

Markus REINHOLZ<sup>1</sup>  
 Benjamin KENDZIORA<sup>1</sup>  
 Surina FREY<sup>1</sup>  
 Eva Maria OPPEL<sup>1</sup>  
 Franziska RUÉFF<sup>1</sup>  
 Benjamin Maximilian  
 CLANNER-ENGELSHOFEN<sup>1</sup>  
 Markus V. HEPPT<sup>2</sup>  
 Lars Einar FRENCH<sup>1</sup>  
 Andreas WOLLENBERG<sup>1</sup>

<sup>1</sup> Department of Dermatology and Allergy  
 University Hospital, Ludwig Maximilian  
 University of Munich, 80337 Munich,  
 Germany Munich, Germany

<sup>2</sup> Department of Dermatology,  
 University Hospital Erlangen,  
 Friedrich-Alexander-University  
 Erlangen-Nürnberg (FAU), 91054 Erlangen,  
 Germany

**Reprints:** Markus Reinholz  
 <markus.reinholz@med.uni-  
 muenchen.de>

## 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

**Background:** Hand hygiene measures in the general population and in health care workers have increased considerably since the outbreak of the COVID-19 pandemic. **Objectives:** To investigate the prevalence and symptoms of hand eczema, as well as hygiene measures and concepts of care, in German health care workers. **Materials & Methods:** This was an observational questionnaire study to investigate hygiene and skin care habits, as well as the prevalence and symptoms of hand eczema in 66 nurses and doctors of our dermatology department before and during the SARS-CoV-2 pandemic. **Results:** Hand washing and hand disinfection procedures increased significantly during the COVID-19 pandemic. Self-diagnosed hand eczema was reported by 33% of the participants, with a median duration of 14 days. The majority of staff currently affected by hand eczema were free of eczema a month previously (82%) and would treat their skin condition with emollients (77%). Erythema, scaling, burning and fissures were reported by 66.1% of the participants and were classified as predominant signs of toxic-irritant hand dermatitis rather than contact allergy. **Conclusion:** Overall, the SARS-CoV-2 pandemic has led to a significant increase in the incidence of signs of irritant hand eczema despite intensified emollient use as a preventive measure. Awareness of the prevalence of hand eczema in health care workers in Germany during the COVID-19 pandemic should be raised, and preventive measures should be intensified.

**Key words:** hand eczema, corona virus, COVID-19, SARS-CoV-2, health care workers, dermatology

Article accepted on 05/12/2020

Increased hygiene measures have been in place in hospitals since the beginning of the SARS-CoV-2 pandemic. Most of the available studies recommend hand washing and disinfection as protective measures during the COVID-19 pandemic [1-3]. It is remarkable that a large number of employees report symptoms of hand eczema [4]. In the general population, there is also an increase in palmar dermatitis [5]. These observations are mainly based on expert opinions and comprise a very small number of studies. Therefore, we planned an observational study to investigate the current situation. In this study, we evaluated hygiene habits, prevalence of hand eczema and preventive use of emollients before and during the SARS-CoV-2 pandemic. For this purpose, we conducted a survey on employees of our dermatology department during calendar Week 15 of 2020, shortly after the first COVID-19 wave in Munich.

### Material and methods

The study was approved by the ethics committee of the medical faculty of the LMU, Munich, Germany (Ref.-No. 20-295) and complies with the principles of the Declaration of Helsinki. Patient information and identification were kept

confidential at all times, and data analysis was performed anonymously.

Medical and nursing staff of the dermatology department completed a questionnaire about their possible signs and symptoms of hand eczema, hand washing, disinfection habits and use of emollients before and during the SARS-CoV-2 pandemic. Simultaneously, basic information on gender, age, profession, contact allergies and atopic diathesis were evaluated.

For data analysis and statistics, Microsoft<sup>®</sup> Excel (2016, Microsoft Corporation, USA) and SPSS<sup>®</sup> version 25 (IBM<sup>®</sup>, NY/USA) were used.

Non-parametric tests, such as the Mann-Whitney-U test, Wilcoxon test, Chi-square test, and Fisher's Exact test, were used as appropriate. Results with *p* values  $\leq 0.05$  were deemed significant, and highly significant at  $\leq 0.01$ .

