



# Hand Hygiene Habits and Prevalence of Hand Eczema During the COVID-19 Pandemic

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## Abstract

**Purpose:** This study aimed to explore the prevalence of and possible risk factors for hand eczema with respect to the dissemination of information about new hand hygiene habits to protect against ongoing COVID-19 cross-transmission. The authors conducted a survey among health care workers (HCWs) and non-HCW populations in Khon Kaen, Thailand. **Results:** A total of 805 participants participated. The prevalence of hand eczema in the study population was 20.87%. There were several risk factors, including working as a HCW, having a history of previous hand eczema, having underlying atopic dermatitis, wearing gloves in everyday life, and washing hands frequently (more than 10 times/day). Hand hygiene with alcohol-based products was shown to be a risk factor for hand eczema, (OR (95% CI) 1.86 (1.03-3.35),  $P=.04$ ). **Conclusion:** In terms of hand eczema prevention, we suggest that the use of alcohol-based products should be discontinued if other handwashing methods are available. The following factors increase the risk of hand eczema: being a HCW, having previous hand eczema, and having underlying atopic dermatitis. Proper strategies in terms of hand eczema prevention should be addressed, especially in this group, since we need to continue performing hand hygiene during the ongoing COVID-19 pandemic.

## Keywords

alcohol-based product, hand hygiene, hand eczema, COVID-19

## Keywords

face mask, adverse skin reaction, COVID-19

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## Introduction

The World Health Organization (WHO)<sup>1</sup> and other authorities recommend frequent hand washing and indicate that hand hygiene procedures are one of the methods to prevent the COVID-19 transmission.<sup>2</sup> In the context of this pandemic, hand hygiene habits have been changed. Health care workers (HCWs) who work with infected cases or work in a high-risk situation have increased their frequency of handwashing.<sup>3</sup> This phenomenon is also observed in non-HCWs because of a fear of this pandemic throughout the world.<sup>4</sup> With this new

hand hygiene habit, a growing prevalence of hand eczema has been noticed.<sup>5-8</sup> A recent study from China revealed a high prevalence of hand eczema among health care workers (HCWs) managing COVID-19.<sup>9</sup> Such overzealous hand

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hygiene habits contribute to an increased incidence of hand eczema not only among HCWs, but also in the general population. Hand eczema can be as mild as dry and itchy symptoms. However, a severe form can be presented with deep seated vesicles on the hands, blisters, fissures, and bleeding. This type of skin damage affects individuals' quality of life since it can be very painful when touching things by hands. Hand eczema can be worse if individual has improper treatment. Previous studies have found some risk factors that associated with hand eczema, such as frequency of handwashing greater than 10 to 20 times/day, wearing gloves, and previous hand eczema.<sup>9</sup> Most previous studies have focused on the HCW group; however, the present study will expand the study population to both HCWs and non-HCWs, since we have noticed that changes in hand hygiene habits have also appeared in the general population. Thus, the objective of this study was to determine the factors that might affect the occurrence of hand eczema given the development of new hand hygiene habits and the various hand hygiene methods used during the COVID-19 pandemic. The results may help prevent hand eczema while it is still necessary to perform hand hygiene during the COVID-19 pandemic.

## Methods

### Participants

All individuals older than 18 years of age were eligible to participate. Consecutive individuals entered into the Faculty of Medicine, Khon Kaen University, were asked to participate in the study. These included both HCWs and non-HCWs. HCWs in the study population was defined as the participants who delivers care and services to the sick and ailing either directly as doctors and nurses or indirectly as aides, helpers, and laboratory technicians. While, non-HCWs were the participants who did not have a direct care with the patients. A total number of 805 participants were enrolled based on the sample size calculation. The study was planned to determine the proportion of hand eczema cases that occurred during the time in which the questionnaires were answered. An estimated of proportion (p) was 0.4 from the previous study.<sup>10</sup> A confidence coefficient of 95% was desired, and an absolute precision (d) of 0.04 was used.

The study was approved as exemption research by the institutional review board of the Khon Kaen University, Human Research Ethics Committee (#HE631406).

