



## Short Communication

**Investigating hand dermatitis among nurses in Iran during the outbreak of COVID-19: Comparison of COVID and non-COVID wards**Nafiseh Imani Khanegah<sup>1</sup>, Nastaran Ayadi<sup>1</sup>, Mehdi Heidarzadeh<sup>2</sup>, Mehdi Ajri-Khameslou<sup>3\*</sup>, Mahnaz Davari<sup>4</sup><sup>1</sup>Students Research Committee, School of Nursing and Midwifery, Ardabil University of Medical Sciences, Ardabil, Iran<sup>2</sup>Department Medical-Surgical Nursing, School of Nursing and Midwifery, Ardabil University of Medical Sciences, Ardabil, Iran<sup>3</sup>Department of Intensive Care Nursing, School of Nursing and Midwifery, Ardabil University of Medical Sciences, Ardabil, Iran<sup>4</sup>Department of Emergency Nursing, School of Nursing and Midwifery, Ardabil University of Medical Sciences, Ardabil, Iran

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## ABSTRACT

**Background & Aim:** Hand dermatitis is one of the occupational skin diseases among nurses. Due to the prevalence of COVID-19, nurses' exposure to disinfectant solutions has increased, which can increase the incidence of dermatitis among them. The purpose of this study was to determine the prevalence of hand dermatitis among nurses in COVID and non-COVID wards and its related factors during the outbreak of COVID-19 in Iran.**Methods & Materials:** This descriptive-correlational study was performed by available sampling on 287 nurses. Data were collected using a self-administered questionnaire on hand dermatitis. Data were analysed using SPSS software version 22.**Results:** The prevalence of hand dermatitis among COVID wards nurses was 65.7% and among non-COVID wards nurses was 36.2%. However, the logistic regression showed that Female gender ( $P=0.001$ , odds ratio=3.19, CI=1.57-6.46), marital status (single) ( $P=0.011$ , odds ratio=2.64, CI=1.25-5.57), age 31-40 ( $P=0.003$ , odds ratio=0.16, CI=0.06-0.55), COVID wards ( $P=0.000$ , odds ratio=4.99, CI=2.36-10.59), Allergy history ( $P=0.000$ , odds ratio=13.07, CI=6.12-27.95) increase the prevalence of hand dermatitis among nurses.**Conclusion:** Hand dermatitis is a serious problem among corona ward nurses. Therefore, timely identification and treatment of this injury can be very helpful. Nurses should receive adequate training and care for hand dermatitis.**Introduction**

COVID\_19 spread in China in 2019 (1) and quickly led to the involvement of various countries, including Iran.

In 2020, the first case of COVID-19 was reported in Iran (2). According to studies, respiratory droplets and contact are the main transmission routes of COVID-19 (3, 4). This shows the importance of prevention and adherence to protective standards to prevent COVID-19 (5). The most important way to prevent COVID-19 is to wash and disinfect hands frequently and to use personal protective equipment (5, 6).

The use of disinfectants, hand washes, and personal protective equipment increase the risk of dermatitis among nurses (7). Hand dermatitis presents with symptoms such as itching, redness, cracking, dryness, and scaling (8). Studies in different countries show a high prevalence of hand dermatitis in nurses (9, 10). In review studies, the prevalence of hand dermatitis in nurses in Australia is 50%, in Korea 33 to 48%, in Switzerland Zinska 66.4%, and in the Netherlands 70% (11). Also, the prevalence of hand dermatitis in Iran has been reported

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to be 36.8% (12). Injuries caused by occupational dermatitis can reduce nurses' productivity and physical discomfort (9, 13). On the other hand, dermatitis reduces the quality of life of nurses and increases absenteeism (8, 14).

Although nurses are always exposed to various risks, including dermatitis, it can increase during COVID 19 pandemic. Therefore, this study aimed to investigate the incidence of dermatitis among nurses in COVID and non-COVID wards during the outbreak of COVID-19 in Iran.

