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Skin Barrier Damage due to Prolonged Mask Use among Healthcare Workers and the General Population during the COVID-19 Pandemic: A Prospective Cross-Sectional Survey in China

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Keywords
COVID-19 · Mask · Healthcare worker · General population · Skin barrier damage

Abstract
Background: Coronavirus disease 2019 (COVID-19) has resurged in localized areas in China. Individuals wear masks to prevent the spread of droplets. However, skin barrier damage occurs because of the prolonged use of masks. ***Objective:*** To investigate the prevalence and associated risk factors of skin injuries among healthcare workers (HCWs) and the general population during the COVID-19 outbreak. ***Methods:*** A multicenter cross-sectional study of skin barrier damage caused by wearing masks was conducted using an online questionnaire between December 10 and December 31, 2020. Data regarding demographics, characteristics of facial skin damage, and information on masks were registered. Multivariate logistic regression was used to analyze factors associated with skin barrier damage, and odds ratios (OR) with 95% confidence intervals (CI) were used to establish correlation strength. ***Results:*** A total of 1,538 responses were retrieved from 1,700 questionnaires (response rate, 90.47%), and 1,409 questionnaires were valid (effective response rate, 91.61%). The respondents comprised 567 HCWs (40.24%) and 842 individuals from the general population (59.76%). The prevalence of skin injuries was 46.03% among HCWs and 46.20% among the general population. History of chronic skin disease (OR, 6.01; 95% CI, 4.75–7.75), type of mask used (OR, 2.77; 95% CI, 1.95–3.93), daily wearing time (OR, 1.57; 95% CI, 1.36–1.82), and mask replacement cycle (OR, 0.76; 95% CI, 0.68–0.86) were associated with skin barrier damage. ***Conclusion:*** There was a high incidence of skin barrier damage due to prolonged mask use among HCWs and the general population, and treatment and prevention were inadequate. Attention needs to be given to strengthening comprehensive health education and popularization of science.

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Introduction

Coronavirus disease 2019 (COVID-19) is highly infectious and spreads rapidly via respiratory droplets and direct contact [1]. According to incomplete statistics, COVID-19 cases have resurged in local areas in China in the

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last 6 months. The neighboring provinces of Jiangsu (Shandong, Tianjin, Shanghai, and Anhui) have witnessed multiple sporadic cases. Since December, the pandemic in China has exhibited a rapid growth trend again. During the same period, SARS-CoV-2 variants have been widely reported in European and American countries, which are more infectious than the previous version [2]. Most infected individuals are asymptomatic at the initial stage [3] and may cause cross-provincial transmission [4]. Driven by the constant appeal of the country and the people's own awareness of protection, people have begun to consciously wear masks to minimize droplet transmission to the greatest extent. However, wearing a mask for a long time can cause facial skin barrier damage. Recent investigations revealed that many people, especially in healthcare settings, have different degrees of facial skin damage, which manifests in several clinical features, such as dryness, itching, erythema, acne, indentation, and pressure ulcer [5–7]. This phenomenon covers a wide range and is still ongoing.

A healthy skin barrier is a speed-limiting layer for various substances to be absorbed through the skin to resist the entry of external harmful substances and irritants [8]. It also has moisturizing and regulating functions and plays an important physiological role in maintaining the stability of the body's internal environment and resisting harmful factors from the external environment.

Previous studies on characteristics of skin damage are largely focused on healthcare workers (HCWs) who wore multistage personal protective equipment (e.g., N95 masks, goggles, protective clothing, and gloves) [5–7]. The present study populations included HCWs and the general population. Mask was used as a single exposure factor to investigate the prevalence and risk factors of skin injuries between the two groups during the COVID-19 pandemic, which, to our knowledge, has been rarely described in the dermatological literature.

Materials and Methods

Participants and Sample Size

This study was deemed exempt by the Institutional Review Board of The Affiliated Hospital of Xuzhou Medical University. This multicenter cross-sectional study was conducted between December 10 and December 31, 2020, in 9 designated hospitals and 6 cities in Jiangsu Province, China. A total of 1,700 questionnaires were distributed and 1,538 questionnaires were retrieved. The response rate was 90.47% (each participant received appropriate financial incentives to maximize the response rate). Five percent of the questionnaires submitted on the same day were randomly selected for rechecking. For those whose project (e.g., type of mask used and type of reported skin manifestations) compliance rate was less than 90%, the subjects were contacted through the reserved phone number to fill in the questionnaires again, otherwise the questionnaires were deemed unqualified and deleted to minimize misclassification bias.

