



Risk factors for hand eczema in the general population of Saudi Arabia during the COVID-19 pandemic: An internet-based cross-sectional study

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Background: Hand eczema (HE) is a common disorder that negatively impacts the quality of life. During the COVID-19 pandemic, several studies have shown an increase in HE in health care workers. However, data on the general population are lacking.

Objective: To assess the prevalence and risk factors of HE among the Saudi general population during the pandemic.

Methods: This cross-sectional study was conducted using an online questionnaire composed of 4 sections (participant characteristics, history of atopic disorders, hand hygiene methods, and HE symptoms). It was distributed on Twitter during the lockdown period, between August 2020 and September 2020. Descriptive, bivariate, and multivariable analyses were conducted using STATA v16.

Results: A total of 582 (52.6% women and 47.4% men) participants responded to the questionnaire. The 6-month prevalence of HE was 34%. In multivariable analysis, having a past history of eczema, rhinitis/conjunctivitis, using soaps for >5 times daily, using gloves daily, and using moisturizers were significantly associated with HE. Interestingly, using sanitizers for >5 times daily was not a statistically significant risk factor.

Limitations: Due to its internet-based nature, the response rate cannot be accurately calculated. In addition, the response bias and the small sample size limit the generalizability of the results and prevent drawing broad conclusions and accurate measurement of prevalence.

Conclusion: HE prevalence increased during the pandemic in the Saudi general population. Frequent use of soaps and gloves, but not sanitizers, increased HE risk. (JAAD Int 2022;6:119-24.)

Key words: contact dermatitis; COVID-19; eczema; hand eczema; hand hygiene; skin barrier.

INTRODUCTION

Hand eczema (HE) is a common skin condition worldwide, with a point prevalence of 3% and a 1-year prevalence of 9.1%.¹ In Saudi Arabia, approximately 22% of health care workers experience HE²; however, its prevalence in the general population has never been studied. HE has a huge negative

impact on the patients' quality of life. The social and emotional lives are affected in most patients with HE, with 15% of them being excluded from the labor market and 8% changing their jobs. The intensity of its negative effect on the quality of life is found to be similar to or worse than that of hepatitis, vision disturbances, diabetes, and some types of cancer.³

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Although atopic dermatitis is an important risk factor for HE, exogenous factors have more etiologic importance. Water, soaps, and detergents are common external causes due to their drying and irritating effects. Both endogenous and exogenous factors lead to HE by altering the skin barrier function and increasing the transepidermal water loss and the penetration of external irritants and allergens.⁴

The first case of COVID-19 in Saudi Arabia was detected on March 2, 2020. Of a population of 34 million people, the highest number of daily cases was recorded on June 18, 2020, with a total of 4919 new cases. During the period of data collection, the numbers were still high, with an average of 1309 daily cases in August 2020 and 646 cases in September 2020 compared with the lowest daily number of 113 cases by the end of 2020. One of the main protective measures against COVID-19, washing hands frequently, is the most common extrinsic cause of HE. The World Health Organization and the Centers for Disease Control and Prevention stress the importance of washing hands with soaps or using sanitizers more frequently. Several studies before^{5,6} and after COVID-19⁷⁻⁹ have already shown in health care workers that washing hands frequently increases the risk of skin dryness and HE.

The general population has not received such interest concerning hand hygiene and HE. During the COVID-19 pandemic, people have been washing and disinfecting their hands more frequently. Besides, the methods and frequencies of hand cleaning are highly variable, which, in turn, may lead to variable risks of developing HE. This study aimed to provide an estimate of HE prevalence in the Saudi general population during the pandemic and to assess the risk factors of HE, with a focus on hand hygiene methods.

METHODS

Study design and setting

This analytical cross-sectional study was conducted using a pretested, online questionnaire, which was built on limesurvey.org. Due to the nationwide restrictions, a web-based survey was used to collect data between August 2020 and September 2020. To reach the highest possible number and variety of the Saudi general population, Twitter, which is used by >40% of the Saudi population,¹⁰ was chosen to distribute the questionnaire. All complete answers from Saudi adults

were included. Incomplete responses and responses from other countries were excluded.

Questionnaire and data collection

A self-prepared questionnaire was sent to 2 dermatology professors and was modified based on their comments. Subsequently, some additional modifica-

tions were made after the initial survey was piloted on 50 randomly chosen persons whose responses were not included in the study results.

The questionnaire comprised 4 sections: socio-demographic characteristics, past history of atopic disorders, hand cleaning and care methods and frequencies during the pandemic, and

hand skin symptoms (dryness, erythema, itching, and fissures) experienced in the past 6 months.