### Results

#### Study population characteristics

Thirty physicians (45.5%) and 36 nurses (54.5%) of the Department of Dermatology and Allergy at LMU Munich

**Table 1.** Characteristics of the study population.

	<i>Physicians (n = 30)</i>	<i>Nurses (n = 36)</i>	<i>Total (n = 66)</i>	
Female	21 (70.0%)	31 (86.1%)	52 (78.8%)	
Age (mean±SD)	31.4 (±7.7)	43.2 (±14)	(2 w.i.)	37.7 (±12.8) (2 w.i.)
Contact allergy	2 (6.7%)	7 (20.0%)	(1 w.i.)	9 (13.8%) (1 w.i.)
Asthma	1 (3.3%)	5 (13.9%)	6 (9.1%)	
Pollinosis	12 (40.0%)	12 (33.3%)	24 (36.4%)	
Atopic eczema	3 (10.0%)	3 (8.3%)	6 (9.1%)	

SD: standard deviation; w.i.: without information.

**Table 2.** Frequency of hand washing per day before and during the COVID-19 pandemic.

<i>Frequency of hand washing</i>		<i>Physicians</i>	<i>Nurses</i>	<i>Total</i>
Before the COVID-19 pandemic	<5×	3 (10.0%)	3 (8.3%)	6 (9.1%)
	5-10×	18 (60.0%)	15 (41.7%)	33 (50.0%)
	10-20×	8 (26.7%)	13 (36.1%)	21 (31.8%)
	20-30×	1 (3.3%)	3 (8.3%)	4 (6.1%)
	>30×	0 (0.0%)	2 (5.6%)	2 (3.0%)
During the COVID-19 pandemic	<5×	0 (0.0%)	2 (5.7%)	2 (3.1%)
	5-10×	12 (40.0%)	1 (2.9%)	13 (20.0%)
	10-20×	14 (46.7%)	23 (65.7%)	37 (56.9%)
	20-30×	4 (13.3%)	5 (14.3%)	9 (13.8%)
	>30×	0 (0.0%)	4 (11.4%)	4 (6.2%)

participated in the study. Demographic characteristics and patients' history are shown in *table 1* table 1.

### History of contact allergy, atopy and hand eczema

A history of contact allergy was reported in 13.8% of the participants. A history of atopy was frequently reported (hay fever in 36.4%, bronchial asthma in 9.1%, and atopic eczema in 9.1% of the health care workers) (*table 1*). Twenty-two participants reported hand eczema. Seventeen indicated a recent new onset of hand eczema, which had developed within the last 30 days in almost all patients (88.2%). Hand eczema was reported by 53% of non-atopic participants, and 47% of atopic participants.

### Hand hygiene measures

The self-reported median frequency of hand washing, which was 5 to 10 times per day before the COVID-19 pandemic, increased significantly to 10 to 20 times per day during the pandemic ( $p < 0.001$ ). The median frequency of hand disinfection increased from 10 to 20 times daily before to 20 to 30 times since the COVID outbreak ( $p < 0.001$ ) (*table 2* table 2).

**Table 3.** Self-reported symptoms of hand eczema (in order of frequency).

<i>Symptom</i>	<i>Physicians (n = 30)</i>	<i>Nurses (n = 36)</i>	<i>Total (n = 66)</i>
<i>Erythema</i>	13(43.3%)	17(47.2%)	30(45.5%)
<i>Scaling</i>	10(33.3%)	12(33.3%)	22(33.3%)
<i>Itching</i>	4(13.3%)	12(33.3%)	16(24.2%)
<i>Burning</i>	7(23.3%)	8(22.2%)	15(22.7%)
<i>Other symptoms</i>	5(16.7%)	5(13.9%)	10(15.2%)
<i>Rhagades</i>	3(10.0%)	5(13.9%)	8(12.1%)
<i>Pain</i>	1(3.3%)	3(8.3%)	4(6.1%)

### Signs and symptoms of hand eczema

Erythema, scaling, and fissures, as objective signs of eczema, as well as burning, were increased in patients with a self-reported diagnosis of hand eczema, while itching, pain, and other symptoms were not (*tables 3, 4* table 3)table 4. Even though more than 66% of the participants had reported one or more symptoms of hand eczema, only 33% would state a self-diagnosis of hand eczema.