## **Methods**

The present study is a descriptive-correlational study conducted in 2020. The research population includes all nurses working in all 13 educational hospitals affiliated with Ardabil University of Medical Sciences. Approximately 2,000 nurses (Statistical population of this research) work in these 13 hospitals. A total of 359 nurses were selected through the convenience sampling method from July 30, 2020 to August 20, 2020. Inclusion criteria included: working as a nurse at the hospitals for at least 6 months (from the beginning of the COVID 19 pandemic), involving indirect care for the patients, and willingness to participate in the study; and exclusion criteria were nurses who work in the non-clinical duties, and incomplete completion of the questionnaire.

Two questionnaires of demographic characteristics/factors affecting dermatitis and a self-administered questionnaire on hand dermatitis were used for data collection. Demographic characteristics questionnaire/factors affecting dermatitis including age, sex, marital status, education, work experience, workplace department, number of shifts per week, history of allergies, frequency of hand washings per shift, type and frequency of disinfectant used, the type of gloves used and the duration of gloves used per day.

The second questionnaire was a self-reported questionnaire on hand dermatitis used to assess the prevalence of hand

dermatitis among nurses. This questionnaire consists of seven questions. The first 5 questions are about the symptoms of hand dermatitis, and the last two questions are about the recurrence of signs of hand dermatitis. In this questionnaire, having one or more dermatitis-related symptoms that lasted more than three weeks or occurred more than once is considered as dermatitis (15). It should be noted that nurses were instructed to complete this questionnaire based on their symptoms over the past 6 months (length of time nurses were involved in caring for COVID-19). The sensitivity and specificity of the self-administered questionnaire on hand dermatitis are 65% and 93%, respectively (15). This questionnaire has been translated into Persian, and the reliability of this questionnaire by Cronbach's alpha method was 89% (16).

In the present study, the reliability of the self-administered questionnaire on hand dermatitis by Cronbach's alpha method was 88%. Due to the prevalence of COVID-19 and maintaining social distance, the electronic link of the questionnaire was sent to nurses via email, WhatsApp, and Telegram. A total of 359 nurses participated in the study. 20% of the questionnaires were excluded from the data analysis due to incomplete completion, and the data from 287 questionnaires were analyzed.

Data were analyzed using SPSS software version 22 using descriptive statistics (mean and standard deviation) and inferential statistics (chi-square and Logistic regression). The significance level used in this study was considered 0.05.

The ethics committee approved this research of Ardabil University of Medical Sciences with the code IR.ARUMS.REC.1399.205.

## **Results**

287 nurses participated in this study, which included 99 nurses in the COVID wards (COVID respiratory wards, COVID intensive care unit, COVID emergency departments) and 188 non- COVID ward

nurses (internal wards, surgical ward, neurology ward, urology ward, emergency departments, and non- COVID intensive care unit, coronary care unit).

The highest number of participants in the study were female, with 192 cases (66.9%). The mean age of participants in

this study was 31.6 years, with a standard deviation of 5.6. The history of nurses participating in the study was 8.4 years, and the standard deviation was 4.9. 52 (27.7%) non- COVID ward nurses and 35 (35.4%) COVID ward nurses had a history of allergies (Table 1).

**Table 1.** Demographic characteristics of nurses participating in the study

Demographic characteristics	Non-COVID wards= 188	COVID wards= 99	Total	
	N (%)	N (%)	N (%)	
Sex	Male	62 (33)	33 (33.3)	95 (33.1)
	Female	126 (67)	66 (66.7)	192 (66.9)
Age (y)	20-30	95 (50.5)	57 (57.6)	152 (53)
	31-40	63 (33.5)	36 (36.4)	99 (34.5)
	41-50	27 (14.4)	5 (5.1)	32 (11.1)
	51-60	3 (1.6)	1 (1)	4 (1.4)
Marital status	Single	75 (39.9)	43 (43.4)	118 (41.1)
	Married	113 (60.1)	56 (56.6)	169 (58.9)
Work experience (y)	6 months-1year	52 (27.7)	15 (15.2)	67 (23.3)
	2-5	52 (27.7)	39 (39.4)	91 (31.7)
	6-10	35 (18.6)	17 (17.2)	52 (18.1)
	11-15	33 (17.6)	23 (23.2)	56 (19.5)
	16-20	6 (3.2)	4 (4)	10 (3.5)
	>20	10 (5.3)	1 (1)	11 (3.8)
Education	Undergraduate student	45 (23.9)	11 (11.1)	56 (19.5)
	Bachelor	106 (56.4)	77 (77.8)	183 (63.8)
	MSc student	12 (6.4)	3 (3)	15 (5.2)
	MSc	15 (8)	2 (2)	17 (5.9)
	PhD	10 (5.3)	6 (6.1)	16 (5.6)
Allergy history	Yes	52 (27.7)	35 (35.4)	87 (30.3)
	No	136 (72.3)	64 (64.6)	200 (69.7)

