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Research Article

Skin Manifestation of Healthcare Providers

Skin Manifestations of Personal Protection Devices and Sanitizers Among COVID-19 Healthcare Providers: A Survey at Southern Region Hospitals, Saudi Arabia

Hamad Ayed Alfahaad[1*], Mahdi Turki Bin Ali Alfataih[2], Bader Maiedh Mohsen Al Adainan[2], Alhassan Ahmed M Al Dundur[2], Ali Mahdi J Alyami[2], Ali Hadi M Alyami[2], Mana Mahdi R Almunajjim[2], Hamad Mahdi K Al Khamsan[2], Ali Mansour Z Al Abbas[2], Rashed Saleh M Balhareth[2], Batool Hamad Hussain Alyami[2] and Aljoharah Ali H Alzabin[2]

[1]*Associate Professor, College of Medicine, Najran University*

[2]*Medical Intern, College of Medicine, Najran University*

Abstract: Staff infection control measures, such as more personal protective equipment (PPE) and more stringent hand hygiene practices, have resulted in an increase in the prevalence of occupational skin disease among frontline workers. Objective: Measure the prevalence of occupational skin diseases among health care workers during the COVID-19 pandemic at the general hospitals in Najran region, Southern Saudi Arabia. Method: A cross-sectional study was conducted at the general hospitals in Najran region, Southern Saudi Arabia, during the period from 1st March to 31st April 2022. A self-administered online questionnaire was distributed to all health care professionals (physicians, nurses and paramedics). The questionnaire included questions regarding the condition of skin damage and the frequency/duration of several infection prevention measures. Results: 68.2% had new onset of obvious skin damage and 31.8 % did not. 21.6% of the new onset of obvious skin damage was on the fingertips, 46.6% was on the hands, 22.4% was in paws, 3.4% was on the face and 6.0% was under the eye. 29.8% of the symptoms of the damaged site was itching, 44.7% dryness, 12.8% burning/pain, and 12.8% tenderness. 16.5 % of the type of skin lesions was peeling, 28.2% fissure, 18.8% erosion/ulcer, 24.7% redness, 4.7% papule (pimples) and 7.1% others. Conclusion: In our study, 68.2% of our participants suffered obvious skin damage during the pandemic: 90.6% of this occurred on the hands and 9.4% on the face. Contact dermatitis in the form of itching, dryness, burning, pain and tenderness were the most common adverse effects noted. Therefore, it is important to organize training on the prevention and management of possible skin lesions due to PPE use according to guidelines.

***Corresponding Author**

Hamad Ayed Alfahaad , Associate Professor, College of Medicine, Najran University