**Table 4.** Onset of hand eczema.

Onset of hand eczema (days)	n	%
< 10	5	29.4
11 - 20	6	35.3
21 - 30	4	23.5
> 30	2	11.8
Total	17	

### Therapy of hand eczema

Over three quarters of employees who developed eczema used emollients for treatment (77.3%), whereas less than one quarter (22.5%) of employees without eczema used emollients. This difference was highly significant ( $p < 0.001$ ). Topical corticosteroids were only used by three participants (Niedner Class II and III), all of whom suffered from hand eczema.

### Skin care and hand eczema

With the increase in hand washing and hand disinfection during the COVID-19 pandemic, the use of hand creams among physicians and nurses also increased (table 5 table 5). The application frequency of emollients increased from 1-2 times to 2-5 times per day ( $p < 0.001$ ). There was

no significant association between the frequency of hand cream application and self-perceived diagnosis of hand eczema.

## Discussion

This short survey has demonstrated a significant increase in signs and symptoms, most likely compatible with irritant hand eczema (table 6 table 6), since the beginning of the COVID-19 pandemic due to increased sanitary and disinfection measures in health care workers, who were not involved in the treatment of COVID-19 patients. The number of disinfections increased significantly to a median of 20 to 30 times per day during the SARS-CoV-2 pandemic, and the number of hand washings from 5-10 times to 10-20 times per day.

We assume that the cause of the new cases of hand eczema was due to a toxic-irritant mechanism. Exaggerated hand washing destroys the protective lipid barrier of the skin and is a known risk factor for the development of occupational hand eczema [6, 7]. This combination of increased disinfection and hand washing is a known major risk factor for developing an irritant hand eczema, and subsequently also a potential risk factor for developing additional contact sensitization, although this was not evaluated in the current study [6]. In contrast to the literature, the healthcare workers with

**Table 5.** Frequency of hand cream application per day.

Hand cream application		Physicians	Nurses	Total
Before the COVID-19 pandemic	1×	13 (48.1%)	9 (25.0%)	22 (34.9%)
	1-2×	6 (22.2%)	10 (27.8%)	16 (25.4%)
	2-5×	6 (22.2%)	12 (33.3%)	18 (28.6%)
	5-10×	2 (7.4%)	3 (8.3%)	5 (7.9%)
	>10×	0 (0.0%)	2 (5.6%)	2 (3.2%)
During the COVID-19 pandemic	1×	5 (16.7%)	4 (11.4%)	9 (13.8%)
	1-2×	6 (20.0%)	6 (17.1%)	12 (18.5%)
	2-5×	12 (40.0%)	15 (42.9%)	27 (41.5%)
	5-10×	5 (16.7%)	9 (25.7%)	14 (21.5%)
	>10×	2 (6.7%)	1 (2.9%)	3 (4.6%)

**Table 6.** Correlation between sensations and symptoms of hand eczema (in order of strength of correlation).

Symptom	p	chi <sup>2</sup>	
Erythema	<0.001	23.457	correlation with hand eczema
Scaling	<0.001	28.010	correlation with hand eczema
Burning	<0.001	13.579	correlation with hand eczema
Rhagades	0.009	6.901	correlation with hand eczema
Itching	0.069	3.307	no correlation with hand eczema
Other symptoms	0.083	3.001	no correlation with hand eczema
Pain	0.481	0.497	no correlation with hand eczema

atopy in this study had no increased risk of hand eczema compared to those without atopy, however, the number of participants was very limited [8].

The symptoms reported in this study were mainly erythema, scaling, itching and burning (table 3), which is consistent with a diagnosis of acute, toxic-irritant hand eczema [7, 9]. Pain and fissures, which correspond mainly to chronic hand eczema, were reported less frequently [6,7]. In some cases, allergic contact dermatitis of the hands exhibited satellite lesions, or even a dyshidrosiform presentation.

The fact that 82.4% of the existing hand eczema cases had developed within one month suggests a temporal link to the recently increased hygiene measures to reduce the transmission of SARS-CoV-2 in hospitals, and is in concordance with recently published studies [4, 5]. Hand washing and disinfection are both the main factors for hand eczema in health care workers [10, 11].

Interestingly, even health care workers who work in a dermatological hospital, partly as dermatologists, are unable to practice skin care that would prevent hand eczema.