Only 1,409 responses (effective response rate, 91.61%) from 567 HCWs (40.24%) and 842 individuals from the general population (59.76%) were included after the exclusion of responses with invalid or missing data. Verbal consent from all eligible participants was obtained. The inclusion criteria were participants who (1) use a mask for a minimum of 0.5 h daily and for at least 1 week continuously, (2) have good communication and judgment skills, (3) are willing to be investigated, and (4) have a history of chronic skin disease (e.g., eczema, atopic dermatitis, allergic dermatitis, and acne), which was defined as recurrent symptoms lasting more than 6 weeks, or a number of previous attacks of more than 3. The key exclusion criteria were (1) questionnaires with the same or incomplete answers, (2) participants with an answer time of less than 120 s, (3) a history of chronic skin disease was ongoing and treated when starting wearing masks, and (4) participants who used personal protective equipment more than masks.

Investigation Tools

We formulated a questionnaire by reviewing the current literature and consulting two statistical specialists and domain experts. The questionnaire was reviewed and revised based on the feedback from these experts. The questionnaire items included demographic data (age, gender, and occupation), the condition of facial skin damage (types and anatomical sites), information on masks (types, daily wearing time, and replacement cycle), and preventive measures. Closed structured questionnaires were distributed to randomly selected study samples at each location by trained medical personnel. All questionnaires were completed online through the professional online questionnaire software platform of Questionnaire Star (Changsha Ranxing Information Technology Co., Ltd.).

Statistical Analysis

SPSS 26.0 was used for statistical analysis. Qualitative data (categorical variables) are expressed in percentage or composition ratio. Pearson χ^2 test or likelihood ratio test was used to compare categorical data. Bonferroni test was used for pairwise comparisons between subgroups. Kruskal-Wallis test was used for grade data (age, daily wearing time, and mask replacement cycle). $p < 0.05$ was considered statistically significant. Bivariate logistic regression analysis was conducted separately for each independent variable to evaluate the relationship with the dependent variable (facial skin barrier damage). Multivariate logistic analysis was performed based on the univariate analysis of significant variables with $p < 0.05$ to identify the influencing factors related to skin barrier damage. A forward variable selection method (likelihood ratio) was utilized to input variables into the logistic regression model to assess which variables are substantially related to the rate of skin barrier damage. Hosmer and Lemeshow were used to check the pros and cons of the fitted model, and the results showed that the assumption was met ($p = 0.098 > 0.05$). A critical value of $p \leq 0.05$ was set to assess the significance, and odds ratios (OR) with 95% confidence intervals (CI) were used to establish correlation strength.

Table 1. Overall situation of skin barrier damage caused by masks (n = 1,049)

	Healthcare worker (n = 567)			General population (n = 842)			Total p value
	skin barrier damage		p value	skin barrier damage		p value	
	no	yes		no	yes		
Age, n (%)			0.403			0.001	0.001
≤20 years	10 (1.8)	8 (1.4)		90 (10.7)	65 (7.7)		
21–30 years	135 (23.8)	123 (21.7)		210 (24.9)	260 (30.9)		
31–60 years	155 (27.3)	130 (22.9)		144 (17.1)	61 (7.2)		
>60 years	6 (1.1)	0 (0.0)		9 (1.1)	3 (0.4)		
Gender, n (%)			0.124			0.06	0.643
Female	174 (30.7)	165 (29.1)		181 (21.5)	131 (15.6)		
Male	132 (23.3)	96 (16.9)		272 (32.3)	258 (30.6)		
History of chronic skin disease[a], n (%)			<0.001			<0.001	<0.001
No	227 (40.0)	121 (21.3)		358 (42.5)	109 (12.9)		
Yes	79 (13.9)	140 (24.7)		95 (11.3)	280 (33.3)		
Types of masks used[b], n (%)			0.001			<0.001	<0.001
Single-use mask	98_{a} (17.3)	55_{a} (9.7)		278_{a} (33.0)	170_{a} (20.2)		
N95 mask	17_{b} (3.0)	37_{b} (6.5)		61_{b} (7.2)	129_{b} (15.3)		
Surgical mask	188_{a} (33.2)	166_{a} (29.3)		$108_{a, c}$ (12.8)	$76_{a, c}$ (9.0)		
Cotton/paper mask	$3_{a, b}$ (0.5)	$3_{a, b}$ (0.5)		$6_{b, c}$ (0.7)	$14_{b, c}$ (1.7)		
Daily wearing time, n (%)			0.026			<0.001	<0.001
<1 h	11 (1.9)	3 (0.5)		70 (8.3)	16 (1.9)		
1–4 h	30 (5.3)	23 (4.1)		216 (25.7)	181 (21.5)		
4–8 h	143 (25.9)	108 (19.0)		131 (15.6)	148 (17.6)		
>8 h	122 (21.5)	127 (22.4)		36 (4.3)	44 (5.2)		
Mask replacement cycle, n (%)			0.037			<0.001	<0.001
<4 h	25 (4.4)	25 (4.4)		91 (10.8)	84 (10.0)		
4–8 h	98 (17.3)	95 (16.8)		132 (15.7)	174 (20.7)		
8–24 h	77 (13.6)	76 (13.4)		81 (9.6)	71 (8.4)		
>24 h	106 (18.7)	65 (11.5)		149 (17.7)	60 (7.1)		