The most common symptoms were itching of the hands or fingers with fissures (nurses in non- COVID wards 38.8% and nurses in COVID wards 56.6%) and scaling of the hands or fingers with fissures (nurses in non- COVID wards were 38.3% and nurses in COVID wards were 56.6%), respectively. The last sign in the two groups is related to vesicles

on the hand or between the fingers. There was no significant relationship between COVID and non-COVID ward nurses regarding vesicles symptom (P=0.243) (Table 2). However, 36.2% of non-COVID ward nurses and 65.7% of COVID ward nurses had hand dermatitis during the COVID-19 outbreak (Table 2).

**Table 2.** Prevalence of hand dermatitis and symptoms of hand dermatitis among nurses participating in the study

Symptoms		non-COVID wards	COVID wards	Total	P value*
		N (%)	N (%)	N (%)	Odds Ratio CI
Red and swollen hands or fingers	Yes	63 (33.5)	54 (54.5)	117 (40.8)	0.001
	No	125 (66.5)	45 (45.5)	170 (59.2)	Odds Ratio= 2.38 CI=1.45-3.92
Red hands or fingers and fissures	Yes	64 (34)	54 (54.5)	118 (41.2)	0.001
	No	124 (66)	45 (45.5)	169 (58.9)	Odds Ratio=2.32 CI=1.41-3.83
Vesicles on the hand or between the fingers	Yes	18 (9.6)	14 (14.1)	32 (11.1)	0.243
	No	170 (90.4)	85 (85.9)	255 (88.9)	Odds Ratio=1.56 CI=0.74-3.28
Scaling of the hands or fingers with fissures	Yes	72 (38.3)	56 (56.6)	128 (44.6)	0.003
	No	116 (61.7)	43 (43.4)	159 (55.4)	Odds Ratio=2.1 CI=1.28-3.44
Itching of the hands or fingers with fissures	Yes	73 (38.8)	56 (56.6)	129 (44.9)	0.004*
	No	115 (61.2)	43 (43.4)	158 (55.1)	Odds Ratio=2.05 CI=1.25-3.36
Hand dermatitis	Yes	68 (36.2)	65 (65.7)	133 (46.3)	
	No	120 (63.8)	34 (34.3)	154 (53.7)	<0.000

\* Chi-square

We conducted the logistic regression analysis to investigate the relationship of hand dermatitis with demographic variables and risk factors for hand dermatitis among 287 nurses participating in the study. Based on the results obtained from logistic regression, age, female, single marital status, COVID wards, and history of previous allergies were associated with the prevalence

of hand dermatitis. Female gender (P:0.001, odds ratio: 3.19, CI: 1.57-6.46), marital status (single) (P:0.011, odds ratio: 2.64, CI: 1.25-5.57), age 31-40 (P:0.003, odds ratio: 0.16, CI: 0.06-0.55), COVID wards (P:0.000, odds ratio: 4.99, CI: 2.36-10.59), Allergy history (P:0.000, odds ratio: 13.07, CI: 6.12-27.95) increase the prevalence of hand dermatitis (Table 3).

