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Original Article

Education Section

Prevalence of Hand Eczema Owing to Hand Hygiene Practices among Healthcare Workers Managing COVID-19 Patients: A Cross-sectional Study Haryana, India

ASHISH DALAL[1], SURAJ CHAWLA[2], JYOTI SANGWAN[3]

ABSTRACT

Introduction: Healthcare Workers (HCWs) have borne the major brunt of the Coronavirus Disease-2019 (COVID-19) pandemic, being at the forefront. With the disease being enigmatic and no proven treatment or vaccine available during the initial stages, personal protection in general, and hand hygiene, in particular, have been the mainstays for protection against the disease, exposing HCWs to more wet work. Wet work exposure is considered a major risk factor for the occurrence of Hand Eczema (HE).

Aim: To estimate the prevalence of hand dermatitis and ascertain the risk factors among HCWs exposed to wet work while caring for COVID-19 patients.

Materials and Methods: A cross-sectional study was conducted among HCWs managing COVID-19 patients in a dedicated COVID-19 hospital from July to December 2020. The diagnosis of HE was based on medical history and clinical examination. Clinical features like itching, redness, scaling, clustered papulovesicles, hyperkeratosis, or fissuring largely confined to the hands, with none or only minor involvement of other areas, were used in diagnosing HE. An association of various wet work exposures with HE among study participants was analysed. Categorical variables were analysed using the Chi-square test, and a p-value <0.05 was considered statistically significant.

Results: A total of 390 HCWs, of which 203 (52.1%) were females, participated in the study. The majority, i.e., 329 (84.4%) of participants, were in the age range of 21-35 years. A total of 244 (62.6%) HCWs were performing duties for 30-40 hours per week. Among all 390 HCWs studied, 102 (26.2%) were found to have features of HE. High frequency of alcoholic hand disinfectant use (>20 times daily) was significantly associated with the occurrence of HE. Similarly, the high frequency of hand washing with soap at work (>20 times) significantly increased the risk of developing HE. A prior history of atopic diathesis was found to be a significant risk factor for fresh episodes of HE.

Conclusion: The present study concludes that intensive hand hygiene during the prevailing COVID-19 pandemic leads to the occurrence of HE among HCWs.

Keywords: Hand rub, Papulovesicles, Scaling

INTRODUCTION

COVID-19 is an infectious disease caused by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) virus. It was first identified in Wuhan, China, in December 2019 and has since spread globally, infecting millions of people. The World Health Organisation (WHO) declared COVID-19 a pandemic in March 2020 [1]. According to current evidence, the COVID-19 virus is primarily transmitted between people through respiratory droplets and contact routes [2,3]. Ways to reduce the transmission of this virus include getting vaccinated and following infection control measures like hand hygiene, surface disinfection, and using personal protective equipment, etc. HCWs, who are on the front line in combating COVID-19, are at higher risk of contracting the coronavirus infection, so enhanced preventive measures are being implemented by them [4].

COVID-19 healthcare work includes a substantial amount of wet work, such as the use of alcoholic hand sanitisers before and after patient care, soap and water for visibly dirty hands, and disposable gloves if contact with body fluids is anticipated. Wet work exposure is considered a major risk factor for the occurrence of HE [5]. Limited studies have reported skin damage, especially HE caused by wet work exposure among HCWs [5,6]. This present study was carried out to estimate the prevalence of hand dermatitis and ascertain its clinical features and risk factors among HCWs exposed to wet work during the care of COVID-19 patients.

MATERIALS AND METHODS

A cross-sectional study was conducted among HCWs managing COVID-19 patients at a dedicated COVID-19 Hospital, Shaheed Hasan Khan Mewati, Government Medical College, Nuh, Haryana, India, from July to December 2020. Approval from the Institutional Ethics Committee (IEC) was obtained before commencing the study under letter no SHKM/IEC/2020/37 dated 24 April 2020.

Inclusion criteria: All HCWs aged 50 years or younger, who were involved in the management of COVID-19 patients (indoor or outdoor) and willing to give written consent, were included in this study.

Exclusion criteria: Subjects with pre-existing acral dermatitis or HE, or those unwilling to participate, were excluded from the study. HCWs above the age of 50 years were automatically excluded as they were not involved in the direct care of COVID-19 patients as per the standard operating procedures of the study hospital.

Sample size: The sample size for the study was determined using the formula $\{N=Z^2\ 1-\alpha/2\ P\ (1-P)/D^2\}$. Here, Z represents the value of the area under the normal curve (for two-tailed), α represents the level of significance set at 0.05. 'P' represents the prevalence of hand dermatitis among HCWs assumed to be 43.8% according to a previously published study [7], and 'D' represents the absolute precision (5%). Thus, a sample size of 390 HCWs was derived.

