Pharmacology and Clinical Pharmacy Research
Volume 8 No. 1 April 2023
ISSN:2527-7322 | e-ISSN: 2614-0020
doi: 10.15416/pcpr.v4i3.38851

A Study on the Occurrence of Hand Dermatitis in Healthcare Workers during the COVID-19 Pandemic due to Enhanced Hand Hygiene

Abhishree B S, Kavitha R, Geetha A

Department of Pharmacology, Bangalore Medical College and Research Institute, Bengaluru, Karnataka - India

Abstract

Hand hygiene measures have increased in the general population and among healthcare workers since the pandemic outbreak. However, enhanced hand hygiene can hurt the skin barrier leading to the development of hand dermatitis (HD). The study aimed to determine the occurrence of occupational-related contact dermatitis among healthcare workers. An observational, questionnaire-based cross-sectional study was conducted in 2021 amongst 257 Health Care Workers (HCWs) of a tertiary care hospital. The data were analyzed using Microsoft Excel for Windows. The frequency of hand washing had increased to > 5 times in 42% of the HCWs while hand sanitizer usage had increased to >5 times in 95% of them during the pandemic. The duration of glove usage had increased from 3% pre-pandemic to 91 % during the pandemic and the majority of them used latex gloves. Symptoms of hand dermatitis in HCWs had increased from 3% pre-pandemic to 84% during the pandemic. Less than 10 % of the study participants moisturized their hands after sanitization. The fact that over 84% of the HCWs developed HD during the pandemic can be attributed to preventive measures to reduce the transmission of the virus. Measures such as the use of moisturizers should be recommended to prevent the onset of occupational hand eczema. It is thus imperative to raise awareness of HD in India and intensive measures should be provided.

Keywords: COVID-19, hand dermatitis, hand eczema, health care workers, hand hygiene

Introduction

Severe Acute Respiratory Syndrome Corona Virus 2 (SARS CoV-2) was first detected in Wuhan, China. Despite having attempted to curb the virus, it has spread globally and was declared a pandemic by World Health Organization (WHO). The virus is highly transmissible and primarily spreads through the respiratory tract, by respiratory secretions, droplets, via direct contact, and less commonly through fomites.[1]

Health Care Workers (HCWs) being the front-line workers of the SARS-CoV-19 outbreak response are exposed to the infection which puts them at risk of contracting the virus. Hand hygiene encompasses hand washing and hand sanitizer usage. Frequent hand hygiene and the use of protective gear such as gloves are recommended to prevent the transmission of the disease.

Corresponding Author: Abhishree B S. Department of Pharmacology, Bangalore Medical College and Research Institute, Bengaluru-560 002, Karnataka, India. Email: abhi.abhishree100@gmail.com
Received: 26 July 2022 **Revised**: 15 October 2022 **Published:** 5 April 2023

Enhanced hand hygiene, duration of employment, wet work, and glove usage play a detrimental role in skin integrity and contributes to the development of Hand Dermatitis (HD). HCWs in particular are at risk of developing occupational dermatitis.[2] To mitigate the expected rise in HD from enhanced hand hygiene the American Contact Dermatitis Society (ACDS) recommends good hand hygiene techniques such as the application of moisturizer after hand sanitization.[3]

Occupational HD is one of the most common occupational diseases. Several studies worldwide have reported that occupational skin disease prevalence in HCWs is between 8 and 90%.[4-6] The symptoms of HD include itching, swelling, redness, burning, and scaling. Stringent hand hygiene measures result in the loss of surface lipids, leading to an increase in trans-epidermal water loss, and increasing the penetration of allergens and irritants resulting in HD.[3,7]

Despite the recognition of the problem, there is insufficient data on developing hand dermatitis in India during the COVID-19 pandemic. Therefore, the aim was to conduct a cross-sectional study to determine the occurrence of occupational-related HD among the HCWs.

Methods

This observational, questionnaire-based cross-sectional study was conducted in October 2021 amongst HCWs attached to Bangalore Medical College and Research Institute, Bengaluru, India. The hospital was a designated COVID-19 center with 3000 beds dedicated to COVID-19 patients. Around 4000 HCWs currently work in the hospital. However, HCWs working in the first week and second week of October 2021 formed the sample pool for the study.