**Table 3.** Logistic regression coefficients to assess the relationship hand dermatitis with demographic variables and risk factors for hand dermatitis among nurses participating in the study

Variables	b	SE	P value	Odds ratio	CI % 95 Confidence interval	
Age (y)	20-30					
	31-40	-1.69	0.55	0.003	0.16	0.06 0.55
	>40	-0.85	0.51	0.097	0.427	0.16 1.17
Sex	Male					
	Female	1.16	0.36	0.001	3.19	1.57 6.46
Marital status	Married					
	Single	0.97	0.38	0.011	2.64	1.25 5.57
Working section	Non-COVID wards					
	COVID wards	1.61	0.38	<0.000	4.99	2.36 10.59
Number of shifts per week	4>					
	5-7	-0.97	0.84	0.245	0.38	0.07 1.95
	8-10	-0.51	0.60	0.391	0.59	0.18 1.94
	>10	-0.41	0.64	0.519	0.66	0.19 2.33
Frequency of hand washing s per shift	1-3					
	4-7	-1.13	0.69	0.103	0.32	0.08 1.26
	8-11	-0.001	0.41	0.997	0.99	0.44 2.23
	>11	0.69	0.43	0.113	1.99	0.85 4.66

Gloves type	Latex						
	Nylon	-0.33	0.47	0.474	0.71	0.28	1.79
Duration of gloves used per day	1-3 hours						
	4-5 hours	0.31	0.43	0.472	1.36	0.59	3.17
	6 and over (hours)	0.48	0.42	0.255	1.62	0.71	3.72
Allergy history	No						
	Yes	2.57	0.38	<0.000	13.07	6.12	27.95
Type disinfectant	Alcohol 70%						
	Hand rub	0.59	0.53	0.269	1.79	.63	5.09
	Liquid soap	0.344	0.494	0.487	1.41	0.53	3.71
The amount of disinfectant used	Little						
	Some	0.37	0.62	0.546	1.45	0.431	4.89
	Much	-0.04	0.42	0.924	0.96	0.42	2.19
	Too much	-0.16	0.42	0.706	0.85	0.37	1.96

## Discussion

All nurses, especially nurses working in the COVID wards, are affected by various complications. One of these complications is hand dermatitis. This study showed that the prevalence of hand dermatitis among nurses working in COVID wards is very high compared to non- COVID wards. The study conducted in Turkey in 2009 reported 57.5% prevalence of hand dermatitis among pediatric nurses (17), and the study conducted in Germany reported 22.4% prevalence of hand dermatitis (18). In general, the average rate of hand dermatitis among nurses varied between 17 and 50% (11). Our study showed that hand dermatitis was significantly increased among nurses caring for COVID-19 patients. In the study by Guertler et al. (19) as well as in the study by Erdem et al. (20), the incidence of hand dermatitis among health care providers increased during the COVID 19 pandemic period. Our study showed that nurses with any characteristics, age, education, marital status, work experience, etc., are at risk of hand dermatitis. The prevalence of hand dermatitis has increased by 100% in the COVID-19 outbreak. This requires the rapid intervention of the health management system to control the increase in hand dermatitis.

The most common signs associated with hand dermatitis include scaling of the hands or fingers with fissures and itching of the hands or fingers with fissures which were in

line with the study of Arefi et al. (12). However, in the study by Campion, the most common symptoms were redness and eczema (21). The lowest symptom in this study was related to hand vesicles which were not statistically significant in COVID and non- COVID ward nurses ( $P=0.243$ , odds Ratio=1.56). The findings of this study were consistent with the study of Arefi et al. (12). In most studies, the most common symptoms were redness, eczema, scaling, and itching, and the least common were vesicles (11, 12, 19).

Based on the results of our study, among the demographic variables, female gender ( $P=0.001$ ), marital status single ( $P:0.011$ ), and age 31-40 ( $P:0.003$ ) were identified as a risk factor for hand dermatitis. Most studies show a higher prevalence of dermatitis among women than men (22, 23). However, in the study of Guertler et al., the relationship between gender and hand dermatitis was not significant in COVID nurses (19). In a study by Nutten, decreasing age identified a risk factor for dermatitis (24). In the study of Lee et al., young age and single marital status were identified as an important risk factor for dermatitis (25). According to the present study results, women working in COVID wards should be monitored more for hand dermatitis to receive the necessary treatment in time. The reason why gender has been identified as a risk factor for hand dermatitis should also be further studied.

Based on our findings, having a history of allergies puts nurses at risk for hand dermatitis, so that the history of allergies was significantly associated with the incidence of hand dermatitis among nurses ( $P=0.000$ , odds Ratio=13.07). This finding was consistent with the studies of Sanchez, Mekonnen and Ozyazicioglu (8, 11, 17).

