pain/pricking in 3.2% of subjects (14). These are much higher percentages than observed in the current survey; this could be due to the types of face mask used and variations in duration of mask wearing. Healthcare workers predominantly used professional devices, such as N95 masks, and half-face and full-face respirators. In contrast, young people predominantly wore cloth masks. In addition, in the current study there was a significant difference in the frequency of use of half-face and full-face respirators between respondents reporting itch and those who were free of this symptom. During the COVID-19 pandemic PPE is usually used for long periods of time by healthcare workers. Face masks in the general population are usually worn for a much shorter time, generally only when people are in public spaces. Since recreational activities are reduced during the viral pandemic, the period of time the public are using masks is usually limited to the duration of essential activities. In addition, it was observed that the frequency of itch increased with the duration of face mask wearing, being significantly more common in people using face masks for 5 h or longer. In an experimental study by Roberge et al. (1), of a group of 20 healthy people wearing surgical masks during continuous walking on a treadmill at a low–moderate work rate (5.6 km/h) for 1 h, facial itch occurred in 7% of participants, and an additional 11% experienced skin irritation. They drew the conclusion that surgical masks are generally well tolerated. The current data is in agreement with those results. Considering itch reported only as a bothersome symptom, three layers surgical mask appeared to be the most convenient and best tolerated type.

The current study documented that sensitive skin and atopic predisposition were significantly related to increased risk of itch development. It is well-known that itch is a common phenomenon in sensitive skin syndrome (19), and that the majority of atopic disorders, such as atopic dermatitis or pollinosis, are associated with itch (20). Moreover, the risk of face mask-induced itch was linked with the presence of facial dermatoses, including atopic dermatitis, seborrhoeic dermatitis, and acne. In all

of these diseases itch may occur, atopic dermatitis being a common symptom (20–22). Zuo et al. (14) showed that pre-existing acne, rosacea and seborrhoeic dermatitis were exacerbated by using face masks. This is in accordance with the opinion expressed by a group of Chinese experts (23). The population in the current study was relatively young, and hence rosacea was not reported.

The current study is the first to assess the intensity of itch related to the use of face masks. Itch was found to be of moderate severity (WI-NRS 4.07 ± 2.06 points) and more than half of respondents who developed itch experienced moderate itch intensity. This is a slightly lower intensity than reported by Schut et al. (24), who analysed 3,530 patients with various types of itchy dermatoses and revealed itch intensity at a mean of 5.5 ± 2.5 points visual analog scale. Itch is a cutaneous sensation inducing desire to scratch (25). It is not surprising that the majority of people experiencing itch scratch the itchy areas of skin. Almost 20% of subjects in the current study who had itch scratched their face without removing the mask, and a further 10% removed the mask and scratched the affected skin. The action of touching the surface of the mask or taking it off can reduce the protection offered and may even promote the spread of viral infection (3).

Interestingly, only 30% of respondents with itch reported doing something to relieve itch. This may indicate that the itch was not very severe and/or bothersome to the young people. This may be supported by our data that the group of participants who tried to alleviate itch presented with significantly higher itch intensity. Among all modalities, emollients appeared to be the most commonly used. It is well known that disturbed skin barrier, which may also be caused by wearing face masks (14), might be associated with itch development (26, 27). Emollients are therefore recommended in the European Guideline for Chronic Pruritus as one of the basic options to help alleviate itch (28). Rinsing with water, reported by approximately one-quarter of those who tried to alleviate their itch, is also understandable, as lowering the temperature of the skin with cold water (similarly to the effect of using an ice pack) is helpful (28).

Limitations

This study has some limitations. Firstly, the survey design did not allow precise diagnosis of facial dermatoses, sensitive skin and atopic predisposition. These assessments were self-reported. Secondly, several types of material might be used to manufacture face masks, especially respirators and cloth masks. Therefore, the current study could only link itch to the type of face mask, not the material of construction.

Conclusion

The COVID-19 pandemic has resulted in the use of new practices, such as use of face masks in public spaces.

This study showed that wearing face masks results in the development of itch in many subjects. Itch can induce scratching and thus lead to inappropriate use of face masks, which could compromise their effectiveness and reduce the protection they offer.

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