### Methods

This was a prospective cross-sectional study conducted at the Khon Kaen University, Faculty of Medicine, Thailand, between August 4, 2020, and August 31, 2020. All individuals older than 18 years of age were eligible. Consecutive participants entered into the Faculty of Medicine, Khon

Kaen University, were asked to participate in the study. A structured questionnaire was used to collect the data, with the main outcome being having hand eczema at the time of completing the questionnaire. The demographic background information on the questionnaire included age, sex, general condition, and underlying skin diseases. Possible risk factors for hand eczema, the frequency of handwashing per day, handwashing methods, the use of moisturizer after washing the hands, and underlying skin conditions on the hands before new hand hygiene habits were formed were also addressed in a structured questionnaire.

### Statistical Analysis

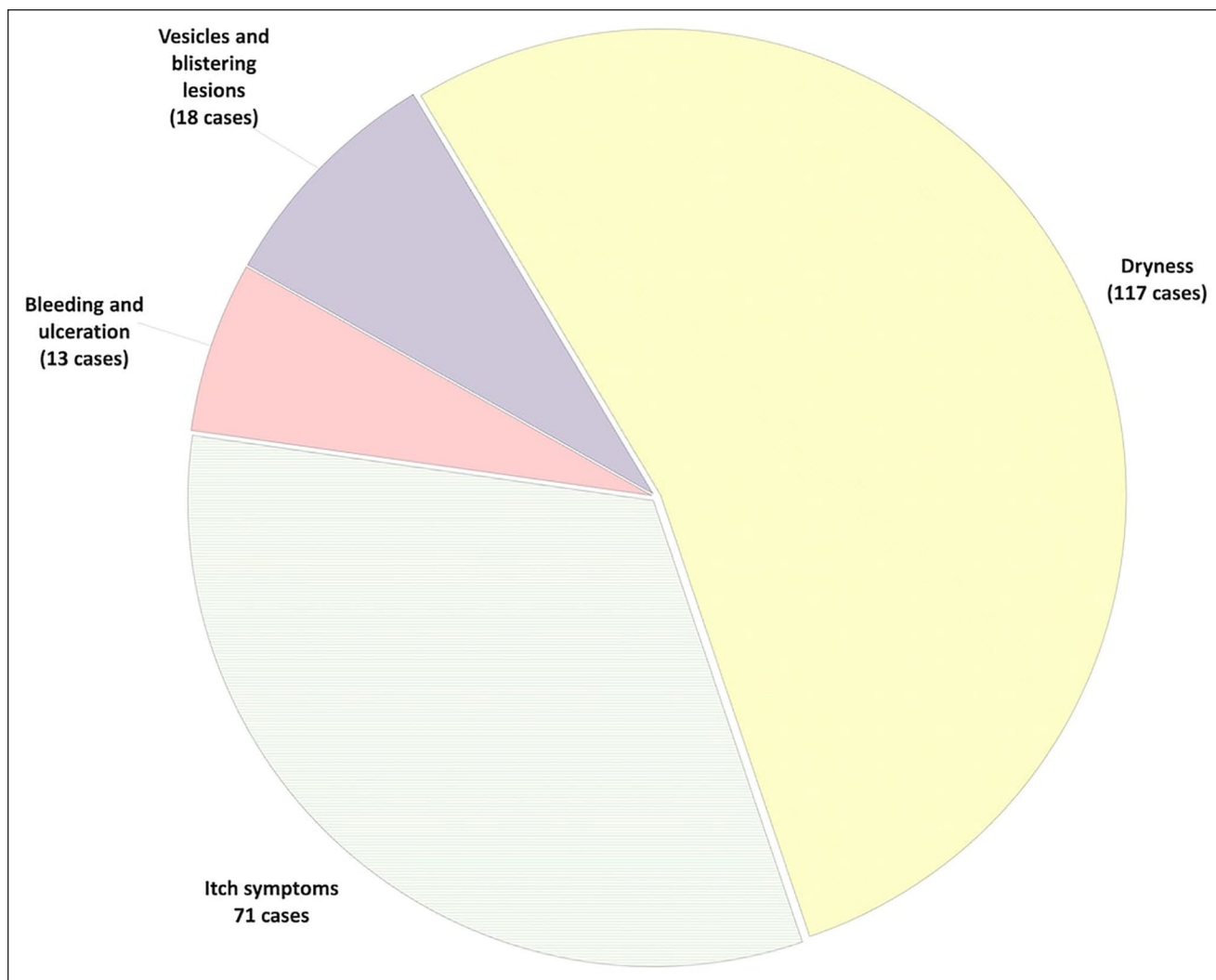
At the end of the study, the collected data were analyzed using STATA software version 10 (StataCorp LP). Descriptive statistical methods, means, standard deviations (SDs), medians and frequencies were used to analyze the demographic data. Univariate and multivariate logistic regression analyses were performed to test the associations between the proposed factors and the occurrence of hand eczema. Values of  $P < .05$  were considered to indicate statistical significance. Incomplete questionnaires and missing data were addressed as imputed data, and final calculations included all recorded data.