Data collection: Demographic details including age, gender, and occupation of all HCWs looking after the COVID-19 patients were

recorded. Information regarding hand hygiene practices, wet work exposure, atopic diathesis, and use of topical moisturisers was also collected.

All study subjects underwent dermatological examination to detect HE. The diagnosis of HE was based on medical history and clinical examination. Clinical features suggestive of HE included itching, redness, scaling, clustered papulovesicles, hyperkeratosis, or fissuring largely confined to the hands, with none or only minor involvement of other areas. The diagnosis of HE was made by excluding other hand dermatoses of known aetiology (e.g., tinea mannum, scabies), well-defined non eczematous disorders (e.g., psoriasis, lichen planus, granuloma annulare, porphyria cutanea tarda, keratosis palmo-planters, fixed drug eruptions), and neoplastic disorders.

STATISTICAL ANALYSIS

After compilation, the data were entered into an MS Excel sheet, and analysis was carried out using the Statistical Package for Social Sciences (SPSS), version 20.0 (IBM, Chicago, USA). Data of the study subjects were presented as absolute frequencies and percentages. Categorical variables were analysed using the Chi-square test, and a p-value <0.05 was considered statistically significant.

RESULTS

A total of 390 HCWs were interviewed for their socio-demographic details and hand hygiene practices. Out of the total 390 participants, 52.1% were females, 84.4% of participants were between the ages of 21-35 years (with a mean age of 31.6 years), the majority (42.6%) of participants had less than 1 year of experience, and most (62.6%) healthcare workers performed duties for 30-40 hours per week [Table/Fig-1]. Among all 390 HCWs studied, 102 (26.2%) exhibited features of HE [Table/Fig-2].

Variable	n (%)	Hand Eczema (HE) present (n=102; 26.2%)	No Hand Eczema (HE) (n=288; 73.8%)
Age (years)			
21-29	156 (40.0)	38 (24.4)	118 (75.6)
30-39	173 (44.4)	45 (26.0)	128 (74.0)
40-50	61 (15.6)	19 (31.1)	42 (68.9)
Gender			
Female	203 (52.1)	60 (29.6)	143 (70.4)
Male	187 (47.9)	42 (22.5)	145 (77.5)
Profession			
Doctors	155 (39.7)	37(23.9)	118 (76.1)
Nursing staff	212 (54.4)	59 (27.9)	153 (72.1)
Laboratory technicians	23 (5.9)	06 (26.1)	17 (73.9)
Years of experience			
Less than 1 year	166 (42.6)	41 (24.7)	125 (75.3)
1-5 years	139 (35.6)	34 (24.5)	105 (75.5)
More than 5 years	85 (21.8)	27 (31.8)	58 (68.2)
Weekly working hours			
Less than 30	76 (19.5)	16 (21.1)	60 (78.9)
30-40	244 (62.6)	57 (23.4)	187 (76.6)
More than 40	70 (17.9)	29 (41.4)	41 (58.6)

[Table/Fig-1]: Distribution of study participants according to socio-demographic characteristics (n=390).

A high frequency of alcoholic hand disinfectant use (>20 times daily) was significantly associated with the occurrence of HE. Similarly, a high frequency of hand washing with soap at work (>20 times) significantly increased the risk of developing HE. A prior history of atopic diathesis was found to be a significant risk factor for fresh episodes of HE [Table/Fig-3].

[Table/Fig-2]: Picture depicting unilateral Hand Eczema (HE).

