

ORIGINAL ARTICLE

Evaluation of skin problems and dermatology life quality index in health care workers who use personal protection measures during COVID-19 pandemic

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Abstract

The aim of this study was to evaluate the skin problems and dermatological life quality of the health care workers (HCWs) due to personal protection equipment (PPE) use, who are at high risk for COVID-19 infection. A questionnaire about HCWs' PPE use, their skin symptoms, and prevention, management methods and Dermatology Life Quality Index (DLQI) was fulfilled. The median age of 440 participants was 33.5 (21.0-65.0) years old. Skin problems were found to be 90.2%, the most common were dryness, itching, cracking, burning, flaking, peeling and lichenification. The presence of skin problems ($P < .001$) was higher in those who did not use moisturizers. Of all, 22.3% ($n = 98$) stated that the use of PPE increased the severity of their previously diagnosed skin diseases and allergies ($P < .01$). Only 28.0% ($n = 123$) stated that they know the skin symptoms that may develop by using PPE. The proper hand washing rate was higher as education level increased ($P < .001$). Skin problems were higher in those using mask with metal nose bridge ($P: .02$ and $P: .003$, respectively). As the mask using period prolonged, acne was more common ($P: .02$). DLQI was significantly affected in women ($P = .003$), and with increased skin problems related to PPE ($P < .001$). It is important to organize trainings on prevention and management of possible skin symptoms due to PPE use according to guidelines.

KEYWORDS

COVID-19, dermatology life quality index, health care workers, personal protection equipment, skin

1 | INTRODUCTION

Covid-19 outbreak was declared as a pandemic on 11 March 2020 by the World Health Organization.^{1,2} In Turkey, the first case was diagnosed on 11 March and pandemic was declared on 16 March 2020.³

SARS-CoV-2 is transmitted through virus-containing droplets and contaminated objects.⁴ Rapid transmission, variable incubation time, unidentified transmission ways, presence of asymptomatic carriers, lack of herd immunity, and high mortality and morbidity rates associated with SARS-CoV-2 have been factors that concern clinicians and

researchers worldwide. Still, we have limited information about the pathogen.⁵ While millions of people remain at home to minimize disease transmission worldwide, healthcare workers (HCWs) are at high risk, as they have to go to the hospital. The China International Health Commission reported that at least 22 HCWs died and 3300 HCWs were infected in the early days of March. In Italy, 20% of HCWs are infected and some are dead. So, as the pandemic accelerates, the use of personal protective equipment (PPE) has come into prominence.⁶ WHO has defined aprons, gloves, medical masks, N95 or FFP2 masks, goggles or face visors, gowns as PPE and alcohol-based disinfectants and soap are recommended for hygiene.¹

The skin is the body's first defense barrier, and therefore maintaining skin integrity is essential to prevent the spread of COVID-19.⁷ The use of PPE such as glasses, masks and protective clothing may impair skin integrity, so dermatological problems should be taken seriously.⁸ It is pointed out that there is high cutaneous irritation due to the use of N95 masks and glasses. Cutaneous side effects related to the use of PPEs were also noted in the SARS-2 epidemic in previous reports.^{9,10}

In literature, there are few studies about skin problems caused by the use of PPE in HCWs during the COVID-19 pandemic period and none has studied the dermatologic life quality related to the skin problems experienced. In this study, we aimed to evaluate the skin problems and dermatological life quality of the HCWs due to PPE use and personal hygiene measures in our hospital.

2 | MATERIALS AND METHODS

The study was approved by Ministry of Health and ethics committee of our faculty. A questionnaire about HCWs' PPE use, their skin symptoms, and prevention, management methods was fulfilled. We included doctors, nurses, cleaning staff, and medical secretaries who work in close relation with the patients as HCWs. The printed questionnaires were delivered by the researchers and infection control committee members who are nurses reaching all of the Covid and non Covid outpatient, inpatient services. HCWs working in inpatient and outpatient services of Covid-19 and who can be reached in the current pandemic working conditions, were included in the study on a voluntary basis. Besides, Dermatology Life Quality Index (DLQI) which is a simple, 10-questioned index based on symptoms, patient feelings, daily activity, leisure time, school/work life, personal relationships, and treatment was used.¹¹⁻¹⁴ DLQI is interpreted as; 0 to 1 points = no effect at all, 2 to 5 points = small effect, 6 to 10 points = moderate effect, 11 to 20 points = very large effect, and 21 to 30 points = extremely large effect on patient's life. It was translated and validated in Turkish by Öztürkcan et al.¹¹⁻¹⁴

2.1 | Statistical analysis

Descriptive data were summarized with mean, SD, median, min-max, number, and percentage values. Chi-square (χ^2) test was used to compare categorical data, and Mann-Whitney *U* test and Kruskal Wallis test were used in independent groups. $P < .05$ was accepted as the limit value for significance.