## Results

A total number of 805 participants were enrolled. There were 213 (26.5%) male and 592 (73.5%) female participants; thus, the ratio of males to females was 0.35. The ages of participants ranged from 18-75 years with a median age of 32 years (IQR 25-41). There were 344 (42.7%) participants who worked as HCWs, and the remaining 461 (57.3%) participants were non-HCWs. The majority of cases (723 cases, 89.81%) increased their frequency of handwashing by using water during the COVID-19 pandemic. Seventy cases (8.7%) reported of no changes in their handwashing frequency, and 12 cases (1.49%) responded that they washed their hands less frequently.

Hand eczema was found in 168 cases (20.87%, 95% CI: 18.11-23.84). Hand dryness was the most frequent symptom found in the study population (117, 14.5%), followed by itching (71, 8.8%), vesicles and blistering lesions (18, 2.2%), and fissures and bleeding (13, 1.6%). Figure 1 shows a list of hand symptoms in the study population with the numbers of cases.

There were 4 types of handwashing methods in the study population: alcohol-based products (699, 86.83%); soap and water (634, 78.76%); anti-septic products and water (251, 31.18%); and plain water (239, 29.69%). Using alcohol-based products increased the risk of hand eczema compared to the group that did not use alcohol-based products for handwashing, (OR (95% CI) 1.86 (1.03-3.55),  $P = .004$ ).



**Figure 1.** List of hand symptoms in the study population with the numbers of cases.

Bivariate analyses of factors associated with the presence of hand eczema are shown in Table 1. HCWs had a higher prevalence of hand eczema than non-HCW participants did (OR (95% CI) 1.85 (1.31-2.61);  $P < .001$ ). Having previous hand eczema and underlying skin disease (atopic dermatitis) increased the risk of hand eczema (OR (95% CI) 57.05 (32.78-99.32);  $P < .001$  and 2.96 (1.78-4.91);  $P < .001$ , respectively).

A frequency of handwashing of more than 10 times/day increased the risk of hand eczema (OR (95% CI) 1.55 (1.09-2.21);  $P < .0015$ ). Other factors related to the occurrence of hand eczema in the study population were female gender, the use of alcohol-based products for handwashing, and wearing gloves in everyday life. (Table 1).

Significant risk factors from bivariate analysis were further tested for multivariate regression. The results revealed that the significant risk factors for hand eczema during the

COVID-19 pandemic were previous hand eczema and frequency of handwashing more than 10 times/day (adjusted OR (95% CI) 58.03 (33.17-101.53),  $P < .001$  and 1.70 (1.05-2.75),  $P < .032$ , respectively) (Table 2).

## Discussion

During the COVID-19 pandemic, hand hygiene is one of the methods to prevent the spread of the virus. This new habit has caused a resurgence in hand eczema in many settings around the world, especially among HCWs.<sup>4,9,11</sup> The general population, however, has also been affected by this phenomenon. A recommendation to perform more frequent hand hygiene was also given to the general population. Thus, reports of hand eczema have also increased in the general population.<sup>12</sup> This fearfulness has grown throughout the world, and the prompt action is needed to prevent