Variable	Hand Eczema (HE) present (n=102; 26.2%)	No Hand Eczema (HE) (n=288; 73.8%)	OR (95% CI[#])	p-value
Alcoholic hand disinfectant use (times daily)				
Low (<20)	28 (27.5)	127 (58.3)	Reference	
Medium (20-40)	46 (45.0)	107 (30.2)	1.95 (1.14-3.33)	0.014*
High (>40)	28 (27.5)	54 (11.5)	2.35 (1.27-4.34)	0.006*
Hand washing with soap at work (times daily)				
Low (<10)	23 (22.5)	108 (37.5)	Reference	
Medium (10-20)	45 (44.1)	115 (39.9)	1.83 (1.04-3.23)	0.035*
High (>20)	34 (33.4)	65 (22.6)	2.45 (1.33-4.53)	0.004*
Daily time spent wearing disposable non sterile gloves (in hours)				
Low (<1)	23 (22.5)	118 (40.1)	Reference	
Medium (1-3)	37 (36.3)	101 (35.0)	1.87 (1.04-3.37)	0.034*
High (>3)	42 (41.2)	69 (23.9)	3.12 (1.71-5.62)	0.001*
Hand washing with soap at home (times daily)				
Low (<5)	22 (21.6)	75 (26.1)	Reference	
Medium (5-10)	38 (37.2)	102 (35.4)	1.27 (0.69-2.32)	0.776
High (>10)	42 (41.2)	111 (38.5)	1.29 (0.71-2.33)	0.400
Kitchen and laundry or cleaning work				
≤1 hour	42 (41.2)	127 (44.0)	Reference	
>1 hour	60 (58.8)	161 (56.0)	1.12 (0.71-1.78)	0.609
Use of moisturisers				
Yes	49 (48.0)	135 (46.9)	Reference	
No	53 (52.0)	153 (53.1)	1.22 (0.78-1.92)	0.377
History of atopic diathesis				
No	83 (81.4)	259 (90.0)	Reference	
Yes	19 (18.6)	29 (10.0)	2.04 (1.08-3.83)	0.025*

[Table/Fig-3]: Association of variables of wet work exposure with occurrence of Hand Eczema (HE) among HCWs.
[#]Confidence interval; *Statistically significant on Chi-square test

DISCUSSION

The HE is a multifactorial dermatosis in which constitutional, irritant, and allergic factors frequently co-exist. It is a common and widespread condition characterised clinically by itching, redness, scaling, clustered papulovesicles, hyperkeratosis, or fissuring, usually confined to the hands. The pathogenesis of HE is often complex which could be due to either irritant contact dermatitis (caused by direct skin injury) or allergic contact dermatitis (due to type IV delayed-type hypersensitivity). The multifactorial aetiology of HE involves exogenous factors such as soaps, detergents, caustic chemicals, prolonged wet work, and endogenous predisposing factors like individual susceptibility, racial differences, atopy, age, hormones, etc. The exact incidence of HE is challenging to assess due to underreporting of minor features of the condition [8].

A population-based study in Sweden reported HE in 11.8% of participants aged 20-65 years over a 12-month period, while a

meta-analysis study based on 66 studies reported a prevalence of 14.5% [8,9]. An Indian study from Chandigarh also found a similar prevalence of HE at 20% [10], whereas the prevalence of HE among HCWs has been reported to range from 21-50% [11,12].

Since the outbreak of the COVID-19 disease, the WHO has recommended enhanced infection preventive measures, especially for HCWs. According to the Centre for Disease Control and Prevention (CDC) guidelines, hands should be washed with soap and water for atleast 20 seconds. If soap and water are not readily available, Alcohol-Based Hand Rubs (ABHRs) with atleast 60% alcohol and endorsed by the CDC are effective for hand hygiene practices [13]. However, excessive use of sanitiser and intensive hand washing can disrupt the epidermal barriers due to the depletion of the natural lipid layer of the epidermis, leading to an increased incidence of HE.

In the current study, the prevalence of HE among HCWs was 26.2%. Almost similar prevalence rates of 21% and 20.87% were reported in studies conducted by Ibler KS et al., and Techasatian L et al., respectively [11,14]. Another study conducted by Kilaru KR et al., reported HE as the most common cutaneous manifestation among HCWs during the COVID-19 pandemic, with a prevalence of 43.8% [7]. The increasing trend of HE prevalence with advancing age was noted in present study, possibly due to age being an endogenous predisposing factor for HE.

The prevalence of HE among females (29.6%) was slightly higher than that among males (22.5%). Other studies have shown a similar trend in sex predisposition, as reported by Kilaru KR et al., who found HE in 75.18% of females and 24.82% of males [7], and Fowler JF et al., who also observed a female predilection [8]. A similar predominance of females developing HE was documented in a pre-COVID-19 study [9].

A slightly higher prevalence of HE within HCWs, was noted among nursing staff (27.9%) and laboratory technicians (26.1%) compared to physicians (23.9%). This could be because of wearing protective gloves for a longer period, prolonged contact with indoor patients, over-apprehensiveness of COVID-19 infection among these groups, or the need to follow strict hand hygiene practices along with an extended period of wearing gloves. A similar trend of skin damage was reported among nurses (48.33%), followed by doctors (42.29%) and support staff (33.33%), in a study conducted by Kilaru KR et al., [7].