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1. INTRODUCTION

In epidemics involving highly infectious diseases, such as Ebola, severe acute respiratory syndrome (SARS), or coronavirus (COVID-19), healthcare workers (HCW) are at much greater risk of infection than the general population due to their contact with patients' contaminated body fluids. Personal protective equipment (PPE) can reduce this risk by covering exposed body parts [1]. COVID-19 can occur if a person touches a surface contaminated with SARS-CoV-2 and then the hands come into direct contact with mucous membranes such as the eyes, nose, or mouth. Thus, sufficient washing of hands with soap and water or hand sanitizers is recommended[2]. Hand sanitizers mainly comprise ethanol, isopropyl alcohols, and hydrogen peroxides in different combinations. These preparations may become toxic to human health and the environment if misused as they may become overly released by evaporation[3]. Whilst frequent use of hand sanitizers is proven to kill bacteria and viruses on organic surfaces, alcohol is also known to have a drying effect on skin by removing moisture, resulting in skin that is dry, flaky, and sensitive to the touch. In addition to being uncomfortable, the American Academy of Dermatology Association notes that having dry skin can actually increase the chances of contracting infections, and it can also trigger an eczema breakout. According to the Center for Disease Control and Prevention (CDC), the best way to clean hands is with soap and water, if available[4]. A common form of PPE is a medical mask, which has been recommended for wear by healthcare professionals since the outbreak of COVID-19. The effects of wearing these for extended periods include skin irritation as wearing of a face mask leads to the accumulation of oils, dirt and sweat on the skin. This accumulation can cause skin irritation, redness, and even a rash that may worsen acne[5]. For this reason, using masks made of cotton and natural filters, not synthetic fabrics, allows better air circulation to and from the mask. Washing masks after each use to clean and disinfect them of the dirt, washing of the face before wearing the mask, and not applying makeup under the mask are all recommended measures to keep the pores of the skin in their best condition[6]. Chapped lips are also a common side effect of wearing a face mask, so it is important to keep them moisturized[7]. Unfortunately, wearing a face mask during daylight hours in outdoor places can also cause sunburn in areas that are not covered by the mask. It is therefore recommended that wearers use sunscreen to protect the skin from the dangers of ultraviolet rays, especially on places that the mask does not cover[8]. Healthcare workers (HCWs) are also encouraged to wear gloves by the WHO in the direct care of the patients during the COVID-19 pandemic. Medical gloves are made of different polymers, including latex, nitrile rubber, polyvinyl chloride, polyurethane, and neoprene. Nitrile and latex gloves are preferred due to better durability[9]. Interestingly, hypersensitivity to natural rubber latex (NRL) has been increasingly reported, with an incidence of 2.8% to 17% among HCWs. In fact, HCWs are highly at risk of developing allergic reactions to NRL, especially operating room personnel, dental assistants, laboratory personnel, hospital housekeeping personnel, and ambulance attendants[10]. Atopic background, history of hand dermatitis, allergies to certain foods, begin female, and multiple exposures are among the risk factors for developing hypersensitivity to NRL. Skin reactions include localized pruritus, burning, stinging, and contact and generalized urticaria. The most frequently observed reaction is irritant contact dermatitis, presenting as dry, crusted, fissuring patches[11]. In suspected patients, a thorough history of allergic reactions to balloons, gloves, barium enema, and other latex devices should be taken. The gold standard in the diagnosis is skin-prick testing in patients with localized symptoms and latex-specific IgEantibody assessment in cases of systemic symptoms[12]. However, the wear and/or use test and the patch test are alternative diagnostic tests. The most effective approach for the management of latex allergy is personal and environmental avoidance via the use of hypoallergic gloves[13]. There have been several dermatologic diseases reported to be associated with the wearing of PPE. Health care workers can develop acne mechanica as mechanical trauma from the mask and goggles can cause rupture of micro-comedones, resulting in inflammation. The mask and goggles also create a hot and humid environment, causing excess sweat and sebum accumulation on the face. This enhances bacterial growth (*Propionibacterium acnes*) and creates an ideal environment for acne. Health care workers may also develop erythema and indentation from pressure caused by prolonged wearing of goggles and masks. Common sites for this are the nasal bridge and cheeks. Occasionally, blisters or erosion can develop at the sites of pressure[14]. Hand dermatitis is a major skin disease associated with increased hand hygiene in conjunction with COVID-19 precautions. The hands have been reported to be a common site affected during this pandemic, potentially caused by the occlusion effects of gloves, glove powder, soaps and incomplete hand drying before donning gloves [15]. In such skin reactions, topical steroids are used for inflammation and intensive emollients for skin barrier repair. When using lipid-bearing emollients or barrier creams on the hands, this should be done at least 1 h before a shift. Health care workers should also ensure their hands are completely dry before using PPE to avoid occlusive effects that precipitate skin damage. Avoiding oil or petroleum- based hand creams, as they may cause glove damage, is also recommended[16]. It has been reported that more advanced protection, increased working frequency, and longer wearing times of protective suits, are more correlated with the appearance of facial skin lesions. The appearance of erythema was found to be related to protection level, working frequency, and the duration of wearing a protective suit[17].

2. PARTICIPANTS AND METHOD

2.1 Setting and Population

A cross-sectional study was conducted at the general hospitals in Najran region, Southern Saudi Arabia during the period from 1st March to 31st April 2022.