**Table 1.** Bivariate Analysis Among Factors Associated with Hand Eczema in the Study Population.

Factors	Hand eczema		Crude OR (95% CI)	P-value
	Absent (n=637)	Present (n=168)		
Gender				
Male	179 (28.1)	34 (20.24)	1	.041
Female	458 (71.9)	134 (79.76)	1.54 (1.02-2.33)	
Occupation				
Non-health care worker	385 (60.44)	76 (45.24)	1	<.001
Health care worker	252 (39.56)	92 (54.76)	1.85 (1.31-2.61)	
Previous hand eczema				
Absent	618 (97.02)	61 (36.31)	1	<.001
Present	19 (2.98)	107 (63.69)	57.05 (32.78-99.32)	
Underlying skin disease (atopic dermatitis)				
Absent	595 (93.41)	139 (82.74)	1	<.001
Present	42 (6.59)	29 (17.26)	2.96 (1.78-4.91)	
Frequency of handwashing/day				
<10 times/day	453 (71.11)	103 (61.31)	1	.015
≥10 times/day	184 (28.89)	65 (38.69)	1.55 (1.09-2.21)	
Handwashing methods during COVID-19 pandemic				
Alcohol-based products				
No	92 (14.44)	14 (8.33)	1	.040
Yes	545 (85.56)	154 (91.67)	1.86 (1.03-3.35)	
Soap and water				
No	123 (19.31)	48 (28.57)	1	.010
Yes	514 (80.69)	120 (71.43)	0.60 (0.41-0.88)	
Anti-septic products and water				
No	438 (68.76)	116 (69.05)	1	.943
Yes	199 (31.24)	52 (30.95)	0.99 (0.68-1.42)	
Plain water				
No	449 (70.49)	117 (69.64)	1	.831
Yes	188 (29.51)	51 (30.36)	1.04 (0.72-1.51)	
Wearing gloves in everyday life				
No	457 (71.74)	98 (58.33)	1	.001
Yes	180 (28.26)	70 (41.67)	1.81 (1.28-2.58)	

**Table 2.** Multivariate Regression Among Significant Risk Factors (from Bivariate Analysis) with Adverse Skin Reactions.

Factors	Crude OR (95% CI)	P-value	Adjusted OR (95% CI)	P-value
Previous hand eczema				
Absent	1	<.001	1	<.001
Present	57.05 (32.78-99.32)		58.03 (33.17-101.53)	
Frequency of handwashing/day				
<10 times/day	1	.015	1	.032
≥10 times/day	1.55 (1.09-2.21)		1.70 (1.05-2.75)	

further skin damage since COVID-19 is still actively ongoing. Thus, the objective of the study was to determine the prevalence of and possible risk factors for hand eczema during the COVID-19 pandemic. The authors aimed to study both HCW and non-HCW populations because the ongoing COVID-19 pandemic has a widespread effect even in the non-health care-related population.

The prevalence of hand eczema in the present study was 20.87%. This finding is similar to the prevalence (21%) found in a previous study by Ibler et al.<sup>13</sup> This prevalence is low compared to that found in a recent study of skin damage during the COVID-19 pandemic in China.<sup>9</sup> However, the mentioned study included all types of skin damage related to all types of protective equipment, which reflected overall

skin damage during the pandemic. The setting was in contrast to our study, which focused only on the prevalence of hand eczema. Moreover, the mentioned study examined only the HCW population at risk, while the present study examined in both HCWs and the general population. Thus, in the at-risk population, as in the mentioned study, individuals were more prone to developing hand eczema.

HCWs is a population prone to developing adverse skin reactions to all types of personal protective equipment: face masks, face shields, goggles, gloves, etc. This may be because HCWs have a longer duration of exposure to such protective equipment. The present study also revealed a 1.85-fold higher risk of hand eczema in the HCW population than in the non-HCW population, which was correlated with the results of previous studies during the same period of time.<sup>8,11</sup>

There are many different methods of hand hygiene, including washing hands with soap and water, anti-septic products and water, plain water, and alcohol-based products. The present study showed a higher risk of hand eczema with the use of alcohol-based products (OR (95% CI) 1.86 (1.03-3.35),  $P = .04$ ). Although alcohol-based products are widely used around the world as one of the most effective, simple, and low-cost preventive measures against COVID-19 cross-transmission,<sup>8</sup> in terms of preventing hand eczema, the use of this method should be discontinued if other hand washing methods are available.