3 | RESULTS

The median age of 440 participants was 33.5 (21.0-65.0) years. The sociodemographic characteristics of the HCWs and the PPE usage data are listed in Table 1. The use of visor, protective mask and gloves was higher in COVID-19 outpatient and inpatient service workers than others ($P < .001$).

TABLE 1 The sociodemographic characteristics of the HCWs and the Personal Protective Equipment usage data

	n	%
Gender		
Female	266	60.5
Male	174	39.5
Education		
Primary School	15	3.4
Secondary School	22	5.0
High School	68	15.5
University/higher	355	76.1
Occupation		
Nurse	191	43.3
Doctor	131	29.8
Cleaning staff	58	13.2
Secretary	32	7.3
Other	28	6.4
Work place		
Intensive care	41	9.3
Covid inpatient/outpatient clinic	218	49.5
Non-Covid	181	41.2
Apron use		
Yes	75	17.0
Daily time median (min.- max.) 4.0 (1-10) hours		
No	365	83.0
Mask use		
Daily time median (min.- max.) 8.0 (1-24) hours		
Yes, one mask	377	85.7
Yes, two masks	63	14.3
Mask with string	357	81.1
Mask with ribbon	83	18.9
With nose fixation metal	408	92.7
Without nose fixation metal	32	7.3
Glove use		
Yes	335	76.1
Daily mean time(min.-max.) 4.0 (1-8) hours		
No	105	23.9
Visor use		
Yes	163	37.0
With plastic forehead	133	81.6
Other Material	30	18.4
Daily time median (min.-max.) 4.0 (1-8) hours		
No	277	63.0
Goggles		
Yes	295	67.0
Daily time median (min.-max.) 4.0 (1-8) hours		
No	145	33.0

TABLE 2 Hygienic care and attitudes of HCWs

	n	%	Factor	P value
Hand washing properly and enough duration	397	90.2	Occupation	<0.001
			Age	<0.001
Hand washing frequency does not change, use disinfectant after washing	198	45.0		
Using disinfectant cologne after every hand washing	180	40.9		
Using moisturizer after every hand wash	100	22.7		
Used for hand cleaning*				
Liquid soap use	321	73.0		
Antibacterial liquid soap use	92	20.9		
Solid soap use	64	14.5		
Moisturizer use			Gender	<0.001
A cream from market	176	40.0		
Vaseline™	103	23.4		
Dr/ Pharmacist recommendation	67	1.2		
Other	44	10.0		
Do not use	50	11.4		
Daily showering frequency				
Once a day	329	74.8		
2-3 times	44	10.0		
4 or more	67	15.2		

When the hygienic habits of the HCWs were questioned, the nurses ($\chi^2 = 18\,887$, $P < .001$) and older HCWs washed hands in the correct and appropriate duration ($P < .001$). Hygiene and care practices are shown in Table 2.

Skin problems caused by PPEs used for COVID-19 and locations are listed Table 3. There was no relation between the frequency of taking shower and the presence of skin problems ($P = .23$). Solid soap usage was lower in those with skin problems ($\chi^2 = 7054$, $P = .03$). HCWs managed their with skin problems ($n = 397$) by self-preferred cream/pill ($n = 235$, 59.2%), dermatologist recipe ($n = 33$, 8.3%), friend advice ($n = 33$, 8.3%), pharmacist advice ($n = 20$, 5.0%) and the other methods ($n = 76$, 19.1%). The presence of skin problems ($\chi^2 = 37.550$, $P < .001$) was higher in those who did not use moisturizers. Skin cracking ($\chi^2 = 6.178$, $P = .01$), dryness ($\chi^2 = 29.944$, $P < .001$), itching ($\chi^2 = 8.874$, $P = .003$), flaking ($\chi^2 = 15.848$, $P < .001$), and lichenification ($\chi^2 = 6.977$, $P = .008$) were more frequent in those who did not use moisturizers. HCWs who used moisturizer by the recommendation of a doctor or pharmacist, or Vaseline() and market creams had lower cracking complaints ($\chi^2 = 12\,983$, $P = .005$). The use of moisturizer was higher in women than in men ($\chi = 19\,105$, $P < .001$). It's in Table 2.

