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Original

Hand dermatitis, Prevalence and Risk Factors among Healthcare Workers during the COVID-19

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ABSTRACT

Background: Healthcare workers (HCWs) need to perform new preventive measures to protect themselves and patients against ongoing COVID-19 transmission, which can increase hand dermatitis (HD) among them. This study aims to investigate the prevalence of HD among HCWs and its possible risk factors in IRAN. **Methods:** A survey of 159 HCWS working in university hospitals was performed from August to September 2020 in a cross-sectional study. Research data were collected via standardized self-administered questionnaire. The history of HD was determined via standardized Nordic Occupational Skin Questionnaire (NOSQ-2002). **Results:** The prevalence of HD in the study population was 51.6%. A significant association was found between the prevalence of HD among HCWs and sex, age, working hours per week, and wearing gloves ($P<0.05$). Females had a 3.84 fold higher risk of HD than males (confidence interval (CI): 1.85-8). HCWs older than 40 and those who aged 30-39 had a 9.6 and 1.72 fold higher risk of HD than those aged 20-29 (CI: 2.6-35.7; CI: 0.87-3.4, respectively). **Conclusion:** Possible risk factors for developing HD among HCWs are female gender, age, wearing gloves, and fewer working hours per week. Preventive measures for HD are needed for HCWs, especially during the COVID-19 pandemic.

Keywords: COVID-19; SARS-CoV-2; Dermatitis; Eczema; Hand; Health Care

Introduction

The Coronavirus disease of 2019 (COVID-19) first appeared in December 2019 in Wuhan, China. Later, the World Health Organization (WHO) declared it a pandemic on March 11, 2020. [1] The Centers for Diseases Control (CDC) and WHO recommended preventive measures to hinder the spread of this novel virus (SARS-CoV-2). The measures emphasize the importance of social distancing, wearing a facemask and gloves, frequent hand washing with water and soap, or using alcohol-based hand sanitizers. [2-3] These preventive measures are critical to protect healthcare workers (HCWs), and prevent cross-transmission and spread of pathogens have already been

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emphasized. [4-5] Although these recommendations may be effective against infectious diseases, they may alter the integrity of the skin, resulting in skin barrier dysfunction and increased risk of hand dermatitis (HD). [6-7]

Contact dermatitis is a skin disorder which occurs when the skin encounters irritants or allergens. Contact dermatitis is the most common occupational disease, which includes irritant contact dermatitis (80%) and allergic contact dermatitis (20%). [8-9] prolonged glove-wearing and frequent hand hygiene using detergents, soaps, water, alcohol-based sanitizers, and other disinfectants are known risk factors for developing contact dermatitis. Therefore, HCWs are at higher risk of developing contact dermatitis. [9] Studies before COVID-19 pandemic indicated that the prevalence of contact dermatitis affecting HCWs' hands ranged from 12% to 50%. [10-12] This was while the prevalence of contact dermatitis was increased based on studies from different countries during the COVID-19 outbreak. [13-16]

Currently, there is limited data on the prevalence of HD among HCWs in Iran during the COVID-19 outbreak. The authors aim to determine the prevalence of HD among HCWs in three university hospitals in Birjand, Iran, during the COVID-19 pandemic. Furthermore, the association between HD and other related factors was investigated.

Methods

1.1. Study design

This was a cross-sectional study conducted from August to September 2020 in Birjand, the capital of South Khorasan province, Iran. Cluster sampling was carried out in three hospitals affiliated with Birjand University of Medical Sciences, including Razi, Valiasr, and Imam Reza. **Sample size calculation**

A sample size of 159 HCWs, defined as first-line workers performing patient-related duties, was calculated through convenience sampling method. HCWs working at the hospitals for at least one year were included in the study. Those who did not complete the questionnaire were completely excluded.

1.2. Data collection

Data were collected using a validated self-administered questionnaire. The history of occupational HD was determined using standardized Nordic Occupational Skin Questionnaire version 2002 (NOSQ-2002) [17,] which included two forms; the first form included questions about demographic information :of age, gender, level of education, occupation, marital status, work experience, workplace ward, working hours per week, etc.; the second form consisted of questions about the most important occupational and environmental risk factors for formation of HD (i.e. history of allergy, history of HD, wearing gloves, frequency of hand washing, etc), and symptoms associated with HD (i.e. itching, burning, redness, dry skin with scaling, irritation, pain, and tiny water blister on the hand, wrist, or forearm) to determine prevalence of HD and the associated factors among HCWs. [18] In this questionnaire, having any of dermatitis-associated symptoms over the last six month (the length of time HCWs were involved in caring for COVID-19) was considered dermatitis.

1.3. Data quality control

The use of this standardized questionnaire makes it possible to compare the results with other studies. The English version of NOSQ was translated to Persian by a professional translator familiar with medical terminology; thereafter, a panel of experts of academics (two dermatologists and eight faculty members of nursing and midwifery) familiar with terminologies reviewed and confirmed the validity of the questionnaire. The reliability of the questionnaire was also confirmed by calculation of Cronbach's α coefficient of 82%. [19]

1.4. Data analysis

Chi-square and logistic regression tests were used

for data comparisons, regarding the α level of 0.05. Data analysis was done using SPSS version 18. P-value < 0.05 was considered significant. Data were shown as mean ± SD and number (percent).