The online questionnaire was distributed to 400 HCWs and the google form was kept open for 10 days to collect the responses. After obtaining institutional ethics committee clearance, informed consent was taken from HCWs over the google form before proceeding to answer the questions.

Study Population

The study population consisted of all frontline HCWs (doctors, nurses, and lab workers) who worked during the COVID-19 outbreak. All HCWs who had no contact with the patients or the patient's tissues and body fluids were excluded from the study. Participants who were not able to comprehend the google questionnaire were also excluded from the study. The sample size was calculated for an assumed prevalence of 19% with an absolute precision of 5% based on previous studies. [4-6] A minimum of 250 participants were required to find a statistically significant difference. The questionnaire was distributed to 400 HCWs of which 257 responded, hence the results are analyzed for 257 HCWs.

Questionnaire

A comprehensive literature review was done using search engines like Pubmed and Google Scholar and questions were identified from these articles.[5,8] The developed questionnaire was subjected to evaluation by a team of eight experts from different healthcare fields for their inputs, critical appraisal, face, and content validation. The subsequent version of the questionnaire was tested by conducting a pilot study on a sample of 60 HCWs to test the instrument's validity, resulting in modifying some questions to prevent misinterpretations. Further, construct validity was established by using factor analysis.

The questionnaire included demographic features (age, sex) and work-related questions (occupation), frequency of hand washing in a

ISSN:2527-7322 | e-ISSN: 2614-0020

day pre and during the pandemic, frequency of using hand sanitizer a day pre and during the pandemic, type of hand sanitizer used, preference for the type of hand sanitization, moisturization of hands post hand disinfection, types of gloves used, duration of glove usage pre and during the pandemic, presence of symptoms of hand dermatitis pre and during the pandemic, symptoms associated with hand dermatitis (redness, itching, burning, scaling, and dryness) and treatment is taken for hand dermatitis.

Statistical Analysis

The data were analyzed using Microsoft Excel for Windows. Data were presented as percentages or ranges. For analyzing item responses to the questionnaire, descriptive statistics were applied. The association between two categorical variables was analyzed using the Chi-square test. A p-value of less than or equal to 0.05 was considered statistically significant. All the results are summarized as figures and tables.

Results and Discussion

The SARS-CoV-19 pandemic necessitated drastic changes in the healthcare system to protect frontline workers and patients. Frequent sanitization and use of personal protective equipment were recommended for all those working in the hospitals.

Two fifty-seven HCWs responded to the survey. The results from our study indicate that the majority of the participants belonged to the age group 20-39 years while the least belonged to the age group 50-59 years (Table 1). This is in line with the recommendations issued by WHO where older individuals are at a higher risk of developing severe COVID-19 illness and such HCWs should not be required to carry out high-risk tasks.[9] Of note, the majority of the HCWs during the pandemic reported features of HD with the most common presenting symptom being dryness followed by itchiness, scaling, burning, and redness (Figure 1).

Our data showed an increase in the frequency of hand washing and hand sanitizer usage to more than 5 times per day during the pandemic. The preferred method was using soap water followed by a hand sanitizer. There was an increase in the duration of glove usage to more than an hour with a majority of HCWs using latex gloves (Table 1). Among the HCWs who developed HD, the frequency of hand sanitizer usage was more than 5 times per day in the majority of them. The duration of glove usage for more than an hour was seen in most of the HCWs with HD ($p<0.05$). (Table 2)

The aforementioned measures of hand hygiene are to the international guidelines issued by WHO to prevent transmission of the virus.[8] The increase in symptoms of HD during the pandemic suggests a temporal link to the increased hand hygiene measures undertaken globally. Studies conducted in Ireland, Wuhan, and Hubei showed that the majority of the HCWs developed hand eczema during the pandemic.[2,10,11] In the study by Alluhayyan et al in Saudi Arabia 92% of HCWs developed dryness of hands followed by itchiness.[5]

Excessive hand sanitization using detergents impairs the hydrolipid barrier of the skin causing dryness and itching.[12] In a comparative study conducted by Erdem et al in Turkey, the frequency of hand washing had increased to over 10 times per day in the COVID group.[13] Excessive hand washing can remove essential oils from the surface of the skin. Washing hands immediately before or after using an alcohol-based hand rub could aggravate dermatitis as the alcohol in the hand rub can penetrate the sensory nerve endings of pre-irritated skin.[14]