2.2 Sample Size

The calculation methodology of the sample size for the population survey used a "Raosoft" sample size calculator. According to this method, a minimum of 302 participants were needed to provide a margin of error alpha (α) = 0.05, a confidence level = 95%, and response of distribution = 50%. This was increased to 332 to compensate for non-responses and incomplete forms.

2.3 Data Collection

Self-administered online questionnaires were distributed to all healthcare professionals (physicians, nurses and paramedics) at the Najran General Hospitals, Najran, Saudi Arabia. The questionnaires included questions regarding the condition of

skin damage and the frequency or duration of several infection prevention measures (wearing PPE and using sanitizers).

2.4 Data Analysis

Data was analyzed using SPSS version 26 with descriptive statistics (frequency and standard deviation). For the qualitative data, comparisons between groups were determined using the chi-squared test, and a p value less than 0.05 was considered as significant.

2.5 Ethical Considerations

Ethical approval was obtained from the ethics committee of Najran University, and consent was obtained from the participants. All data was kept confidential and was only used for the purpose of the study.

3. RESULTS

4.1 Demographic Characteristics

Table[1] shows the socio-demographic data of the participants. The study included 303 participants according to the inclusion criteria. Most (46.9%) were males More than half (56.8%) of the participants were 20-30 years old, 28.1% of them were between 31 and 40 years old, 12.5% were between 41 and 50 years old, and only 2.6% were between 51 and 60 years old. Most of our participants (38.6%) were physicians, 24.4% were nurses, 21.1% medical students and interns, and 10.6% from the ICU department.

Parameter			
Gender	Male	142	46.9
	Female	161	53.1
Age (in years)	20-30	172	56.8
	31 - 40	85	28.1
	41 - 50	38	12.5
	51 - 60	8	2.6
Area of work	Computer scientists	1	0.3
	CSSD specialists	3	1.0
	Physicians	117	38.6
	Lab specialists	21	6.9
	Medical students and interns	64	21.1
	Nurses	74	24.4
	Pharmacists	10	3.3
	Physiotherapists	7	2.3
	Radiologists	6	2.0
	ICU Staff	32	10.6
	Emergency Department Staff	78	25.7

4.2 Understanding the COVID-19 Disease and Personal Safety Precautions

As shown in table (2) 27.1% of our participants had a history of chronic skin disease such as hand eczema, atopic dermatitis and allergic dermatitis. 29.0% performed standard hand hygiene procedures 1-5 times daily, 36.0% 5-10 times daily, 21.1% 11-15 times daily, and 13.9% performed standard hand hygiene procedures more than 16 times daily. In 60.4% of the participants, the type of hand hygiene mainly used was both hand sanitizers (alcohol) and water and soap, 21.8% used hand sanitizers (alcohol) only while 17.8% used water and soap only. Regarding the type of device protecting the eyes, 20.8% wore face shields, 13.5% wore goggles, 36.3% wore both, and 29.4% did not wear any. The duration over which the protective devices (gloves, goggles, face shield or gown) were worn every day. 75.3% wore protective devices for 6 hours or less and 24.7% wore protective devices for more than 6 hours as shown in Figure (1). Table (3) illustrates the presence of new onset of obvious skin damage with the sites and symptoms. Of the participants, 33.3% experienced new onset of obvious skin damage. 23.1% of this damage was on the hands, 15.2% on the face, 13.2% on the nose, 7.6% on the feet, 5.9% on the legs, 3.6% on the trunk and 0.3% was under the eye. Symptom of skin lesions was dryness in 22.1%, itching in 16.8%, 10.2% was burning/pain and tenderness in 3.6%. As regards the type of skin lesions, 21.3% was peeling, 12.2% was fissure, 5% was erosion/ulcer, 16.5% was redness, 5.9% was papule (pimples), and 2% was maceration.