Due to the fact that hand dermatitis is one of the important factors in increasing absenteeism (8), this can lead to a lack of nurses providing care to patients with COVID 19. Thus, it is recommended that nurses with a history of hand allergies be less used in the COVID wards. Given that hand dermatitis is a preventable disease, early detection of hand dermatitis can play an important role in treating this complication; therefore, educating the symptoms related to hand dermatitis and primary prevention has a key role in controlling this complication among nurses. In the case of hand dermatitis, the use of emollient creams and hand hygiene can play an important role in the rapid treatment of the complication.

According to the best of our knowledge, this study is one of the first studies to compare hand dermatitis among corona and non-corona ward nurses during the COVID-19 pandemic.

### **Limitations**

This study used a self-reporting tool to obtain symptoms related to dermatitis that could cause bias in the study.

### **Conclusion**

Hand dermatitis is a serious problem among COVID ward nurses. The present study showed that hand dermatitis among nurses in COVID wards is very high compared to nurses in non- COVID wards. Among the demographic variables and risk factors, age, sex, marital status, working section, and history of allergies were significantly associated with hand dermatitis.

Therefore, timely identification and treatment of this injury can play a very

important role in controlling this disease. Also, nurses should receive adequate training and care for hand dermatitis.

### **Relevance to clinical practice**

Hand dermatitis is a common occupational skin disease among nurses. The results of this study showed that the prevalence of hand dermatitis had increased sharply during the COVID 19 pandemic. Hand dermatitis should be timely diagnosed and treatment among nurses so that nurses and the health care system do not suffer from the complications associated with hand dermatitis.

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### **Conflict of interest**

The authors do not report any conflict of interest.

### **References**

1. Zhu N, Zhang D, Wang W, Li X, Yang B, Song J, et al. A Novel Coronavirus from Patients with Pneumonia in China, 2019. *New England Journal of Medicine*. 2020; 382(8):727-33. <https://doi.org/10.1056/NEJMoa2001017>
2. Abdi M. Coronavirus disease 2019 (COVID-19) outbreak in Iran: Actions and problems. *Infection Control & Hospital Epidemiology*. 2020;41(6):754-55.
3. Adhikari SP, Meng S, Wu Y-J, Mao Y-P, Ye R-X, Wang Q-Z, et al. Epidemiology, causes, clinical manifestation and diagnosis, prevention and control of coronavirus disease (COVID-19) during the early outbreak period: a scoping review. *Infectious diseases of poverty*. 2020;9(1):1-12. <https://doi.org/10.1186/s40249-020-00646-x>

