RESEARCH

# Allergenic Effect of Facemasks Used Due To Covid-19 Pandemic

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**Abstract:** We aim to discuss the prevalence of adverse skin reactions to facemask among the community admitted to our hospital during the SARS outbreak. Between 2019 and 2020, 97 patients who developed an allergic reaction on their face in the SARS-CoV-2 pandemic were discussed. The average age of the patients was 37.7 (range 18-78), while the average age was 35.2 for males and 40.04 for females. While 13 (27.7%) of the male patients were using cloth masks, 34 (72.3%) of them were using surgical masks, 11 (22%) of the female patients were using cloth masks and 39 (78%) of them were using surgical masks.The combination of the female gender, additional disease, and surgical mask contributes to the development of allergic reactions on the face.

## INTRODUCTION

The use of face masks and respirators for the protection of health care workers (HCWs) has received renewed interest following the 2009 influenza pandemic [1] and emerging infectious diseases such as avian influenza [2], Middle East respiratory syndrome coronavirus (MERS-coronavirus) [3,4] and Ebola virus [5]. In 2019-2020, the use of individual protective equipment was on the agenda again due to the covid-19 pandemic.

SARS-CoV-2 can be transmitted by both direct contact (droplet and person to person) and indirect contact (contaminated objects and air). Droplet transmission, direct inhalation of droplets scattered from the respiratory tract of the sick person; Contamination by contact occurs by touching the mouth, nose and eyes with virus-contaminated hands after contact with the surfaces contaminated by the droplets [6]. In a study, it was stated that SARS-CoV-2 was suspended in aerosols for at least three hours[7].

Another study that visualizes respiratory exhalations using high-speed imaging has shown that respiratory droplets can be transported in a gas cloud and have horizontal trajectories beyond two meters by speaking, coughing, or sneezing [8].Considering the transmission routes, the most effective methods of protection; hand hygiene, use of masks, social distance and isolation, isolation of patients and contact tracing, protection of healthcare workers and environmental cleaning [9].

A medical mask is a flat or layered surgical or procedure mask. These masks are tied with laces on the back of the ears, head, or both. The performance characteristics of these masks are tested according to a set of standardized test methods (ASTM F2100, EN 14683 or equivalent).The aim here is to breathe with high filter capacity and preferably balance the liquid penetration resistance with each other [10],[11].

After using a mask; Headache, facial tension, ear pain, vision problems and shortness of breath are among the common complaints [12].

Community in affected countries were exposed to the regular use of personal protective equipment (PPE) such as the facemask. Our aim was to study the prevalence of adverse skin reactions to facemask among the community admitted to our hospital during the SARS outbreak.

## MATERIALS and METHODS

Ninety-seven patients, who applied to the Dermatology Outpatient Clinic, between 2019 and 2020 during the COVID-19 pandemic process, were included in the study. The patients were divided into 2 groups: using a surgical mask and a cloth mask. To be included in the study, no person was given a mask for a certain period of time. Persons with chronic upper and lower respiratory tract disease and those with acute lower or upper respiratory infections were excluded from the study. Those who used surgical medical masks were defined as the first group, and those who used cloth masks were defined as the second group. Mask-related complaints (acne, facial itch, rash), the patients' age, gender, presence of comorbidity, presence of allergies and smoking were noted.

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### *Statistical Analysis*

Data obtained in the study were statistically analyzed using SPSS 23.0 software (SPSS Inc., Chicago, IL, USA). The data were expressed as mean ± standard deviation (SD). Pearson chi-square test was used in the analysis of statistical evidence. The value of $p<0.05$ was regarded as statistically significant.

## RESULTS

The average age of the patients was 37.7 (range 18-78), while the average age was 35.2 for males and 40.04 for females. While 13 (27.7%) of the male patients were using cloth masks, 34 (72.3%) of them were using surgical masks, 11 (22%) of the female patients were using cloth masks and 39 (78%) of them were using surgical masks (Table 1).