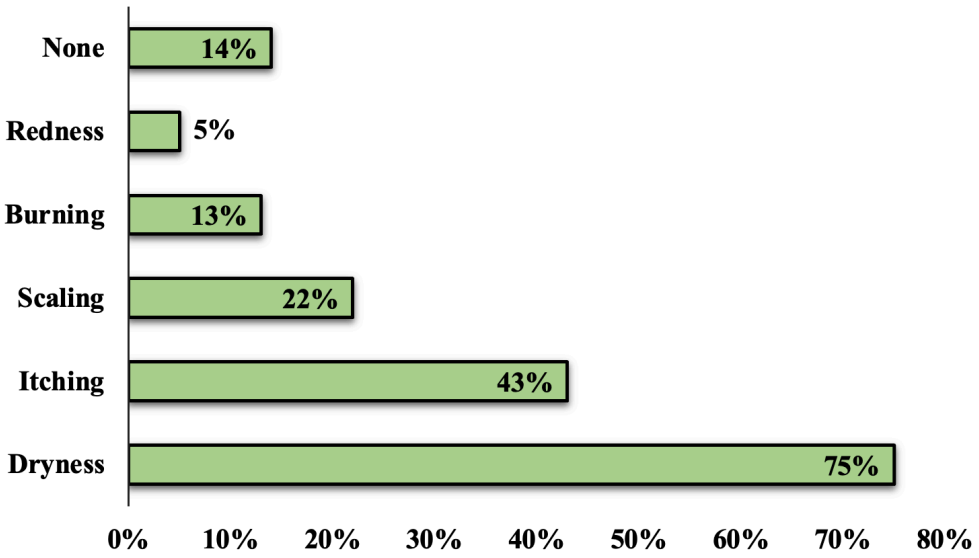

Figure 1. Presentation of Skin Changes in HCWs (Common Symptoms of Hand Dermatitis)

Repeated usage of hot water should be avoided to prevent the development of HD. A study by Hansen et al claims that individuals are at a high risk of developing HD due to an increase in usage and prolonged exposure to latex gloves.[15] Rubber gloves contain the chemicals 1,3-diphenyl guanidine and cetylpyridinium chloride that are known to cause HD.[16] In addition, long-term usage of gloves leads to occlusion and hyperhydration state of the epidermal layer of skin leading to the development of HD.[12] Hence, to lower the humidity, gloves should be changed frequently and applied only on dry hands.

The use of a moisturizer post handwash and sanitization is one of the most important skincare precautions recommended to prevent HD.[3,9] The UK and European guidelines recommend using a moisturizer similar to the guidance by ACDS which stresses the application of moisturizers before wearing the gloves.[3] Skin moisturizers protect from developing HD by trapping the water effectively and help in epithelial regeneration.[16] In the present study less than a quarter of HCWs used moisturizer after hand sanitization and many opined that a hand moisturizer dispenser is essential along with a sanitizer (Table 1).

The non-availability of a moisturizer, dearth of time due to an overburdened healthcare system during the pandemic, and lack of awareness regarding the effects of increased hand hygiene could be some of the reasons for the aggravation of HD. A study conducted by Kiely et al in Ireland during the COVID pandemic showed that over 45% of the participants denied using emollients after hand sanitization resulting in HD.[2] However, a study conducted in Germany by Reinholz et al showed an increase in the frequency of moisturizer application in most participants.[18]

The higher frequency of washing hands in our study, in contrast to a lower percentage of moisturizer application provides an imbalance that predisposes the front-line staff to an increased risk of HD. Hence, a standard therapeutic regimen should be framed and implemented to prevent and treat HD in developing countries like India.