Definition of the main outcomes

HE was defined as the presence of 2 or more HE symptoms. This definition was shown by Visser et al¹¹ to be 90% accurate when the patients were examined clinically. The questions about the past history of atopic disorders were adapted from the validated Arabic questionnaire of the International Study of Asthma and Allergies in Childhood (ISAAC).¹²

Statistical analysis

The minimum sample was estimated using Epi Info software (Centers for Disease Control and Prevention), with a confidence interval (CI) level of 95% and a margin of error of 5%. For a year prevalence of 10%, the minimum sample size would be 138 participants.

Descriptive, bivariate, and multivariable analyses were conducted using STATA v16 (StataCorp LLC). Bivariate analysis was performed (crude odds ratios [ORs]) with 95% CIs to measure the association between independent variables and the dependent variable (HE). Multivariable analysis was performed (adjusted OR) with a 95% CI to measure the association between independent variables and the dependent variable. All independent variables were included in multiple logistic regression based on background information, despite nonsignificance, and rule of events per predictor variables in logistic regression.¹³ The model was assessed using the area under the receiver operating characteristic curve and was appropriate. A *P* value of <.05 was considered strong evidence against the null hypothesis.

CAPSULE SUMMARY

- Reported hand eczema prevalence has increased in the Saudi general population during the COVID-19 pandemic.
- Hand sanitizers may be less associated with hand eczema than hand soaps.

Abbreviations used:

CI: confidence interval
HE: hand eczema
OR: odds ratio

Ethical consideration

The ethical approval was obtained from the research ethics committee at Qassim University (number: 19-12-07, on May 18, 2020).

RESULTS

As the link was published on Twitter, the response rate could not be calculated accurately. However, the tweet was expanded 1219 times, of which 626 persons submitted their responses (51.4%). A total of 44 responses came from other countries and were excluded, leaving a total of 582 (52.6% women and 47.4% men) included participants. The answers came from adults of all ages; however, the majority of respondents (62%) were aged between 18 years and 30 years. The responses are summarized in Table I.

In total, 90% (524/582) of the participants admitted that they wash or sanitize their hands more frequently since the beginning of the pandemic. Regarding skin health, 60% of the respondents (351/582) reported having 1 or more of the symptoms in the past 6 months. Skin dryness was the most frequently reported symptom, with a total of 319 participants (54.8%) complaining of it.

Only 27% of women reported being symptom-free, versus 53% of men. No significant difference was found between men and women in terms of using soaps, sanitizers, or gloves. When it comes to moisturizers, 46% of men never use them and 35.9% use them occasionally compared with only 2.9% and 27.5%, respectively, for women.

By adapting the criteria used by Visser et al,¹¹ participants were defined as having HE when they reported having at least 2 of the symptoms. This left us with a total of 199 patients with HE (34%). In the bivariate analysis, HE was significantly higher among women ($P < .001$), wet or manual workers ($P = .036$), jobless participants ($P = .035$), atopic patients, people using soaps or sanitizers more frequently, and those using gloves daily (Table II). Multivariable analysis (Table III) showed that having a past history of eczema (OR, 3.68; 95% CI, 2.37-5.72; $P < .001$), rhinitis and/or conjunctivitis (OR, 1.64; 95% CI, 1.07-2.5; $P = .022$), washing hands with soaps for >5 times daily (OR, 3.32; 95% CI, 1.79-6.14; $P < .001$), using gloves daily (OR, 3.57; 95% CI, 1.75-7.27; $P < .001$), and using moisturizers at any frequency ($P < .05$) were significantly associated with high odds of

Table I. Characteristics and responses of the participants

| Total | n (582) | % (100%) |
|---|---------|----------|
| Sex | | |
| Female | 306 | 52.6% |
| Male | 276 | 47.4% |
| Age | | |
| 18-30 y | 361 | 62% |
| >30 y | 221 | 38% |
| Profession | | |
| Manual or wet | 161 | 27.7% |
| Jobless | 103 | 17.7% |
| General* | 318 | 54.6% |
| Smoking | | |
| Yes | 63 | 10.8% |
| History of eczema | | |
| Yes | 150 | 25.8% |
| History of asthma | | |
| Yes | 101 | 17.35% |
| History of rhinitis and/or conjunctivitis | | |
| Yes | 234 | 40.2% |
| Daily soap | | |
| <3 times | 156 | 26.8% |
| 3-5 times | 269 | 46.2% |
| >5 times | 157 | 27% |
| Daily sanitizers | | |
| <3 times | 346 | 59.45% |
| 3-5 times | 124 | 21.3% |
| >5 times | 112 | 19.2% |
| Daily moisturizers | | |
| Never | 136 | 23.4% |
| Some days | 183 | 31.4% |
| 1-2 daily | 133 | 22.85% |
| >2 daily | 130 | 22.3% |
| Daily gloves | | |
| Yes | 53 | 9.1% |
| No | 529 | 90.9% |
| Skin symptoms during the pandemic | | |
| Dryness | | |
| Yes | 319 | 54.8% |
| Erythema | | |
| Yes | 129 | 22.2% |
| Itching | | |
| Yes | 176 | 30.2% |
| Fissures | | |
| Yes | 75 | 12.9% |