[a] Chronic skin disease included eczema, atopic dermatitis, allergic dermatitis, and acne.
[b] The subsets with the same letters indicate that the means within subsets were at par (not significant). Significance level was set to 0.05. Subsets with different letters differed significantly from others.

Results

Overall Situation of Skin Barrier Damage Caused by Masks

Among the 567 HCWs, 59.8% (n = 339) were females and 40.2% (n = 228) were males. The majority (50.3%, n = 285) were aged 31–60 years. Among the 842 individuals from the general population, 63.0% (n = 530) were males and 37.1% (n = 312) were females. Over half of the respondents from the general population (55.8%, n = 470) were in the age group of 21–30 years. Except for gender, the statistically significant predictors of the prevalence of skin injuries included age, history of chronic skin disease, type of mask used, daily wearing time, and mask replacement cycle in the overall population (all $p < 0.001$). Among HCWs, the prevalence of adverse skin reactions was 46.0% (261/567) and was significantly correlated with a history of chronic skin disease, type of mask used, daily wearing time, and mask replacement cycle (all $p < 0.05$), but not age ($p = 0.403$) and gender ($p = 0.124$). The prevalence of skin barrier damage in those who wore single-use masks and surgical masks was not remarkably different but was considerably different from individuals who wore N95 and cotton/paper masks. Among the general population, the general incidence of skin barrier damage was 46.2% (389/842) and was statistically associated with age, history of chronic skin disease, type of mask used, daily wearing time, and mask replacement cycle (all $p <$ 0.001). The rate of skin injuries among individuals from the general population who wore different types of masks was substantially different (Table 1).

Table 2. Clinical features and other data of HCWs and the general population who suffered from dermatoses (n = 650)

Items[a]	Healthcare worker (n = 261)	General population (n = 389)	Total (n = 650)	p value
Symptoms, n (%)				
Itching	144 (55.2)	232 (59.6)	376 (57.9)	0.258
Dryness/tightness	95 (36.4)	198 (50.9)	293 (45.1)	<0.001
Pricking	62 (23.8)	141 (36.3)	203 (31.2)	0.001
Pain (behind the ear)	83 (31.8)	49 (12.6)	132 (20.3)	<0.001
Skin lesions, n (%)				
Erythema	158 (60.5)	254 (65.3)	412 (63.34)	0.726
Acne	180 (69.0)	209 (53.7)	389 (59.9)	<0.001
Indentation	134 (51.3)	108 (27.8)	242 (37.2)	<0.001
Desquamation	78 (29.9)	152 (39.1)	230 (35.4)	0.016
Aggravation of pre-existing skin disease[b]	42 (16.1)	44 (11.3)	86 (13.2)	0.078
Pigmentation	12 (4.6)	58 (14.9)	70 (10.8)	<0.001
Pressure ulcer	14 (5.4)	52 (13.4)	66 (10.2)	0.001
Others[c]	6 (2.3)	2 (0.5)	8 (1.2)	0.044
Sites, n (%)				
Cheek	156 (59.8)	246 (63.2)	402 (61.9)	0.372
Chin	143 (54.8)	169 (43.4)	312 (48.0)	0.005
Nasal bridge	91 (34.9)	184 (47.3)	275 (42.3)	0.002
Forehead	42 (16.1)	130 (33.4)	172 (26.5)	<0.001
Ear	71 (27.2)	82 (21.1)	153 (23.5)	0.071
Treatment measures, n (%)				
Reduce wearing time	143 (54.8)	223 (57.3)	366 (56.3)	0.523
Change the type of mask	70 (26.8)	185 (47.6)	255 (39.2)	<0.001
Moisturizing the skin	83 (31.8)	143 (36.8)	226 (34.8)	0.193
Oral/topical medication	36 (13.8)	135 (34.7)	171 (26.3)	<0.001
Use dressing	40 (15.3)	131 (33.7)	171 (26.3)	<0.001
No treatment	85 (32.6)	36 (9.3)	121 (18.6)	<0.001

[a] With overlaps.
[b] Pre-existing skin disease included allergic dermatitis, eczema, acne, and seborrheic dermatitis.
[c] Others included blister, maceration, and erosion.