Table 1. Comparison of Participant Characteristics by Gender (1)

		Total		Male		Female		p-value
		n	%	n	%	n	%	
N=257				76	29.57	181	70.43	NA
Age (Mean-35 years; Median- 34 years; SD: +/- 9 years)	20-29 years	78	30.4	17	6.60	61	23.80	<0.001
	30-39 years	101	39.3	26	10.12	75	29.18	
	40-49 years	49	19.1	15	5.84	34	13.26	
	50-59 years	29	11.3	18	7.00	11	4.3	
Occupation	Doctor	150	58.4	37	14.40	113	44	0.0553
	Nurses	63	24.5	20	7.78	43	16.72	
	Laboratory Technicians	44	17.1	19	7.40	25	9.70	
Major activity at work	Direct patient care	187	72.8	54	21.01	133	51.79	0.689
	Laboratory work	70	27.2	22	8.56	48	18.64	
Handwashing frequency per day before the pandemic	< 5 times	252	98.05	73	28.40	179	69.65	0.132
	5-10 times	5	1.82	3	1.16	2	0.66	
	>10 times	0	0	0	0	0	0	
Handwashing frequency per day during the pandemic	< 5 times	145	56.42	44	17.12	101	39.30	0.121
	5-10 times	96	37.35	24	9.34	72	28.01	
	>10 times	16	6.23	8	3.11	8	3.12	
Hand sanitizer usage per day before the pandemic	< 5 times	232	90.27	67	26.07	165	64.2	0.458
	5-10 times	24	9.34	8	3.11	16	6.23	
	>10 times	1	0.39	1	0.39	0	0	
Hand sanitizer usage per day during the pandemic	< 5 times	13	5.06	7	2.72	6	2.34	0.023
	5-10 times	114	44.36	39	15.18	75	29.18	
	>10 times	130	50.58	30	11.67	100	38.91	

Table 1. Comparison of Participant Characteristics by Gender (2)

		Total		Male		Female		p-value
		n	%	n	%	n	%	
N=257				76	29.57	181	70.43	NA
Preference for type of hand sanitization during the pandemic	Hand sanitizer	105	40.9	23	8.95	82	31.95	0.0579
	Soap and water	6	2.3	3	1.16	3	1.16	
	Both	146	56.8	50	1.95	96	54.85	
Type of hand sanitizer used often	Alcohol based	248	96.50	75	29.18	173	67.32	0.216
	Alcohol free	9	3.50	1	0.39	8	3.11	
Type of gloves used often	Latex	216	84	70	27.24	146	56.76	0.022
	Non latex	41	16	6	2.33	35	13.62	
Duration of glove usage before the pandemic	< 1 hour	249	96.89	74	28.79	175	68.09	0.773
	>1 hour	8	3.11	2	0.78	6	2.33	
Duration of glove usage during the pandemic	< 1 hour	23	8.95	9	3.50	14	5.45	0.292
	>1 hour	234	91.05	67	26.07	167	64.98	
Moisturisation of hands post sanitization	Yes	25	9.7	5	1.95	20	7.78	0.269
	No	232	90.3	71	27.63	161	62.65	

Table 1. Comparison of Participant Characteristics by Gender (3)

		Total		Male		Female		p-value
		n	%	n	%	n	%	
N=257				76	29.57	181	70.43	NA
Is a hand cream dispenser essential along with hand sanitizer at the hospital?	Yes	228	88.7	51	19.84	177	68.87	<0.001
	No	29	11.3	25	9.73	4	1.56	
Did you have symptoms of hand dermatitis before the pandemic?	Yes	8	3.11	1	0.39	7	2.72	.282
	No	249	96.89	75	29.18	174	67.70	
Did you have symptoms of hand dermatitis during the pandemic?	Yes	217	84.44	52	20.23	165	64.20	0.0002
	No	40	15.56	21	8.17	19	7.39	
Are you aware that hand dermatitis could alter the skin flora and result in frequent infection?	Yes	175	68.1	48	18.68	127	49.42	0.366
	No	82	31.9	27	10.51	55	21.40	

Table 2. Candidate Predictors in the Development of Hand Dermatitis during the Pandemic