Of all participants, 33.0% ($n = 145$) previously had an allergy; 6.6% ($n = 29$) had latex, 3.9% ($n = 17$) had metal allergies. Of the participants, 22.3% ($n = 98$) stated that the use of PPE increased the severity of their previously diagnosed skin diseases. With the use of PPE, there was a statistically significant increase in skin symptoms in those with previous allergies ($P = .01$) and those with a skin disease ($P < .001$).

Among male HCWs, 35.1% ($n = 61$) had beard. There was no difference in having skin problems related to PPE use in men with beard ($P > .05$). Of the participants, 28.0% ($n = 123$) stated that they know the skin symptoms that may develop by using PPE. Among participants, 17.1% ($n = 21$) received information from the doctor, 42.3% ($n = 52$) from social media, 10.6% ($n = 13$) from friends, 30.1% ($n = 37$) left this question unanswered. Previously diagnosed skin disease or allergy did not affect their knowledge ($P > .05$).

The majority of HCWs wash their hands 20 times a day (6-50 times), and for 20 s on average. There was no statistically significant difference between washing hands in the right way and appropriate time during each hand washing and gender or working in COVID caring departments ($P > .05$). The right application rate was higher as education level increased ($P < .001$).

The presence of skin problems was higher in female HCWs, and in nurses ($P < .05$; Table 3). There was no statistically significant difference between the use of a mask with a thread or a ribbon and ear complaints ($\chi^2 = 0.013$, $P = .91$). Skin problems were higher in those using mask with metal nose bridge and located especially on the nose ($\chi^2 = 5.732$, $P = .02$ and $\chi^2 = 8.979$, $P = .003$, respectively). As the mask using period prolonged, acne was more common ($P = .02$). Dryness and cracking were higher in males while itching was higher in females ($P < .05$).

DLQI categories are showed at Table 4. DLQI was statistically significantly affected in women ($P = .003$), and with increased skin problems related to PPE ($P < .001$). DLQI was affected badly in those who had a mask-related skin problem on the cheek, nose, ear, chin, forehead and scalp ($P < .001$, $P = .013$, $P = .01$, $P = .01$, $P = .002$, $P < .001$). There was a significant relation in DLQI and using gloves ($P = .008$). When DLQI was evaluated according to the departments, there was no difference between the HCWs in the COVID services and other services ($P = .58$). Previously known dermatoses of HCWs, were classified as eczema ($n = 38$, 54.3%), psoriasis, urticaria, acne, and other. In the presence of previously known skin disease, PPE use was affecting DLQI badly ($P = .019$). There was no relationship between DLQI and the educational status of HCWs ($P = .5$). While the quality of life was badly affected in HCWs coping with the skin problems themselves, DLQI was not affected in those who received support from the dermatology department ($P < .01$).

4 | DISCUSSION

During the COVID-19 epidemic, it is important to ensure the safety of healthcare workers.¹⁵ The use of personal protective equipment has become even more important.⁶ In a cross-sectional study investigating skin problems related to the use of PPE in Wuhan, 292 (77.7%) were

	n	%	Factor	χ^2	P value
Skin problem					
Present	397	90.2	Gender	24,243	$P < 0.001$
Absent	43	9.8	Occupation	6,414	$P = 0.04$
*Skin Problems					
Dryness	337	76.6	Gender	44,376	$P < 0.001$
Itching	228	51.8	Gender	4,745	$P = 0.03$
Flaking	177	40.2	Gender	15,807	$P < 0.001$
Tingling	131	29.8	Gender		
Spalling	122	27.7	Gender	19,444	$P < 0.001$
Peeling	64	14.5			
Lichenification	63	14.3			
Swelling	47	10.7			
Acne	44	10.0			
Maseration	31	7.0			
Pruritis	17	3.9			
Rash	22	5.0			
Fungus	11	2.5			
*Skin problem location					
Mask					
Nose Bridge	179	40.7			
Ear	125	28.4			
Cheek	113	25.7			
Perioral	60	13.6			
Chin	65	14.8			
Visor					
Forehead	106	24.1			
Scalp	34	7.7			
Glove					
Hand surface	267	60.7			
Interdigital	100	22.7			
Palm	98	22.3			
Apron					
Goggles	7	1.6			
Ear	4	0.9			
Nose Bridge	13	3.0			
Plastic boot	3	0.7			
Disinfectant/ Cologne	62	14.1			

TABLE 3 Skin problems caused by PPEs used for Covid-19

female HCWs.¹⁶ Pei et al⁸ evaluated 484 HCWs; 75.8% of them were female. In current study, 440 HCWs working in our university hospital participated and more than half of them were nurses and doctors, and more than half were women.

