

Adverse skin reactions among healthcare workers during the coronavirus disease 2019 outbreak: a survey in Wuhan and its surrounding regions

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DEAR EDITOR, During the outbreak of coronavirus disease 2019 (COVID-19), healthcare workers (HCWs) caring for patients with COVID-19 have to wear personal protective equipment (PPE) and are therefore susceptible to PPE-related adverse skin reactions. However, little is known about the prevalence and

characteristics of these adverse skin reactions and their associated risk factors.

To address this, we conducted a cross-sectional questionnaire survey during 6–11 February 2020 in Wuhan and its surrounding regions. Five university hospitals in Wuhan and five regional hospitals around Wuhan were included. The study respondents included doctors and nurses caring for patients with COVID-19. Demographic information was recorded, in addition to data on self-perceived adverse skin reactions, types (dryness or scales, papules or erythema, maceration, erosion or fissure) and sites of eruptions. Univariate and multivariate analyses were performed to assess associations between adverse skin reactions and the following variables: age, sex, hospital size and area, epidemic level, working place,

Table 1 Analysis of variables associated with self-perceived adverse skin reactions

Variable	Self-perceived adverse skin reactions		Univariate analysis		Multivariate analysis ^e	
	Yes (n = 280)	No (n = 96)	OR (95% CI)	P-value	OR (95% CI)	P-value
Age (years), mean ± SD	32.2 ± 6.5	32.0 ± 6.3	–	0.77	–	–
Sex						
Male ^a	50/84 (60)	34	2.52 (1.50–4.24)	< 0.001	1.87 (1.04–3.39)	0.038
Female	230/292 (78.8)	62				
Hospital size and area						
Regional hospitals around Wuhan ^a	182/240 (75.8)	58	0.82 (0.51–1.32)	0.42	–	–
University hospitals in Wuhan	98/136 (72.1)	38				
Epidemic level						
Hospitals with a less severe epidemic ^{a,b}	83/128 (64.8)	45	2.09 (1.30–3.37)	0.002	2.41 (1.41–4.11)	0.001
Hospitals with a more severe epidemic	197/248 (79.4)	51				
Working place						
Fever clinics ^{a,c}	53/91 (58)	38	–	–	–	–
Inpatient wards ^d	218/274 (79.6)	56	2.79 (1.68–4.65)	< 0.001	2.44 (1.37–4.37)	0.003
Both	9/11 (82)	2	3.23 (0.66–15.8)	0.15	5.26 (0.98–28.3)	0.053
Duration with full-body PPE per day						
< 4 h ^a	26/46 (57)	20	–	–	–	–
4–6 h	78/120 (65.0)	42	1.43 (0.71–2.86)	0.31	2.07 (0.97–4.40)	0.063
> 6 h	176/210 (83.8)	34	3.98 (2.00–7.93)	< 0.001	4.26 (1.99–9.12)	< 0.001
Getting soaking wet after work						
No ^a	81/128 (63.3)	47	2.36 (1.46–3.79)	< 0.001	1.58 (0.93–2.67)	0.094
Yes	199/248 (80.2)	49				
Frequency of showering						
Once per ≥ 2 days ^a	33/49 (67)	16	–	–	–	–
Once per day	214/288 (74.3)	74	1.40 (0.73–2.69)	0.31		
At least twice per day	33/39 (85)	6	2.67 (0.93–7.66)	0.068		
Layers of gloves						
One ^a	20/27 (74)	7	–	–	–	–
Two	225/305 (73.8)	80	0.98 (0.40–2.42)	0.97		
Three or more	35/44 (80)	9	1.36 (0.44–4.21)	0.59		
Frequency of hand washing						
< 10 times per day ^a	74/119 (62.2)	45	2.46 (1.52–3.97)	< 0.001	1.68 (0.98–2.88)	0.060
> 10 times per day	206/257 (80.2)	51				