Clinical Features and Other Data of HCWs and the General Population Who Suffered from Dermatoses

The most common symptom in the overall population was itching (57.9%), and its prevalence between HCWs and the general population was not significantly different (p = 0.258). However, the distributions of dryness/tightness, pricking, and pain behind the ear between the two groups were significantly different (all p < 0.001). The 3 most common skin lesions in HCWs were acne (69.0%), erythema (60.6%), and indentation (51.3%), whereas erythema (65.3%), acne (53.7%), and desquamation (39.1%) were the most common skin lesions in the general population. Except for erythema and the aggravation of pre-existing facial skin diseases, the distributions of the other skin lesions in the two groups were significantly different (p < 0.05). The involved sites included cheeks, chin, nasal bridge, forehead, and ears. The cheek was the predominantly involved site in HCWs (59.8%) and the general population (63.2%), and the distribution between the two groups was not significantly different (p = 0.372). More than half of the participants tend to alleviate facial discomfort by reducing the wearing time of masks (56.3%, p = 0.523). Up to 32.6% of the HCWs took a negative attitude in dealing with skin injuries, whereas the general population indicated a higher proportion of treatment (Table 2).

Univariate/Multivariate Logistic Regression Analysis of Facial Skin Barrier Damage

Skin barrier damage was set as the dependent variable (0 = none, 1 = yes), and the single factors with p < 0.05 were set as the independent variables (history of chronic skin

Table 3. Univariate/multivariate logistic regression analysis of skin barrier damage caused by masks

Variable	Facial skin damage		Univariate analysis		Multivariate analysis	
	no (n = 759)	yes (n = 650)	OR (95% CI)	p value	OR (95% CI)	p value[a]
Age, n (%)			0.78 (0.67–0.92)	0.002		
≤20 years	100 (13.2)	73 (11.2)				
21–30 years	345 (45.5)	383 (58.9)				
31–60 years	299 (39.4)	191 (29.4)				
>60 years	15 (2.0)	3 (0.5)				
Gender, n (%)			1.05 (0.85–1.30)	0.643		
Female	355 (46.8)	296 (45.5)				
Male	404 (53.2)	354 (54.5)				
Occupation, n (%)			1.01 (0.81–1.25)	0.951		
Healthcare worker	306 (40.3)	261 (40.2)				
General population	453 (59.7)	389 (59.8)				
History of chronic skin disease[b], n (%)			6.14 (4.86–7.75)	<0.001	6.07 (4.75–7.75)	<0.001
No	174 (22.9)	420 (64.6)				
Yes	585 (77.1)	230 (35.4)				
Types of masks used, n (%)						
Single-use mask	376 (49.5)	225 (34.6)				
N95 mask	78 (10.3)	166 (25.5)	3.56 (2.59–4.88)	<0.001	2.77 (1.95–3.93)	<0.001
Surgical mask	296 (39.0)	242 (37.2)	1.37 (1.08–1.73)	0.010	1.20 (0.92–1.57)	0.186
Cotton/paper mask	9 (1.2)	17 (2.6)	3.16 (1.38–7.20)	0.006	2.15 (0.83–5.52)	0.113
Daily wearing time, n (%)			1.33 (1.18–1.50)	<0.001	1.57 (1.36–1.82)	<0.001
<1 h	81 (10.7)	19 (2.9)				
1–4 h	246 (32.4)	204 (31.4)				
4–8 h	274 (36.1)	256 (39.4)				
>8 h	158 (20.8)	171 (26.3)				
Mask replacement cycle, n (%)			0.77 (0.79–0.85)	<0.001	0.76 (0.68–0.86)	<0.001
<4 h	116 (15.3)	109 (16.8)				
4–8 h	230 (30.3)	269 (41.2)				
8–24 h	158 (20.8)	147 (22.6)				
>24 h	255 (33.6)	125 (19.2)				

OR, odds ratio; CI, confidence interval.