**Table 1.** Mask type and gender

| | | | Mask | | Total |
|---|---|---|---|---|---|
| | | | Cloth | Surgical | |
| Gender | Male | Count | 13 | 34 | 47 |
| | | Expected Count | 11,6 | 35,4 | 47 |
| | | % | 27,7 | 72,3 | 100 |
| | Fe-male | Count | 11 | 39 | 50 |
| | | Expected Count | 12,4 | 37,6 | 50 |
| | | % | 22 | 78 | 100 |
| Total | | Count | 24 | 73 | 97 |
| | | Expected Count | 24 | 73 | 97 |
| | | % | 24,7 | 75,3 | 100 |

The number of smoking male patients was 21 (44.7%), and the number of female patients was 10 (20%). Smoking was present in 5 (20.8%) of the patients using cloth masks and 26 (35.6%) of the patients using surgical masks (Table 2).

**Table 2:** Mask type and smoking

| | | | Smoking | | Total |
|---|---|---|---|---|---|
| | | | Yes | No | |
| Mask | Cloth | Count | 5 | 19 | 24 |
| | | Expected Count | 7,7 | 16,3 | 24 |
| | | % | 20,8 | 79,2 | 100 |
| | Surgical | Count | 26 | 47 | 73 |
| | | Expected Count | 23,3 | 49,7 | 73 |
| | | % | 35,6 | 64,4 | 100 |
| Total | | Count | 31 | 66 | 97 |
| | | Expected Count | 31 | 66 | 97 |
| | | % | 32 | 68 | 100 |

Five (16.1%) of the patients with a history of additional disease such as hypertension and diabetes had a history of smoking. The number of patients using cloth masks and comorbid diseases was 7 (29.2%), and the number of patients using surgical masks and comorbidities was 22 (30.1%). While 7 (14.9%) patients had comorbid diseases in male patients, the number of patients with comorbid diseases in female patients was 22 (44%) (Table 3). There were no significant differences in adverse skin reactions due to age, sex, race, or profession.

**Table 3.** Relationship between gender and additional disease

| | | | Ek hastalık | | Total |
|---|---|---|---|---|---|
| | | | Yes | No | |
| Gender | Male | Count | 7 | 40 | 47 |
| | | Expected Count | 14,1 | 32,9 | 47,0 |
| | | % | 14,9 | 85,1 | 100 |
| | Female | Count | 22 | 28 | 50 |
| | | Expected Count | 14,9 | 35,1 | 50,0 |
| | | % | 44 | 56 | 100 |
| Total | | Count | 29 | 68 | 97 |
| | | Expected Count | 29,0 | 68,0 | 97 |
| | | % | 29,9 | 70,1 | 100 |

Patients used face masks regularly reported adverse skin reactions, which included acne (58.6%), facial itch (50.4%), and rash (37.8%). All those who had skin reactions developed them while using surgical and wool masks for an average duration of 8 hr a day and over a mean period of 10.6 months. Patients reported allergic reaction with mask use, with sites reported encompassing the nose bridge, cheeks, and chin. There were no significant differences in adverse skin reactions due to age, sex, race, or profession.

Considering the statistical evaluation of the data we obtained in the nose, chin and mouth area allergic reactions in patients using surgical masks and cloth masks, the Pearson chi-square value was 0.417 and the significance value was found to be 0.519 ($p> 0.05$). Although there is no significant relationship between masks and gender, the use of surgical masks in women is slightly more than men. According to the Pearson chi-square test, smoking in male patients with allergic reactions was higher than expected, and less than expected in women. Pearson's chi-square value is 6.787 and its significance value is 0.009 ($p <0.05$). As a result, a significant relationship was found between smoking and gender.