An increasing daily frequency of handwashing was documented in both HCW and non-HCW populations. This habit is a consequence of the fear of COVID-19 infection.<sup>2,12</sup> The present study showed that almost ninety percent (89.81%) of the study population increased the frequency of handwashing. We found an increased risk of hand eczema when participants washed their hands more than 10 times/day (OR (95% CI) 1.55(1.09-2.21),  $P = .015$ ). This factor also represented a significantly increased risk of hand eczema by multivariate regression (adjusted OR (95% CI) 1.70(1.05-2.75),  $P = .032$ ). This finding is similar to that documented in a recent study showing a 2.17-fold increase in the risk of skin damage when the frequency of handwashing was greater than 10 times/day.<sup>9</sup>

Atopic dermatitis and hand eczema are common chronic and relapsing inflammatory skin conditions that often co-occur. The meta-analysis showed that patients with atopic dermatitis had a strongly increased prevalence of hand eczema.<sup>14</sup> This association was found in a previous study that showed a higher risk (5.7-fold) of hand eczema when a personal history of atopy was documented.<sup>10</sup> In conjunction with the present study, which also revealed a higher risk of hand eczema in participants with underlying atopic dermatitis (OR (95% CI) 2.96(1.78-4.91),  $P < .001$ ). In terms of hand eczema prevention, atopic dermatitis patients should be informed that they are at risk, and preventive strategies must be addressed promptly to prevent possible skin damage.

Having previous hand eczema showed a strong association with an increased risk of hand eczema during the COVID-19 pandemic (adjusted OR (95% CI) 58.03 (33.17-101.53),  $P < 0.001$ ). It should be noted that these populations are at risk, and preventive strategies such as washing hands in lukewarm (not hot) water, rinsing and drying hands thoroughly after washing, and applying moisturizers (fragrance-free) on the hands after handwashing during the day and after work should be applied.<sup>15</sup>

Wearing gloves may be the cause of hand eczema. This is because protective rubber gloves may cause irritant contact dermatitis from heat and sweating, or allergic contact dermatitis from contact sensitization to rubber additives.<sup>16</sup> The present study showed that the participants who wore gloves in everyday life had a higher risk of hand eczema (OR (95% CI) 1.81(1.28-2.58),  $P = .001$ ). This factor was found mostly in the HCW population. Thus, a relevant recommendation should be provided in this group as a preventive strategy against hand eczema.

### Limitations

The present study revealed the risk factors for hand eczema during the COVID-19 pandemic and proposed potential strategies for hand eczema prevention; however, some limitations need to be acknowledged. First, the present study was set in a warm climate in Thailand. Climate issues, environmental temperature, water temperature for handwashing, and the humidity of the environment may affect the results for hand eczema. Future studies during the winter season or in different parts of the world may be generalizable to other countries. Second, some measures, such as the use of hand moisturizer, which is a recommendation for preventing hand eczema, are lacking in the present study. The majority of the participants did not answer this part of the questionnaires. Future studies should explore this factor, and the authors believe that the results may differ from the standard recommendations due to climate issues in Thailand.

### Conclusion

The prevalence of hand eczema during the COVID-19 pandemic in the study population was 20.87%. There were several risk factors, including working as a HCW, having a history of previous hand eczema, having underlying atopic dermatitis, wearing gloves in everyday life, and washing hands frequently (i.e., more than 10 times/day). Hand hygiene with alcohol-based products was shown to be a risk factor for hand eczema. Therefore, the use of this hand hygiene method should be discontinued if other hand washing methods are available. Since we still need to perform hand hygiene during the ongoing COVID-19 pandemic, proper strategies in terms of hand eczema prevention should be addressed, especially in high-risk populations.

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## Author Contributions

W.T., N.L., P.S., B.C., P.W., W.P., R.U., C.S., P.P., and P.P. contributed to the design and analysis, drafted the manuscript, gave final approval, and agreed to be accountable for all aspects of the study to ensure its integrity and accuracy.

J.C., contributed to the analysis and interpretation, gave final approval, and agreed to be accountable for all aspects of the study to ensure its integrity and accuracy.

L.T., contributed to the design, analysis, and interpretation; critically revised manuscript; gave final approval; and agreed to be accountable for all aspects of the study to ensure its integrity and accuracy.

## Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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## Ethics approval and consent to participate

The study was approved as exemption research by the institutional review board of the Khon Kaen University, Human Research Ethics Committee (#HE631406).

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## Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request. For access of data, please contact: Dr. Leelawadee Techasatian: leelawadee@kku.ac.th

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