HCWs mostly used masks, gloves, protective glasses, visors, and overalls as PPE. The use of visors, protective masks, and gloves was higher in the COVID outpatient and service staff, who needs intense protection.

In the studies, 73.5% to 97% of the HCWs experienced skin problems.^{8,9,16} Lan et al,⁹ reported that the nose bridge, hands, cheeks, nose

bridge + forehead were affected at most and the most common skin problems were dryness/tension and peeling. Dryness or peeling, papules or erythema, maceration was most frequently found on the hands, cheeks and nose bridge.¹⁶ Pei et al⁸ reported erythema, prurigo, bulla, ragads, papule/edema, exudation/dryness, lichenification and almost half of the lesions were on the face, followed by hands, legs, trunk, and the whole body. Atzori et al¹⁷ found that dryness, itching and burning problems were most common in HCWs and the most frequently affected areas are the bridge of the nose, hands, cheeks, periocular, and perioral regions. In this study, skin problems were found to be 90.2%,

TABLE 4 DLQI categories

	n	%
No effect at all	171	39.8
Small effect	146	33.2
Moderate effect	63	14.3
Very large effect	51	11.6
Extremely large effect	9	2.0

and the most common were dryness, itching, cracking, burning, flaking, peeling, and lichenification. They were mostly located on hand, finger toe and palmar areas. Depending on the mask, skin problems were detected on the nose, behind the ear, on the cheeks, on the forehead in visor wearers, and on the nose bridge in those wearing glasses. The presence of skin problems was higher in female HCWs than in men, and in nurses. This was an expected result, since most of the participants were nurses and women.

Foo et al reported that 1/3 of healthcare professionals using N95 experienced acne, facial dermatitis, and pigmentation in the nose bridge cheeks and chin, and acne was the most common problem related to N95. Occlusion and friction were mentioned as the underlying mechanism.^{10,18} Shing et al,¹⁹ evaluated facial dermatitis due to PPE and irritant contact dermatitis (39.5%) was found most frequently, followed by friction (25.5%) dermatitis. Goggles were the most common culprit agent among all PPE causing any one of the dermatoses (51.92%), followed by N95 masks (30.77%) and face shields (17.31%). Nasal bridge (63%) was the commonest anatomical site affected due to dermatoses followed by cheeks and chin (26%). The most common symptom experienced by patients was pruritus (67.44%), while erythema (53.49%) was the most common sign observed. The duration of wearing the goggles and mask, excessive sweating and ill-fitting masks, all were associated with increased sensation of irritation.

In our study, the mask was a frequently used equipment, and surgical mask was used at most. People who used the N95-99 mostly preferred a valve-free mask. Nearly all of the masks had nasal metal wire. The fact that the mask had string or ribbon ear holding part did not differ skin problems behind the ear. As the mask use duration increased, pimples were more frequent, similar to the literature. This can be explained by the acne-causing feature of occlusive materials.²⁰ The presence of skin problems and especially nasal lesions were higher in those using a mask with nasal fixation bar. This can be explained by the pressure effect of metal, friction and contact sensitivity that nickel can create.^{10,17,18,19,21} In addition, those who used glasses had skin findings on the nose for similar reasons. Visor users had contact skin lesions, which could be due to material contact and the occlusion effect. Participants wearing overalls had no skin problem, this may be explained by the numerical scarcity, the fact that the material did not contact the skin directly and seasonally cool working conditions. Dryness and cracking were higher in males while itching was higher in females. Because men tend to use skin care products less; dryness/cracking is expected more.²²