Considering the relationship between the type of mask used and smoking; The Pearson chi-square value is 1.815 and the significance value is 0.178 ($p> 0.05$). No significant relationship was found between smoking and mask type, but smoking was higher in those using surgical masks than those using cloth masks. When evaluated statistically on smoking and comorbidities; Pearson chi-square value is 4.121 and its significance value is 0.042 ($p <0.05$). A significant relationship was found between smoking and comorbidities, and comorbidity was found to be more common in non-smokers than in smokers. In the relationship between gender and comorbidity; Pearson's chi-square value is 9,793, and the significance value is 0.002 ($p <0.05$). A significant relationship was found between gender and comorbidity, and comorbidity was more common in women than in men.

## DISCUSSON

Where the medical mask approach is adopted, potential harms and risks should be carefully considered, eg contamination from touching the mask on contaminated hands [13,14]; when wet; contamination caused by not changing the mask when dirty or damaged; skin lesions, irritation or acne that gets worse as a result of using the mask for long hours [15,16,17]; discomfort caused by wearing a mask [18,19].

There are studies stating that the use of surgical masks and FFP2 causes allergies. Navarro-Triviño et al. examined the development of

contact dermatitis after the use of an FFP2 mask in a hospital worker who had no previous history of allergic disease [20]. In another study, skin reactions associated with the use of N95 masks were evaluated in healthcare workers [17].

In another study evaluating the use of surgical and N95-type masks, it was stated that complaints developed at a considerable rate [21]. Complaints in the study; Reported in general use regardless of mask duration and mask type. Skin reaction was reported in 49% of the participants, respiratory problems in 17.1%, and eye-related findings in 6.2%.

There has been an increased incidence of skin conditions in the community due to the extended use of facemasks. Contact dermatitis, contact urticaria occurs due to adhesives, rubber in straps, free formaldehyde released from the non-woven polypropylene and from metal in clips [22]. Foo et al., analysed healthcare workers during the SARS pandemic in 2003 at Singapore, and reported that 51.4% experienced itch induced by face masks [15]. In an experimental study by Roberge et al., 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 [23]. Zuo et al.,[21] showed that pre-existing acne, rosacea and seborrheic dermatitis were exacerbated by using face masks.

First, a hot and humid microclimate is created in regions of the face covered by the mask, which predisposes to a flare□up of acne. Secondly, occlusion of pilosebaceous ducts due to local pressure on the skin from the close□fitting mask could result in a flare□up of acne [24]. Itch and rash were reported frequently as well with most cases probably due to irritant contact dermatitis from components of the mask. True allergic contact dermatitis may ocur to adhesives used in the masks or to mask components such as rubber strapsor metal clips [15].

Moisture can accumulate under either type of face mask and predisposeto skin breakdown and, potentially, superinfection [22]. Skin barrier dysfunction and potential skin microbiotadys balance on the face might make patients more vulnerable to side effects from the masks [21].

In our work; surgical masks are numerically higher in patients with allergic reactions. The preference for the use of surgical masks in women was found to be higher than men. Smoking is higher in male patients with allergies than female patients with allergies. Allergic patients wearing surgical masks and smoking are both numerically and proportionally higher than patients who use cloth masks and smokers who develop allergic reactions, but it is not statistically significant. 79.2% of those who use cloth masks and 64.4% of those who use surgical masks do not smoke although they develop an allergic reaction. Additional disease was detected in 16.1% of smokers and 36.4% of non-smokers. In statistical evaluation, the association of smoking and comorbidity does not give a meaningful result in the development of allergic reactions. When the effect of comorbidity and mask selection on allergic reaction was examined, no significant difference was found, both proportionally and numerically.

In women with allergic reactions, the presence of additional disease was found to be statistically significant compared to men. The presence of additional disease in women is statistically significant compared to male patients in which it contributes to the development of allergic reactions.

### *Conclusion*

The combination of female gender, additional disease and surgical mask contributes to the development of allergic reactions related to the mask. Although it is an assumption that smoking and mask association triggers the development of allergic reactions in the community, we think that smoking does not affect the development of allergic reactions when we look at the data we obtain. However, although it is not statistically significant; the combination of smoking and surgical mask is more likely to cause allergy than cloth mask and cigarette combination numerically and proportionally.

### *Conflict of interest*

The authors declare that there are no conflict of interests.


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