N= 257		Have you noticed skin changes during COVID-19 pandemic?				p- value
		NO		YES		
		N	%	N	%	
Gender	Male	15	5.84%	61	23.74%	0.2318
	Female	25	9.73%	156	60.7%	
Age	20-29	8	3.11%	70	27.24%	0.445
	30-39	17	6.62%	84	32.68%	
	40-49	9	3.5%	40	15.56%	
	50-59	6	2.35%	23	8.95%	
Occupation	Doctor	24	9.34%	126	49.03%	0.724
	Nurses	8	3.11%	55	21.4%	
	Laboratory Technicians	8	3.11%	36	14%	
Major activity at work	Direct Patient Care	30	1.17%	157	61.09%	0.729
	Laboratory Work	10	3.89%	60	23.35%	
Handwashing frequency per day during the pandemic	< 5 times	27	10.51%	118	45.91%	0.213
	5-10 times	10	3.90%	86	33.46%	
	>10 times	3	1.17%	13	5.06%	
Hand sanitizer usage per day during the pandemic	< 5 times	6	2.34%	7	2.72%	0.0076
	5-10 times	16	6.23%	98	38.13%	
	>10 times	18	7%	112	43.58%	
Duration of glove usage during the pandemic	< 1 hour	7	2.72%	16	6.23%	0.039
	>1 hour	33	12.84%	201	78.21%	

ISSN:2527-7322 | e-ISSN: 2614-0020

Our study shows that the majority of the HCWs did not seek treatment though they were aware that HD could alter the skin barrier and flora leading to frequent infections. Of particular concern, our study has observed that there is an inconsistency between the development of symptoms and uptake of treatment with less than 20% opting for over-the-counter (OTC) moisturizers and medicated treatments like corticosteroids or antiseptics (Table 3).

Topical corticosteroids and moisturizers act by reducing inflammation and have immunosuppressive effects.[19-21] With Eurasian countries witnessing a surge in new variant infections, COVID will likely be a recurrent problem, it is thus imperative to raise awareness of HD in India and intensive measures should be provided to prevent the development and progression of dermatitis.

The limitations of the present study include self-selection bias, where only HCWs having symptoms of HD are likely to complete the self-administered questionnaire. This was a monocentric study with a small number of participants, hence giving only a snapshot of the problem.

Conclusion

The majority of the HCWs during the pandemic developed HD which can be attributed to increased hygiene measures to reduce the transmission of the virus. Interestingly, HCWs were not able to follow the skincare routine that would prevent the development of HD. With a majority of the respondents reporting signs and symptoms of HD, we must be vigilant that there is no escalation of HD cases. The extent of skin damage reported by both our HCWs and those of international studies is of concern and appropriate implementation of the recommended guidelines is important to prevent the onset of occupational hand eczema.

Hand Hygiene task forces such as the Healthcare Infection Control Practices Advisory Committee (HICPAC), American Contact Dermatitis Society (ACDS), European Society of Contact Dermatitis (ESCD), and Centre for Disease Control (CDC), recommend the use of moisturizers after hand sanitization. Studies like these are indispensable to raise awareness of HD and elevating the importance of good skin care among the staff.

Acknowledgments

None

Funding

Nil

References

1. National Centre for Immunization and Respiratory Diseases (NCIRD), Division of Viral Diseases. *CDC COVID-19 Science Briefs. Atlanta (GA): Centres for Disease Control and Prevention (US); 2020–. Science Brief: SARS-CoV-2 and Surface (Fomite) Transmission for Indoor Community Environments*. 2021
2. Kiely LF, Moloney E, O'Sullivan G, Eustace JA, Gallagher J, Bourke JF. Irritant contact dermatitis in healthcare workers as a result of the COVID-19 pandemic: a cross-sectional study. *Clinical and Experimental Dermatology*. 2021 Jan;46(1):142-4
3. Rundle CW, Presley CL, Militello M, Barber C, Powell DL, Jacob SE, Atwater AR, Watsky KL, Yu J, Dunnick CA. Hand hygiene during COVID-19: recommendations from the American Contact Dermatitis Society. *Journal of the American Academy of Dermatology*. 2020 Dec 1;83(6):1730-7.
4. Techasatian L, Thaowandee W, Chaiyarit J, Uppala R, Sitthikarnkha P, Paibool W, Charoenwat B, Wongmast P, Laoaroon N,

Suphakunpinyo C, Kiatchoosakun P. Hand Hygiene Habits and Prevalence of Hand Eczema During the COVID-19 Pandemic. *Journal of Primary Care & Community Health*. 2021 May;12