4. DISCUSSION

Infection prevention measures among HCWs have lately been linked to skin damage in a number of nations throughout the world. During As the COVID-19 pandemic continues, our study raises awareness about the risk factors and incidence of adverse skin responses connected with infection-prevention methods. Staff infection control measures, such as more personal protective equipment (PPE) and more stringent hand hygiene practises, have resulted in an increase in the prevalence of occupational skin disease among frontline workers (Ferguson et al., 2020). The objective of the study was to measure the prevalence of occupational skin diseases among health care workers during CPVID-19 pandemic, at the general hospitals in Najran region, Southern Saudi Arabia. It was a cross-sectional study conducted at the general hospitals in Najran region, Southern Saudi Arabia, during the period from 1 March to 31 April, 2022. In our study, 33.3% of our participants experienced obvious skin damage during the

pandemic, 23.1% of which was on the hands, 15.2% on the face, 13.2% on the nose, 7.6% the feets, 5.9% in the legs, 3.6% in the trunk and 0.3% was under the eye. However Akbulut et al. (2021) reported that in his study, adverse skin reactions were reported by 79.5% of the participants, hands (63.5%) and face (48.9%) were the most commonly affected body part in HCWs during the pandemic [19]. (Kiely and moloney 2020) mentioned that in total, 82.6% of their respondents had experienced skin lesions. The most commonly affected site were the hands (76.47%) followed by the nose (13.73%) and cheeks (12.55%)[20]. (21) reported that the hands were the most commonly affected site (72.3%) in their study, and (22) reported that the affected sites included the nasal bridge, hands, cheek and forehead, with the nasal bridge being the most commonly affected (83.1%). In (23), skin changes were reported by 41.5% of respondents; the hands were the most common site (77.3%) followed by nasal bridge (63.6 %), then cheeks and malar area (34.1 %). Finally (24) reported that the nasal bridge was the most common site of adverse skin reactions after wearing PPE (54.25%), then cheeks (52.83%), forehead (25.94%) and auricle (21.70%). These results are largely consistent with our figures. In our study, 75.3% of respondents wore protective devices (gloves, goggles, face shield or gown) for 6 hours or less per day and 24.7% wore protective devices for more than 6 hours per day. There was a highly significant relation between the presence of obvious new skin diseases and the duration of wearing protective devices (P<0.01). As noted in (20), the dermatitis group in their study recorded PPE usage for an average of 3.15 hours compared with the non-dermatitis group using continuous PPE for 1.97 hours; however, this was insignificant (P= 0.211). Moreover, in (22) health care workers who wore medical devices more than 6 hours per day had a higher risk of skin damage in corresponding sites than those who wore them for less time. In (24), it was reported that adverse skin reactions occurred in relation to the length of time that PPE was worn; 78.18% of participants wore PPE for over 4 hours, and the longest wearing time was 10 hours (1.09%). In terms of the symptom of skin lesions noted in our study, dryness was most prevalent (22.1%), followed by itching in 16.8%, 10.2% experienced burning/pain and 3.6% tenderness. As regards the type of skin lesions, 21.3% was peeling, 12.2% was fissure, 5% was erosion/ulcer, 16.5% was redness, 5.9% was papule (pimples), and 2% was maceration. These results are similar to those reported in (25), whereby contact dermatitis, acne and eczema were the most frequent disorders and itching and burning the most common symptoms. In (20), the most frequently reported symptom was dry skin, as in ours, with 75.37% of staff affected. 36.94% described redness and 27.61% complained of itching. (21) noted that 4.9% did not report any symptoms, but the most common reported symptom was pruritus in 45.5%, burning in 3.9% and stinging in 2.9%. Compound symptoms, such as itching and burning were found in 38.6%, these being the most common. In (26) a high prevalence of self-reported symptoms associated with hand eczema was found across all HCWs. Dryness was reported most frequently (83.2%), followed by erythema (38.6%), itching (28.9%), burning (21.1%), scaling (18.4%), fissures (9.6%) and pain (4.4%). (22) reported that dryness/tightness and desquamation were the most common symptoms (70.3%). (23) notes that dryness (84.1%) and skin peeling (79.5%) were the common clinical features, and (24) reported that pressure was felt under the nasal bridge in 78.54%, in the cheeks in 70.55%, forehead in 55.63%, and auricle in 52.36%.