Results

The mean age of 159 HCWs was 31.7 ± 10. The majority of the subjects participating in the study, (66.9%) were females (111 people), and most of HCWs (81.1%) were nurses (129 people). Demographic data of the HCWs participating in this study are shown in Table 1.

Table 2 shows the prevalence of HD based on different variables of HCWs participating in this study. 82 (51.6%) participants had HD; and the prevalence of HD had an almost equal distribution among HCWs. The frequency was significantly higher (P<0.05) in females (61.3%) than i males (29.2%). There was an almost equal distribution among HCWs with a high school diploma (45.5%) and a bachelor's degree (49.6%). However, most of the HCWs with an MSc degree (65.2%) reported to have HD. The prevalence of HD was highest (86.4%) in the group above 40 and lowest (39.7%) in 20-29 group. Among 133 HCWs using gloves, 66 (58.4%) had HD, and the prevalence of HD was reported equal among those who did not wear gloves. The highest prevalence of HD (62.4%) was found in HCWs working fewer than 50 hours per week, and decreased with increasing working hours.

Table 1. Demographic data of healthcare workers.

Variable	Frequency	Percentage
Gender		
Male	48	30.20
Female	111	69.80
Education level		
High school diploma	11	6.90
Bachelor's degree	125	78.60
MSc degree	23	14.50
Position		
Nurse	129	81.10
Auxiliary nurse	10	6.30
Supervisor	11	6.90
Midwife	9	5.70
Marital status		
Single	36	22.60
Married	123	77.40

Table 2. Logistic regression analysis to investigate the prevalence of hand dermatitis based on different variables

Variable	Hand dermatitis "Yes" Frequency (Percentage)	Hand dermatitis "No" Frequency (Percentage)	Odds ratio (OR)	Confidence interval (CI)	P-value
Total	82 (51.60)		77 (48.40)		
Gender					
Male	14 (29.20)	34 (70.80)	1	1.85 – 8.00	P < 0.001
Female	68 (61.30)	43 (38.70)	3.84		
Education level					
High school diploma	5 (45.50)	6 (54.50)	1		
Bachelor's degree	62 (49.60)	63 (50.40)	1.18	0.34 – 4.10	P = 0.35
MSc degree	15 (65.20)	8 (34.80)	3.25	0.52 – 9.70	
Age					
20-29	29 (39.70)	44 (60.30)	1		
30-39	34 (53.10)	30 (46.90)	1.72	0.87 – 3.40	P = 0.001
>40	19 (86.40)	3 (13.60)	9.60	2.60 – 35.7	
Working hours					
<50 hours / week	53 (62.40)	38 (37.60)	1		P < 0.001
≥50 hours / week	19 (32.80)	39 (67.20)	0.29	0.15 – 0.58	
Wearing gloves					
Yes	66 (58.4)	47 (41.6)	1		
Yes, but not now	14 (33.3)	28 (66.7)	0.36	0.17 – 0.75	P = 0.021
Not using gloves	2 (50)	2 (50)	0.71	0.96 – 5.20	

Based on the results obtained from logistic regression test, female HCWs had a 3.84 fold increased risk of HD compared with males (CI: 1.85-8; P< 0.001). HCWs over 40 and those between 30 to39 had a 9.6 and 1.72 fold increased risk of HD compared with HCWs aged 20 to29 (CI: 2.6-35.7; CI: 0.87-3.4; P=0.001; P=0.001, respectively). Moreover, the prevalence of HD in HCWs who worked less than 50 hours per week was significantly higher than those who worked 50 hours or more (OR: 0.29; CI: 0.15-0.58; P< 0.001). Furthermore, Chi-square test revealed that the prevalence of HD among HCWs wearing gloves was significantly higher than those who never used gloves (OR: 0.71; CI: 0.96-5.2; P<0.05). Although most of the HCWs with a MSc degree suffered from HD, there was no significant association between the prevalence of HD in HCWs and educational level (P>0.05).