[a] $p = \frac{1}{1+\exp\left[-\left(-1.741+1.803X_1+0.451X_2-0.272X_3+1.018X_4\right)\right]}$

[b] Chronic skin disease included eczema, atopic dermatitis, allergic dermatitis, and acne.

disease: none = 0, yes = 1; type of mask used: single-use mask = 0, N95 mask = 1, surgical mask = 2, cotton/paper mask = 3). Age, daily wearing time, and mask replacement cycle were treated as continuous variables and used in the multivariate logistic regression model using a stepwise forward procedure. Age as a variable was removed from the final multivariate logistic model, and the history of chronic skin diseases was retained. The type of mask used, daily wearing time, and mask replacement cycle were related to the occurrence of skin barrier damage. Individuals with a history of chronic skin disease were at higher risk for skin barrier damage compared with those without a history of chronic skin disease (OR, 6.01; 95% CI, 4.75–7.75). Compared with individuals who usually wore single-use masks, individuals who wore N95 masks had significantly higher odds of skin barrier damage (OR, 2.77; 95% CI, 1.95–3.93), as did respondents who wore cotton/paper masks (OR, 2.15; 95% CI, 0.83–5.52) and those who wore surgical masks (OR, 1.20; 95% CI, 0.92–1.57). Prolonged average daily wearing time (OR, 1.57; 95% CI, 1.36–1.82) could significantly increase the risk of skin barrier damage. Interestingly, we found that prolonged mask replacement cycle was associated with a decreased skin barrier damage risk (OR, 0.76; 95% CI, 0.68–0.86) (Table 3).

Discussion

Our study found that 46.1% (650/1,409) of the participants reported skin barrier damage. This proportion was higher than that (31.5% among 422 HCWs) reported in a 12-month cross-sectional study conducted in Ethiopia, which investigated the prevalence of self-reported occupational-related contact dermatitis [9]. Another study indicated that during the severe acute respiratory syndrome pandemic in Singapore, the prevalence of adverse skin reactions caused by wearing masks was 35.5%, and the most common adverse skin reactions were acne (59.6%), itching (51.4%), and rash (35.8%) [10]. In our study, itching (57.9%) and erythema (63.4%) were the most common symptom and skin lesion, followed by acne (59.9%) and indentation (37.2%), with significant differences in distribution between the two groups (all $p < 0.001$). Itching and erythema may be associated with increased facial skin temperature [11] caused by telangiectasia associated with prolonged use of masks and irritant contact dermatitis related to the components of the mask [12]. If the mask is used for a long time or repeatedly, the area covered by the mask will form a relatively closed humid and hot microenvironment, which will induce the breeding of bacteria [13]. Local oppression may also lead to the blockage of the secretion of sebaceous glands in the hair follicle, which will easily lead to the occurrence of acne [14].

The cheek was the most common site of skin barrier damage in both groups (59.8% in HCWs and 63.2% in the general population). The nasal bridge and ear are mostly related to pressure-related injuries caused by masks, which manifest as indentation or pain behind the ears. The prevalence of these injuries was significantly higher in HCWs than in the general population (indentation: 31.8 vs. 12.6%, pain behind the ears: 51.3 vs. 27.8%; all $p < 0.001$). Most HCWs use N95 and surgical masks with better sealing (72.0%, 408/567), whereas most of the general population wear single-use masks (53.2%, 448/842). A Polish study found that a majority of the public prefer to use cotton masks (46.2%) [15]. A gel dressing should be applied on the bridge of the nose where pressure is most likely to be felt, and an ear-loop mask should be replaced with a belted one to relieve pain at the back of the ear [12, 16]. Prolonged mask use aggravated the pre-existing skin diseases of some of the participants (13.2%). These diseases included seborrheic dermatitis and allergic dermatitis, which may be the reason for the skin damage on their uncovered forehead. Another explanation is that discomfort while wearing a mask leads to frequent touching of the face, which is one of the potential risks of pathogen transmission if hand hygiene is not guaranteed [17].