Emollients were applied more frequently during the COVID-19 pandemic, but this was not sufficient to prevent hand eczema in this study group. There is still no effective standardized therapeutic regimen described, which would prevent or reduce occupational hand eczema in health care workers [12]. Preventive measures such as an increased use of emollients should be recommended to health care workers [13]. If symptoms of hand eczema are present, emollient use only is insufficient and medicated anti-inflammatory creams should be included in the therapeutic regimen to reduce long-term damage and the development of occupational hand eczema [6]. Washing hands for 20 seconds with soap is more hazardous for the skin than the use of disinfectants with lipid-restoring ingredients [3]. Furthermore, educational programs can be successful, e.g. on washing temperature and determining co-risk factors of hand eczema [14, 15].

This study is limited by the fact that the number of participants was small, the recruitment was monocentric and allergic contact sensitization was not assessed by patch testing. However, it clearly shows an increase in toxic-irritant hand eczema in the times of the COVID-19 pandemic.

**Acknowledgments and disclosures.** *Acknowledgements: we dedicate this publication to the memory of Professor Thomas Ludwig Diepgen, who greatly contributed to our knowledge in occupational dermatology and hand eczema worldwide. Financial support: none. Conflicts of interest: none.*

## References

1. Chavez S, Long B, Koyfman A, Liang SY. Coronavirus disease (COVID-19): a primer for emergency physicians. *Am J Emerg Med* 2020; S0735-6757(20): 30178-9.
2. Lin YH, Liu CH, Chiu YC. Google searches for the keywords of "wash hands" predict the speed of national spread of COVID-19 outbreak among 21 countries. *Brain Behav Immun* 2020; 87: 30-2.
3. The Lancet. COVID-19: protecting health-care workers. *Lancet* 2020; 395: 922.
4. Lan J, Song Z, Miao X, et al. Skin damage among healthcare workers managing coronavirus disease-2019. *J Am Acad Dermatol* 2020; 82(5): 1215-6.
5. Singh M, Pawar M, Bothra A, Choudhary N. Overzealous hand hygiene during COVID-19 pandemic causing increased incidence of hand eczema among general population. *J Am Acad Dermatol* 2020; 83(1): e37-41.
6. Diepgen TL, Andersen KE, Chosidow O, et al. Guidelines for diagnosis, prevention and treatment of hand eczema-short version. *J Dtsch Dermatol Ges* 2015; 13: 77-85.
7. Molin S. Pathogenesis of hand eczema. *Hautarzt* 2019; 70: 755-9.
8. Zhang D, Zhang J, Sun S, Gao M, Tong A. Prevalence and risk factors of hand eczema in hospital-based nurses in northern China. *Australas J Dermatol* 2018; 59: e194-7.
9. Johansen JD, Hald M, Andersen BL, et al. Classification of hand eczema: clinical and aetiological types. Based on the guideline of the Danish Contact Dermatitis Group. *Contact Dermatitis* 2011; 65: 13-21.
10. Agner T, Aalto-Korte K, Andersen KE, et al. Factors associated with combined hand and foot eczema. *J Eur Acad Dermatol Venereol* 2017; 31: 828-32.
11. Minamoto K, Watanabe T, Diepgen TL. Self-reported hand eczema among dental workers in Japan - a cross-sectional study. *Contact Dermatitis* 2016; 75: 230-9.
12. Papadatou Z, Williams H, Cooper K. Effectiveness of interventions for preventing occupational irritant hand dermatitis: a quantitative systematic review. *JBI Evidence Synthesis* 2018; 16: 1398-417.
13. Yan Y, Chen H, Chen L, et al. Consensus of Chinese experts on protection of skin and mucous membrane barrier for health-care workers fighting against coronavirus disease 2019. *Dermatol Ther* 2020; 33(4): e13310.
14. Reich A, Wilke A, Gediga G, et al. Health education decreases incidence of hand eczema in metal work apprentices: results of a controlled intervention study. *Contact Dermatitis* 2020; 82(6): 350-60.
15. Cavanagh G, Wambier CG. Rational hand hygiene during the coronavirus 2019 (COVID-19) pandemic. *J Am Acad Dermatol* 2020; 82(6): e211.