Discussion

HD is a common occupational disease with a prevalence of 12-50% among HCWs prior to COVID-19 pandemic. [10-12] In the current study, the frequency of HD was 51.6% among HCWs at university hospitals of Birjand, Iran during the pandemic. A significant correlation was also found between the prevalence of HD and female gender, age, working hours per week, and wearing gloves. The results of this study was consistent with other studies conducted on skin damages among HCWs during COVID-19 pandemic, showing an increase in the prevalence of HD. Lan et al. [20] reported the first evidence of increasing prevalence of skin damage among HCWs in China. It was reported that the prevalence of hand skin damage was 74.5%, which was probably related to frequent hand hygiene and wearing gloves for a longer time. A study conducted by Aydin et al. [13], (2020) in Turkey suggested that the rate of HD among nurses was 70.9%. Another study by Erdem et al. [16], (2020) showed that the frequency of HD included 50.5% of the HCWs working in COVID-19 wards. Similarly, Imani Khanegah et al. 's study [18], (2020) reported that 65.7% of nurses working in COVID-19 ward in Ardabil Province suffered from HD. Other studies from different countries reported the prevalence of symptoms associated with a contact dermatitis of 46.4% in Saudi Arabia [15], 90.4% in Germany [21], 82.6% in Ireland [22], 80% in Italy [23], and 73.1% in China. [24] Disparity in the rate was probably due to different study designs, population sizes, and genetic differences. Moreover, some studies assessed all types of skin damage, which reported the overall skin damage of HCWs during the COVID-19 pandemic. This was while in the current study, the only the prevalence of HD was assessed. Similarly, Tousi et al. [25], (2006) reported that the prevalence of HD was 43.9% among HCWs in a university hospital in Tehran. Thus, the prevalence of HD clearly increased among HCWs during COVID-19 pandemic.

In the present study, a higher rate of HD was observed in females compared with males. In line with this study, Celik et al. [26], (2020) conducted a study on HCWs and showed that the rate of HD was significantly higher in women. Hamnerius et al.'s research [27], (2017) reported similar results. Additionally, a large population-based Norwegian survey demonstrated that the overall rate of HD was higher in women than men in their lifetime. [28] The higher prevalence of dermatitis in women than men could be attributed to the role of women in housekeeping and more exposure to water, detergents, and irritants. [26,29-30] However, some studies reported that HD was not associated with gender. [31-32]

According to this study, there was a positive correlation between age of HCWs and HD, and the highest prevalence of HD was found in HCWs above 40. 2 studies conducted on Danish children reported that older children were at a higher risk of developing HD. They attributed their observations

to a higher frequency of hand washing in older children. [29,33-34] On the other hand, the prevalence of HD was varied at different ages in other studies [30,34-35]; therefore, age could not be considered a direct risk factor for developing HD. This finding iswas probably due to the higher prevalence of HD among HCWs with more years of working experience. [36]

In the current study, a negative correlation was found between the risk of developing HD and the working hours per week among HCWs. Lampel et al. [11] found no significant association between the rate of HD in inpatient nurses working at an academic hospital and their working hours per week. In contrast, Özyazicioğlu et al. [32] reported that the incidence of HD among SENIOR nursing students was significantly higher than junior ones. They attributed this finding to higher working hours of the senior students compared with junior students; this was inconsistent with findings of this research. A possible speculative explanation for this could be increased time of HCWs' exposure to other irritants at home while housekeeping, or the fact that HCWs with HD may work fewer hours per week.

There were some known risk factors for developing contact dermatitis including frequent hand washing, long term wearing gloves, and using disinfectants. [9] It has been reported that COVID-19 transmits through contact, thus proper hand hygiene is one of the main ways to prevent the spread of infection. [37] Previous studies showed a significant increase in the frequency of hand washing and use of disinfectants among HCWs during the COVID-19 pandemic. [21,38] Repeated exposure to soap and water and disinfectants could alter the integrity of the skin and damage its protective effect by changing the pH of epidermis, depleting lipid barrier, and increasing trans-epidermal water loss, which finally leads to contact dermatitis. Paradoxically, prolonged wearing of gloves may cause maceration and irritant contact dermatitis of the hand skin by over-hydrating stratum corneum layer. [9] Additionally, wearing latex gloves could develop skin reactions through immunoglobulin E-mediated hypersensitivity to latex, latex allergy, and irritant contact dermatitis. [39-40] In the present study, 58.4% of HCWs using gloves had HD. Similarly, Kaihui et al. (2020) [41] reported that 88.5% of HCWs using latex gloves for a long time during the pandemic complained about adverse skin reactions.

HD is one of the main factors which can reduce the quality of life and productivity of HCWs, and may cause physical discomfort and increase their absence as well. [42-43] Therefore, the results of this study may help prevent HD among HCWs, especially those who at higher risk.

Conclusion

Although hand hygiene is an effective method to prevent transmission of infectious diseases such as COVID-19, it may increase the risk of hand dermatitis formation. The prevalence of HD was 51.6% among HCWs during COVID-19 pandemic. Additionally, it was revealed that female gender and older age might be possible risk factors for the occurrence of HD among HCWs. It is suggested that hospitals provide education on HD to HCWs, and take proper measures for prevention.

Conflict of Interest

All authors have no conflicts of interest to declare.

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The protocol of study was approved by the Committee on Research Ethics at Birjand University of Medical Sciences with the approved No. 3789. (Ethic code IR.BUMS.REC.1398.008). Additionally, before entering the study, health care workers completed an informed consent form.

Authors Contributions

Omolbanin Motamedrezaei designed the study,

supervised the project. GholamReza Sharifzadeh analyzed the data and also performed statistical analysis. Hadis Rajabipour collected the research data. Farnaz Jahani collaborated on manuscript preparation and also contributed to interpretation of data. Hamed Lotfi and Fereydoon Laal prepared the manuscript and critically revised the manuscript; besides, all authors read and approved the final version of the manuscript.

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