4. Rothan HA, Byrareddy SN. The epidemiology and pathogenesis of coronavirus disease (COVID-19) outbreak. *Journal of Autoimmunity*. 2020;109:102433. <https://doi.org/10.1016/j.jaut.2020.102433>
5. Gan WH, Lim JW, David K. Preventing intra-hospital infection and transmission of COVID-19 in healthcare workers. *Safety and Health at Work*. 2020; 11(2): 241-43. <https://doi.org/10.1016/j.shaw.2020.03.001>
6. Bartoszko JJ, Farooqi MAM, Alhazzani W, Loeb M. Medical masks vs N95 respirators for preventing COVID-19 in healthcare workers: A systematic review and meta-analysis of randomized trials. *Influenza and other respiratory viruses*. 2020; 14(4): 365-73. <https://doi.org/10.1111/irv.12745>
7. Fargly HAE, Mohammed MA, Ahmed RA. Hand Skin Problems: Prevalence and Risk Factors Among Nurses Working at Surgical Departments in Ministry of Health Hospitals. *Assiut Scientific Nursing Journal*. 2019;7(16):24-34.
8. Mekonnen TH, Yenealem DG, Tolosa BM. Self-report occupational-related contact dermatitis: prevalence and risk factors among healthcare workers in Gondar town, Northwest Ethiopia, 2018—a cross-sectional study. *Environmental health and preventive medicine*. 2019 Dec;24(1):1-9.
9. Brans R. Hand dermatitis in nurses: is promotion of protective behaviour ineffective? *British Journal of Dermatology*. 2020; 183(3): 411-12. <https://doi.org/10.1111/bjd.18973>
10. Madan I, Parsons V, Ntani G, Wright A, English J, Coggon D, et al. A behaviour change package to prevent hand dermatitis in nurses working in health care: the SCIN cluster RCT. *Health Technology Assessment*. 2019 Oct;23(58):1-92. doi: 10.3310/hta23580
11. Sanchez A. The prevalence of hand dermatitis in nurses: A narrative review highlighting the importance of prevention. *Journal of Dermatology & Cosmetology*. 2018;2(1):42-8.
12. feize arefi m, Zare Sakhvidi MJ, kargar f, mostaghaci M, Zare G, Maghsood Zi, et al. The investigation of affection risk to skin symptoms (dermatitis) in Educational hospitals staff services in Yazd with Nordic Occupational Skin Questionnaire. *Iran Occupational Health Journal*. 2018;14(6):18-25. [Persian]
13. Chen J, Gomez P, Kudla I, DeKoven J, Holness DL, Skotnicki S. Return to Work for Nurses With Hand Dermatitis. *Dermatitis*. 2016;27(5):308-12. <https://doi.org/10.1097/der.0000000000000215>
14. Lan CCE, Feng WW, Lu YW, Wu CS, Hung ST, Hsu HY, et al. Hand eczema among University Hospital nursing staff: identification of high-risk sector and impact on quality of life. *Contact Dermatitis*. 2008;59(5):301-6.
15. Smit HA, Coenraads PJ, Lavrijsen AP, Nater JP. Evaluation of a self-administered questionnaire on hand dermatitis. *Contact Dermatitis*. 1992;26(1):11-6.
16. Sadeghian F, Delvarianzadeh M, Klalyan H, Zadeh S. The prevalence of hand eczema and some related factors in nursing and midwifery personnel. *Daneshvar Pezeshki*. 2006;14(67):25- 32. [Persian]
17. Özyazıcıoğlu N, Sürenler S, Tanrıverdi G. Hand dermatitis among paediatric nurses. *Journal of clinical nursing*. 2010;19(11-12):1597-603.
18. Stutz N, Becker D, Jappe U, John S, Ladwig A, Spornraft-Ragaller P, et al. Nurses' perceptions of the benefits and adverse effects of hand disinfection: alcohol-based hand rubs vs. hygienic handwashing: a multicentre questionnaire study with additional patch testing by the German Contact Dermatitis Research Group. *British Journal of Dermatology*. 2009;160(3):565-72.
19. Guertler A, Moellhoff N, Schenck TL, Hagen CS, Kendziora B, Giunta RE, et al. Onset of occupational hand eczema among healthcare workers during the SARS-CoV-2 pandemic—comparing a single surgical site with a COVID-19 intensive care unit. *Contact Dermatitis*. 2020; 83(2), 108-14. <https://doi.org/10.1111/cod.13618>
20. Erdem Y, Altunay IK, Çerman AA, Inal S, Ugurer E, Sivaz O, et al. The risk of hand eczema in healthcare workers during the COVID-19 pandemic: Do we need specific attention or prevention strategies? *Contact Dermatitis*. 2020; 83(5): 422-23. <https://doi.org/10.1111/cod.13632>
21. Champion K. A survey of occupational skin disease in UK health care workers. *Occupational Medicine*. 2015;65(1):29-31.
22. Meding B. Differences between the sexes with regard to work-related skin disease. *Contact dermatitis*. 2000;43(2):65-71.
23. Montnemery P, Nihlén U, Löfdahl CG, Nyberg P, Svensson Å. Prevalence of

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self-reported eczema in relation to living environment, socio-economic status and respiratory symptoms assessed in a questionnaire study. *BMC dermatology*. 2003 Dec;3(1):1-6.

24. Nutten S. Atopic dermatitis: global epidemiology and risk factors. *Annals of nutrition and metabolism*. 2015;66 (Suppl. 1):8-16.

25. Lee JS, Kim JM, Seok J, Kim BJ. Correlation between socio-economic status and atopic dermatitis in Korean adults: the Korea national health and nutrition examination survey (2007–2014). *Journal of the European Academy of Dermatology and Venereology*. 2017 Sep;31(9):1509-15.