5. Alluhayyan OB, Alshahri BK, Farhat AM, Alsugair S, Siddiqui JJ, Alghabawy K, AlQefari GB, Alolayan WO, Hashem IA. Occupational-Related Contact Dermatitis: Prevalence and Risk Factors Among Healthcare Workers in the Al'Qassim Region, Saudi Arabia During the COVID-19 Pandemic. *Cureus*. 2020 Oct 15;12(10).
6. Huang D, Tang Z, Qiu X, Liu X, Guo Z, Yang B, Guo Q, Xiong H. Hand eczema among healthcare workers in Guangzhou City: a cross-sectional study. *Annals of Translational Medicine*. 2020 Dec;8(24).
7. David Boothe W, Tarbox JA, Tarbox MB. Atopic dermatitis: pathophysiology. *Management of atopic dermatitis*. 2017:21-37.
8. Hamnerius N, Pontén A, Bergendorff O, Bruze M, Björk J, Svedman C. Skin exposures, hand eczema and facial skin disease in healthcare workers during the COVID-19 pandemic: a cross-sectional study. *Acta dermato-venereologica*. 2021 Sep 8;101(9).
9. World Health Organization. *COVID-19: occupational health and safety for health workers: interim guidance,* 2 February 2021. World Health Organization; 2021.
10. Lan J, Song Z, Miao X, Li H, Li Y, Dong L, Yang J, An X, Zhang Y, Yang L, Zhou N. Skin damage among health care workers managing coronavirus disease-2019. *Journal of the American Academy of Dermatology*. 2020 May 1;82(5):1215-6.
11. Zuo Y, Hua W, Luo Y, Li L. Skin reactions of N95 masks and medial masks among health care personnel: a self-report questionnaire survey in China. *Contact dermatitis*. 2020 Aug 1
12. Darlenski R, Tsankov N. COVID-19 pandemic and the skin: what should dermatologists know? *Clinics in Dermatology*. 2020 Nov 1;38(6):785-7.
13. Erdem Y, Inal S, Sivaz O, Copur S, Boluk KN, Ugurer E, Kaya HE, Gulsunay IE, Sekerlisoy G, Vural O, Altunay IK. How does working in pandemic units affect the risk of occupational hand eczema in healthcare workers during the coronavirus disease-2019 (COVID-19) pandemic: A comparative analysis with nonpandemic units. *Contact dermatitis*. 2021 Aug;85(2):215-24.
14. Tan SW, Oh CC. Contact dermatitis from hand hygiene practices in the COVID-19 pandemic. *Annals of the Academy of Medicine of Singapore*. 2020 Sep 1;49(9):674-6.
15. Hansen A, Brans R, Sonsmann F. Allergic contact dermatitis to rubber accelerators in protective gloves: Problems, challenges, and solutions for occupational skin protection. *Allergologie select*. 2021;5:335.
16. Rubins A, Romanova A, Septe M, Maddukuri S, Schwartz RA, Rubins S. Contact dermatitis: etiologies of the allergic and irritant type. *Acta Dermatovenerologica Alpina, Pannonica et Adriatica*. 2020 Oct 1;29(4):181-5.
17. Purnamawati S, Indrastuti N, Danarti R, Saefudin T. The role of moisturizers in addressing various kinds of dermatitis: a review. *Clinical medicine & research*. 2017 Dec 1;15(3-4):75-87.
18. Reinholz M, Kendziora B, Frey S, Oppel EM, Ruëff F, Clanner-Engelshofen BM, Heppt MV, French LE, Wollenberg A. Increased prevalence of irritant hand eczema in health care workers in a dermatological clinic due to increased hygiene measures during the SARS-CoV-2 pandemic. *European Journal of Dermatology*. 2021 May;31(3):392-5.

19. Mehta A, Nadkarni N, Patil S, Godse K, Gautam M, Agarwal S. Topical corticosteroids in dermatology. *Indian journal of dermatology, venereology, and leprology.* 2016 Jul 1;82(4).
20. Nygaard U, Deleuran M, Vestergaard C. Emerging treatment options in atopic dermatitis: topical therapies. *Dermatology.* 2017;233(5):333-43.
21. Sethi A, Kaur T, Malhotra SK, Gambhir ML. Moisturizers: the slippery road. *Indian journal of dermatology.* 2016 May;61(3):279.