The data are presented as n or n/N (%), except for age. CI, confidence interval; OR, odds ratio; PPE, personal protective equipment. ^aReference group. ^bThe three cities with the most confirmed cases by 6 February 2020 (Wuhan, Xiaogan and Huanggang) were regarded as areas with a more severe epidemic, and the other areas were considered to have a less severe epidemic. ^cFever clinics are outpatient clinics screening patients with fever. ^dInpatient wards are where patients with confirmed or suspected COVID-19 are admitted and treated. ^eVariables with P < 0.1 in univariate analysis were further included in the multivariate analysis.

exposure to ultraviolet irradiation, duration with full-body PPE, getting soaking wet after work, frequency of showering, layers of gloves, frequency of handwashing, and topical hand cream application after washing.

An estimated maximum of 1000 surveys were distributed and 376 HCWs responded (response rate > 37.6%). In total, 136 (36.2%) were from university hospitals in Wuhan and 240 (63.8%) were from regional hospitals around Wuhan. Eighty-four respondents (22.3%) were men and 292 (77.7%) were women. Adverse skin reactions were reported by 280 respondents (74.5%). Of note, this rate was much higher than the rate of occupational contact dermatitis (31.5%) in HCWs under normal working conditions, and that of adverse skin reactions (21.4–35.5%) during the SARS outbreak.^{1,2} The most commonly reported types of eruptions were dryness or scales (68.6%), papules or erythema (60.4%) and maceration (52.9%). Hands, cheeks and nasal bridge ranked as the three most commonly affected areas, reported by 237 (84.6%), 211 (75.4%) and 201 (71.8%) respondents, respectively. In univariate analysis (Table 1), sex, epidemic level, working place, duration with full-body PPE, getting soaking wet after work, and frequency of handwashing were significantly associated with adverse skin reactions. In multivariate analysis (Table 1), female sex [odds ratio (OR) 1.87, $P = 0.038$], working in hospitals with a more severe epidemic (OR 2.41, $P = 0.001$), working in inpatient wards (OR 2.44, $P = 0.003$) and a duration with full-body PPE of > 6 h per day (OR 4.26, $P < 0.001$) were associated with increased adverse skin reactions.




The hands were the most common site affected. Most HCWs washed their hands over 10 times per day, but only 22.1% applied hand creams after washing. For hand care, we suggest applying moisturizers that offer protection against irritant hand dermatitis,³ and using alcohol-based products instead of soaps, as the former show high antimicrobial activity and low risk of skin damage.⁴ With regards to layers of gloves, although coronavirus was found to survive for several hours on used PPE, double gloving is sufficient to reduce the risk of viral contamination during PPE removal and is therefore recommended.⁵ The cheeks, nasal bridge and auricular areas are prone to adverse skin reactions due to masks or respirators. As masks cause less adverse skin reactions than respirators,² choosing appropriate facial equipment under different conditions is recommended.

HCWs working in hospitals with a more severe epidemic and those in inpatient wards reported higher prevalence of adverse skin reactions than those working in hospitals with a less severe epidemic and in fever clinics. One possible explanation was longer working hours, as prolonged use of PPE itself is a risk factor for adverse skin reactions. Adherence to appropriate PPE may be influenced by the epidemic severity, education on PPE use, working experience and workload.⁶ Therefore, on the administrative level, promoting education on proper PPE, and restricting the duration of wearing PPE to no more than 6 h per day would help. On a personal level, HCWs should be encouraged to follow standards of glove use,

hand hygiene and hand care. If severe dermatoses or sustained aggravation of existing dermatoses occur, a prompt dermatological referral is strongly recommended.

Limitations of this study include response bias, as HCWs with adverse skin reactions were more likely to respond. Moreover, adverse skin reactions perceived by respondents could not be validated by dermatologists. Finally, questions regarding existing skin conditions or other predisposing factors were not included. Nonetheless, this pioneering study provides insights into the prevalence and risk factors for strict protection-related adverse skin reactions during the COVID-19 outbreak. Such information may prove useful for interventions to minimize these work-related skin problems.

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