WHO recommends proper and frequent hand washing to prevent the spread of pandemic diseases and to be protected. Alcohol-based hand cleaners had become widespread worldwide. Although hand washing with soap is the most recommended method, products containing ethanol are used in cases where water cannot be reached. Those who use alcohol-based hand washing products have increased skin problems.^{1,20,23} Contact dermatitis is an inflammatory response.²⁴ Irritant contact dermatitis is the most common form of occupational dermatoses. It impairs both the functional and the quality of life of HCWs. Washing hands frequently with alcohol-based products is a risk factor for hand dermatitis. Although gloves are seen as protective barriers, wearing gloves for a long time can disrupt the epidermal barrier, while the glove itself can cause deterioration of the barrier, and when the skin becomes irritated, it is susceptible to allergens and other irritants. In occupational dermatoses, hands are the most frequently affected area.²¹ Wearing long-term gloves causes hyperhydration and contact reactions.²⁵ Frequent washing of hands and disinfectant use in healthcare workers cause peeling, cracking, itching, bleeding on hand. Irritant contact dermatitis was detected in 98% of the employees in a study conducted in HCWs and was associated with frequent hand washing.^{20,21} It is considered that hand dermatitis will increase in COVID-19 period.²⁶ Lan et al,⁹ reported that those who wore PPE for more than 6 h had a higher risk of encountering skin problems. Frequent hand washing was found to be riskier than the washing duration for skin problems. Wearing glasses for more than 6 h has been reported to cause facial dermatitis, washing more hands more than 10 times, causing increased skin problems.¹⁷ The majority stated that they wash hands for the right and proper time for hygiene. Nearly half stated that their hand washing frequency did not change and disinfectant is used after hand washing. The majority of HCWs wash their hands 20 times a day (6-50 times), and for an average of 20 s. Three quarters of the HCWs used liquid soap and skin problems were higher in those who used liquid soap. Interestingly, there was no relationship between the shower frequency and skin lesions. In more than a quarter there was previously known latex and nickel allergies. In addition, the patients used the mask for an average of 8 h a day and other PPE for an average of 4 h, unlike other studies. Irritant contact dermatitis is the most common problem in patients causing dryness, peeling, itching, cracking, burning and scaling problems in the hands. Based on the literature data and the data of our study, we recommend that "covid hand dermatitis" would be a descriptive name for irritant dermatitis for this type of eczema during this period.

It is important to use moisturizers frequently in contact dermatitis. Wearing cotton gloves under the plastic gloves can help.²⁷ In our study, half of the HCWs managed their problems by using creams and pills, followed by those who received professional support from dermatology. Almost half who use creams and pills got knowledge on social media. In those who did not use cream, skin cracking, dryness, itching, flaking, lichenification was higher. Moisturizer use was higher in females than males. Women use cosmetics more frequently than males.²² Gender and working at COVID services had no effect on proper hand washing. As education level increases, knowing right practice was higher. This can be attributed to the regular hand washing training and professional experience.

Training on proper use of PPE and restricting wearing duration, could avoid some cutaneous adverse events.²⁸ In a study, workers with occupational dermatosis had been trained about protection from hand dermatitis and workers adhering to the training recommendations were better both in symptoms and in skin barrier maintenance.²⁹ We think that HCWs should be informed about possible skin symptoms that can result from PPE and personal hygiene habits, since how long the COVID-19 process will last is not known and health care professionals are at the forefront.

Unlike the studies listed above, almost a quarter of the participants had dermatosis at initial, and the use of PPE exacerbated skin symptoms of those who had a previous allergy or skin disease. This can be due to allergens exposed, ingredients and odor besides exposure duration to cleaning products and frequency of hand washing. Contrary to expectations, previous skin disease or allergy did not affect HCWs' knowledge about PPE originated skin symptoms.

This is the first study in which the skin symptoms related to PPE in COVID pandemic, are evaluated by DLQI of HCWs. Occupational dermatoses affected the quality of life, especially in different occupational groups.^{30,31} In current study, we demonstrated that PPE and hygiene habits had a mild to moderate impact on the majority of HCWs' dermatologic quality of life. DLQI scores were worse in female HCWs, in those with previous skin disease and had skin symptoms related to PPE use.

4.1 | Limitations

The skin symptoms were determined subjectively and could not be evaluated by a dermatologist. Further studies can put forth objective results.

This is not only the first study to reveal that the skin symptoms affected the quality of life in literature, but also the first study detecting the skin problems of HCWs in Turkey during the pandemic process. Nearly all HCWs had skin symptoms. The most common skin problems were dryness, itching, cracking and scaling on hands, suggesting irritant contact dermatitis, which can be defined as the term "Covid hand dermatitis". Most of the HCWs did not have information about the skin symptoms and they cope with the skin problems themselves. It is important to organize trainings on prevention and management of possible skin symptoms due to PPE use according to guidelines. Hospital management team and dermatologists should act together to be successful in managing the problems that arise.

AUTHOR CONTRIBUTIONS

Munise Daye: idea of study, preparing questionnaire, collecting data, writing article, last proofreading, getting approval of ethic permissions. Fatma Gökşin Cihan: writing article, collecting data, preparing questionnaire, analyzing data. Yasemin Durduran: statistical analysis, preparing questionnaire, collecting data. We thank all the HCWs who participated and appreciate the great support of Infection Control Committee members of Meram Medical Faculty.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are openly available in [repository name e.g "figshare"] at [http://doi.org/\[doi\]](http://doi.org/[doi]), reference number [reference number].

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