


Skin reactions of N95 masks and medial masks among health-care personnel: A self-report questionnaire survey in China

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KEYWORDS: acne, adverse skin reaction, health-care personnel, medical masks, N95 masks

Coronavirus Disease 2019 (COVID-19) was first recognized in December 2019 and was later declared as a pandemic by the World Health Organization (WHO). Health-care personnel (HCP) in affected

areas were exposed to prolonged use of masks for prevention of infection. This study aims to characterize adverse reactions related to masks among the HCP in China.

METHODS

A cross-sectional survey was conducted among 583 Chinese HCP in February 2020, using a self-administered online questionnaire that was created using a crowdsourcing platform (equivalent to Amazon Mechanical Turk), which recruited 407 participants (response of 69.8%). Three participants were excluded because of improper mask types. Thus, a total of 404 participants constituted our final sample.

TABLE 1 Mask-related skin symptoms reported by health-care personnel (N = 404, multiple answers possible)

Skin symptom	Number	Percentage
Discomforts caused by mask straps	90	22.3
Facial indentation	76	18.8
Itch	60	14.9
Redness or erythema	51	12.6
Rash	50	12.4
Dry or scaling skin	47	11.6
Burning	15	3.7
Pain or prickling	13	3.2
Swelling	5	1.2
Numbness	5	1.2
Greasy skin	4	1.0
Total	198	49.0

Participants were requested to document skin, eye, and respiratory tract symptoms and suspected etiologic factors related to the use of masks (Table 1). Underlying inflammatory facial dermatoses (IFDs) and allergic disorders were queried. Ethical approval for this study was granted by the Ethics Committee of the West China Hospital, Sichuan University (2020-225).

RESULTS

Overall, 198 (49.0%) HCP reported mask-related skin reactions (Table 1), of whom 169 (85.4%) had facial skin problems, 69 (17.1%) reported respiratory tract problems, and 25 (6.2%) had eye symptoms. Suspected risk factors are listed in Table 2. Of all investigated HCP, 45.0% (N = 182) admitted touching the mask surface occasionally owing to discomfort, and 8.9% (N = 36) removed their masks because they could not tolerate it. Of the 129 participants with underlying IFD, 44.2% (N = 57) reported exacerbation, including 43.6% (N = 44) of acne patients, 37.5% (N = 9) with seborrheic dermatitis, and all 14 acne rosacea patients.

DISCUSSION

Our study describes mask-related adverse reactions in HCP. The higher prevalence of skin symptoms among women might be related to a lower threshold for reporting adverse reactions.¹ The most frequent symptoms were pressure related. Symptoms suggesting allergic or irritant reactions, such as itch, redness, and rashes, were also

TABLE 2 Association between mask-related facial skin symptoms and potential risk factors

Risk factor	Total, N (%)	Skin symptoms ^{aa} , N (%)	OR (95%CI) crude	P	OR (95%CI) adjusted ^{bb}	P ^{bb}
Sex						
Male	100 (24.8)	33 (19.5)	1		1	
Female	304 (75.2)	136 (80.5)	1.6 (1.0-2.6)	.039*	1.6 (1.0-2.6)	.073
Allergy						
No	269 (66.6)	105 (62.1)	1		1	
Yes	135 (33.4)	64 (37.9)	1.4 (0.9-2.1)	.11	1.27 (0.8-2.0)	.30
Underlying IFD						
No	275 (68.1)	102 (60.4)	1		1	
Yes	129 (31.9)	67 (39.6)	1.8 (1.2-2.8)	.005*	1.7 (1.1-2.7)	.016*
Mask						
Medical	366 (90.6)	147 (87.0)	1		1	
N95	38 (9.4)	22 (13.0)	2.05 (1.0-4.0)	.035*	2.63 (1.3-5.4)	.009*
Frequency/day						
<1	113 (28.0)	38 (22.5)	1		1	
1	107 (26.5)	40 (23.7)	1.2 (0.7-2.1)	.56	1.1 (0.6-2.0)	.69
≥2	184 (45.5)	91 (53.8)	1.9 (1.2-3.1)	.008*	1.7 (1.0-2.9)	.061
Duration						
<4 h	174 (43.1)	54 (32.0)	1		1	
4-8 h	146 (36.1)	68 (40.2)	1.9 (1.2-3.1)	.008*	1.8 (1.1-3.0)	.020*
>8 h	84 (20.8)	47 (27.8)	2.8 (1.7-4.8)	<.001*	2.7 (1.5-4.7)	<.001*

Abbreviations: CI, confidence interval; IFD, inflammatory facial dermatosis; OR, odds ratio; *P < 0.05; Bold means there is statistically significant difference.

^aEar and scalp adverse discomforts caused by mask straps were excluded as we focused on the side effect of the mask on the face.

^bMultiple logistic regression analysis was used.

prevalent. Previously, N95 and surgical masks have been documented to contain formaldehyde and other preservatives,^{2,3} which might induce contact dermatitis. Friction, warmth, and moisture from respiration may enhance symptoms.⁴

Skin barrier dysfunction and potential skin microbiota disorder of IFD might make patients more vulnerable to the mask side effects. A survey in Singapore⁵ reported acne to be the most common adverse reaction (59.6%, N = 65) to N95 masks. This is consistent with our findings of a high exacerbating rate (43.6%, N = 44) of acne. Meanwhile, it should be noted that use of masks could pose a great risk for rosacea patients because all HCP with rosacea (N = 14) reported an exacerbation. N95 masks have higher air impermeability and stronger local pressure, which may lead to more skin symptoms. Our survey revealed a high share of mask noncompliance due to discomfort, which could favour transmission of pathogens.

In conclusion, this survey found that mask-related skin symptoms were common in Chinese HCP and that those with underlying IFDs should be particularly cautious, as flares were associated with prolonged mask use. N95 masks were associated with more reactions than medical masks. This indicates a need to provide affected HCP with effective dermatological treatment and establish prevention methods for occupational skin disorders at a national level.

ACKNOWLEDGMENTS

This work was supported by 1.3.5 project for disciplines of excellence, West China Hospital, Sichuan University. The authors express sincere appreciation to all the HCP who completed the questionnaire. We give most sincere respect to the health workers who are fighting against the epidemic in the front line.

AUTHOR CONTRIBUTIONS

Ying Zuo: Conceptualization; data curation; formal analysis; investigation; methodology; resources; supervision; writing-original draft; writing-review and editing. **Wei HUA:** Conceptualization; investigation; methodology; project administration; visualization; writing-review and

editing. **Yaxin Luo:** Data curation; formal analysis. **Li Li:** Funding acquisition; project administration; supervision; writing-review and editing.

CONFLICTS OF INTEREST

The authors declare no conflicts of interests.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

How to cite this article: Zuo Y, Hua W, Luo Y, Li L. Skin reactions of N95 masks and medial masks among health-care personnel: A self-report questionnaire survey in China. *Contact Dermatitis*. 2020;83:145-147. <https://doi.org/10.1111/cod.13555>