TABLE (2): HISTORY OF CHRONIC SKIN PROBLEMS, HAND HYGIENE AND TYPE OF DEVICE PROTECTING THE EYES (N=303)

Parameter		No.	Percent
History of any chronic skin disease such as hand eczema, atopic dermatitis, allergic dermatitis	Yes	82	27.1
	No	221	72.9
Frequency of hand hygiene use per day	1- 5 times daily	88	29.0
	5-10 times daily	109	36.0
	11-15 times daily	64	21.1
	More than 16 times	42	13.9
Hand hygiene type mainly used	Hand sanitizers (alcohol)	66	21.8
	Water and soap	54	17.8
	Both	183	60.4
Type of device protecting the eyes	Face shield	63	20.8
	Goggles	41	13.5
	Both of them	110	36.3
	None of them	89	29.4

TABLE (3): PRESENCE OF NEW ONSET OF OBVIOUS SKIN DAMAGE WITH SITE AND SYMPTOMS (N=303)

Parameter		No.	Percent
Presence of new onset of obvious skin damage	**Yes**	**101**	**33.3**
	No	**202**	**66.7**
If yes, which site of the body was affected	**Face**	**46**	**15.2**
	Feet	**23**	**7.6**
	Nose	**40**	**13.2**
	Hands	**70**	**23.1**
	Legs	**18**	**5.9**
	Under the eyes	**1**	**0.3**

	Trunk	11	3.6
Symptoms of skin lesions	Dryness	67	22.1
	Itching	51	16.8
	Tenderness	11	3.6
	Burning/Pain	31	10.2
Type of skin lesion	Redness	50	16.5
	Peeling	64	21.1
	Papule (pimples)	18	5.9
	Fissure	37	12.2
	Erosion/Ulcer	15	5.0
	Maceration	6	2.0
	Dryness	2	0.7
	None	13	4.3

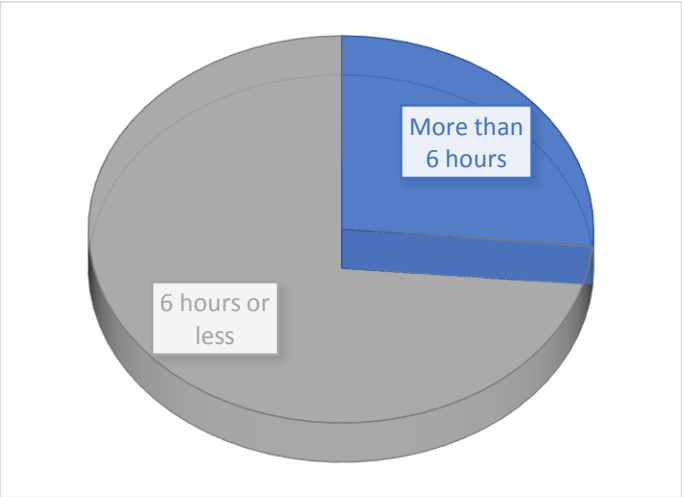

Fig (1): Duration of wearing protective device

5. CONCLUSION

In our study, 68.2% of our participants experienced obvious skin damage during the COVID-19 pandemic: 90.6% of this was on the hands and 9.4% on the face. Contact dermatitis in the form of itching, dryness, burning, pain and tenderness were the most common adverse effects noted. Therefore, it is important to organize training on the prevention and management of possible skin lesions due to PPE use according to guidelines.

6. AUTHOR CONTRIBUTIONS STATEMENTS

Conceptualization, technique, writing of the first draught, research, project management, and final editing by RT and PT. SSA and AA: supervision, joint project management, data gathering, feedback, and significant change. AM: formal analysis, validation, and software. SA: research and visualization. WA and DB are responsible for gathering data, making calculations, writing, editing, and formal analysis of the publication. FA: setting up the Google form and translating it into Arabic. Each author took part in the survey's distribution.

7. CONFLICT OF INTEREST

Conflict of interest declared none.

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