Enhanced wet work exposure owing to frequent hand washing both at the workplace and at home could be a major external risk factor for HE. When wet work is combined with the use of soap and detergents, they decrease the cutaneous protective capacity by depleting the lipid layer of the epidermis, facilitating skin irritation and leading to the development of HE. Additionally, a disrupted skin barrier may create a route of entry for the SARS-CoV-2 virus, as cell receptors (angiotensin-converting enzyme 2) are present in the blood vessels of the skin, basal layer of the epidermis, and hair follicles [10,15,16]. Present study found that hand washing >10 times/day at the workplace is associated with a statistically significant increase in the occurrence of HE (p-value=0.035). Other Indian studies reported that all participants who developed HE were practicing intensive use of sanitiser and hand washing [11,17]. Similar findings were reported in a study conducted in China, where more frequent (>10 times daily) hand hygiene was associated with an increased risk of hand skin damage, and HCWs who wore medical devices for more than six hours had a higher risk of skin damage in corresponding sites compared to those who wore them for less time [18]. Other studies that compared hand hygiene practices before and during the COVID-19 pandemic also found an increased incidence of HE due to an almost two-fold increase in the frequency of hand washing and hand hygiene using sanitisers [13,14,19,20].

The present study found a statistically significant association between HE and hand sanitiser use when the frequency of use exceeds >20 times (p-value=0.014), whereas other studies found this association even when the frequency of hand sanitiser is >10 times [4,7,8,11].

Wearing gloves for an extended duration leads to maceration of the skin due to increased occlusion, sweating, and heat. Even before the COVID-19 pandemic, glove occlusion (using waterproof gloves for >2 hours) has been reported to cause skin barrier impairment [15,21]. Studies conducted during the pandemic also found that prolonged glove wearing had a higher risk of HE [7,14,20]. The present study found that wearing gloves for more than one hour had a statistically significant association with HE, which could be due to HCWs following the combined practice of intensive hand washing, using frequent hand sanitisers, etc., which further advanced the manifestation of HE.

To restore the depleted epidermal skin barrier, the frequent use of moisturisers is advocated. They work only when they are present on the skin, so with the increase in the frequency of hand washing and hand sanitisation, the frequency of using moisturiser should also increase. However, among the current study participants, those practicing frequent moisturiser usage didn't show any significant association with HE, as also reported by Reinholz M et al., in their study. Although the application frequency of emollients increased from 1-2 times to 2-5 times per day, no significant association was found between the frequency of hand cream application and HE [19].

An impaired expression of antimicrobial proteins, filaggrin mutation, and an elevated expression of hK7 (human tissue kallikrein 7) among atopic patients make them predisposed to HE, as reported in the meta-analysis done by Ruff SMD et al., [22]. Present study found that HE is significantly present among HCWs having atopic dermatitis (p-value=0.025), and a similar strong association (p-value=0.001) was reported in other studies [5,7,11,12,14]. However, contrasting findings were reported by Reinholz M et al., that HCWs with atopy had no increased risk of HE compared to those without atopy, which could be due to the small sample size of the study [19].

Considering the necessity to follow hand hygiene practices during the ongoing COVID-19 pandemic, it is also imperative to follow preventive strategies against HE.

Limitation(s)

Although the study was conducted on a large sample size, it only included physicians, nursing staff, and laboratory technicians; therefore, the results may not apply to other categories of HCWs. Authors could not elicit the pre-COVID hand hygiene practices, so a comparison of the occurrence of HE and associated factors before and during COVID-19 was not conducted. Additionally, the severity of HE was not considered in this study; therefore, no association was assessed between severity and hand hygiene practices.

CONCLUSION(S)

The present study concludes that intensive hand hygiene during the prevailing COVID-19 pandemic is leading to the occurrence of HE among HCWs, which, in turn, can become a potential occupational skin disease hampering the performance of routine patient care by HCWs. So, HCWs should be encouraged to follow proper and rational hand hygiene practices along with a proper hand care regimen using low-irritating potential sanitisers and frequent application of hand moisturisers.

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PARTICULARS OF CONTRIBUTORS:
1. Assistant Professor, Department of Dermatology, Shaheed Hasan Khan Mewati Government Medical College, Nuh, Haryana, India.
2. Associate Professor, Department of Community Medicine, Shaheed Hasan Khan Mewati Government Medical College, Nuh, Haryana, India.
3. Professor, Department of Microbiology, Shaheed Hasan Khan Mewati Government Medical College, Nuh, Haryana, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Jyoti Sangwan,
Professor, Department of Microbiology, Shaheed Hasan Khan Mewati Government Medical College, Nuh-122107, Haryana, India.
E-mail: jyolathwal@yahoo.co.in

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