No remarkable differences in adverse skin reactions were found between genders ($p = 0.643$). This finding is consistent with the study conducted in Singapore [10]. Compared with those without a history of chronic skin disease, the participants with a history of chronic skin disease were more prone to skin barrier damage. Patients with a history of chronic skin diseases, especially atopic dermatitis, are stimulated by allergens (masks). The sensitivity of individuals to the induced response triggered by allergens is enhanced – through the IL4/Th2 pathway [18, 19]. Among the HCWs, 88.2% (500/567) wore masks for more than 4 h per day on average, and 43.9% (249/567) wore masks for more than 8 h. Only 9.5% (80/842) of individuals in the general population wore masks for more than 8 h. Among the 567 HCWs, 34.0% ($n = 193$), 26.98% ($n = 153$), and 30.15% ($n = 171$) had a mask replacement cycle of 4–8, 8–24, and >24 h, respectively. Among the 842 individuals from the general population, 36.34% ($n = 306$), 18.05% ($n = 152$), and 24.83% ($n = 209$) had a mask replacement cycle of 4–8, 8–24, and >24 h, respectively. The mask reuse rate was higher in HCWs than in the general population ($p < 0.001$). Prolonged daily wearing time could significantly increase the risk of skin barrier damage. This finding is consistent with the observations reported by Purushothaman et al. [20]. Interestingly, we found that prolonged mask replacement cycle may decrease the risk of adverse skin reactions. Certain reasons can explain this. It has been documented that the organic ingredients contained in masks may lead to irritant contact dermatitis [10, 21], while overtight fitting could also cause pressure injuries [22]. Due to inadequate supply of masks, a substantial proportion of individuals washed and reused masks, which might have removed allergenic ingredients and relaxed masks.

N95 masks or surgical masks decrease particulate matter emissions by 90 and 74% on average, respectively [23], compared with not wearing masks during talking and coughing. More than half of the two groups alleviated facial discomfort by reducing wearing time (54.8 and 57.3% in HCWs and the general population, respectively). Poor compliance could not effectively reduce the spread of diseases [24, 25]. In addition, 32.6% of the HCWs took negative measures after skin barrier damage compared with a remarkably higher level of initiative and enthusiasm among the general population. This result may be related to the high demand of the general population for facial comfort and beauty, as well as the heavy workload of HCWs, who generally lack the time and energy for self-treatment or visits to dermatologists.

In this study, the prevalence of adverse skin reactions was not statistically different between HCWs and the general population ($p = 0.951$). This finding deviates from our hypothesis (a higher prevalence in HCWs than in the general population). The adaptability of HCWs to masks is higher than that of the general population because of the particularity of their occupation, which requires HCWs to wear masks frequently. The general population probably showed a higher sensitivity to adverse skin reactions, which might have elicited a reaction bias.

Masks are critical to protect individuals from COVID-19; however, the prolonged use of masks causes a variety of facial discomfort among HCWs and the general population. Some people may not seek treatment or take inappropriate self-treatment for their symptoms. Postinflammatory hyperpigmentation may occur in prolonged cases. About 10.77% of the participants in our research reported postinflammatory hyperpigmentation. Thus, the potential risk factors are important to understand. Appropriate measures can be taken to prevent or minimize these conditions and are essential to help alleviate long-term skin sequelae and maintain compliance.

Limitations of the study exist. Some degree of misclassification may result from self-reported data. We attempted to randomly select 5% of the responses submitted on the same day to validate the reported answers in a subsample of participants. In addition, some participants may overlook mild to moderate symptoms, which may cause conditional underestimation because of recall bias.

In this cross-sectional study from Jiangsu Province, the prevalence of skin barrier damage was relatively high among HCWs and the general population during the COVID-19 pandemic. History of chronic skin diseases, type of masks used, daily wearing time, and frequent mask replacement cycle were risk factors associated with skin barrier damage. Inadequate supply of masks and lack of awareness of treatment and prevention are common. Based on these findings, we see a need for governments and medical institutions to increase the reserves of masks during the COVID-19 pandemic. Furthermore, training and popularizing scientific knowledge on personal protection should be reinforced.

Key Message

Skin barrier damage due to mask use was common, and treatment and prevention were inadequate.

Statement of Ethics

All patients have given their informed consent, and the study protocol has been deemed exempt by the ethics committee of our hospital.

Conflict of Interest Statement

The authors do not have any conflicts of interest concerning this study.

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The authors have no funding sources to declare.

Author Contributions

Xiao Wan contributed substantially to the conception and design of the study, the acquisition, the analysis and interpretation of data, and drafted and provided the final manuscript. Quansheng Lu contributed to the acquisition, the analysis and interpretation of data, and supervised the study. Dandan Sun and Hong Wu contributed to the acquisition and the analysis and interpretation of data. Prof. Guan Jiang contributed to the conception and design of the study, supervised the whole research, and provided final approval of the version to be published.

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