*All professions not based on manual or wet work.

developing HE. Interestingly, the difference was not significant for using sanitizers more frequently.

DISCUSSION

Questionnaires are not the best method to accurately measure the prevalence of HE. Nevertheless, they comprise a useful tool for primary screening. During the difficult times of COVID-19 restrictions,

Table II. Unadjusted association between potential determinants and hand eczema among Saudi population

| Determinant | Hand eczema | | Unadjusted OR | 95% CI | P value |
|---------------------------------------|-------------|------------|---------------|------------|---------|
| | Yes n (%) | No n (%) | | | |
| Sex | | | | | |
| Female | 133 (43) | 173 (57) | 2.45 | 1.71-3.49 | <.001* |
| Male | 66 (24) | 210 (76) | | | |
| Age | | | | | |
| >30 y | 84 (38) | 137 (62) | 1.31 | 0.92-1.86 | .13 |
| 18-30 y | 115 (32) | 246 (68) | | | |
| Profession | | | | | |
| Manual or wet | 63 (39) | 98 (61) | 1.53 | 1.03-2.28 | .04* |
| Jobless | 42 (41) | 61 (59) | 1.64 | 1.04-2.6 | .04* |
| General [†] | 94 (30) | 224 (70) | Reference | | |
| Smoking | | | | | |
| Yes | 15 (24) | 48 (76) | 0.57 | 0.31-1.04 | .07 |
| No | 184 (35) | 335 (65) | | | |
| History of asthma | | | | | |
| Yes | 49 (49) | 52 (51) | 2.08 | 1.35-3.21 | .001* |
| No | 150 (31) | 331 (69) | | | |
| History of eczema | | | | | |
| Yes | 89 (59) | 61 (41) | 4.27 | 2.89-6.32 | <.001* |
| No | 110 (25) | 322 (75) | | | |
| History of rhinitis or conjunctivitis | | | | | |
| Yes | 110 (47) | 124 (53) | 2.58 | 1.82-3.67 | <.001* |
| No | 89 (26) | 259 (74) | | | |
| Daily soaps | | | | | |
| <3 times | 30 (19) | 126 (81) | Reference | | |
| 3-5 times | 86 (32) | 183 (68) | 1.97 | 1.23-3.17 | .005* |
| >5 times | 83 (53) | 74 (47) | 4.71 | 3.84-7.82 | <.001* |
| Daily sanitizers | | | | | |
| <3 times | 102 (29) | 244 (71) | Reference | | |
| 3-5 times | 51 (41) | 73 (59) | 1.67 | 1.09-2.56 | .02* |
| >5 times | 46 (41) | 66 (59) | 1.67 | 1.07-2.59 | .02* |
| Moisturizers | | | | | |
| Never | 17 (12.5) | 119 (87.5) | Reference | | |
| Some days | 70 (38) | 113 (62) | 4.34 | 2.41-7.82 | <.001* |
| 1-2 daily | 47 (35) | 86 (65) | 3.83 | 2.06-7.11 | <.001* |
| >2 daily | 65 (50) | 65 (50) | 7 | 3.79-12.93 | <.001* |
| Daily gloves | | | | | |
| Yes | 36 (68) | 17 (32) | 4.75 | 2.59-8.71 | <.001* |
| No | 163 (31) | 366 (69) | | | |

OR, Odds ratio.

*Statistically significant ($P < .05$).[†]Professions not based on manual or wet work.

we tried to reach a wide variety of the general population in a safe way. Hence, we chose Twitter, as it is commonly used in Saudi Arabia by people of all ages. Both genders were equally present in our study; however, the younger age group (18-30 years) represented more than half of the participants, although HE rates were comparable between the 2 age groups. To assess the generalizability of our results to the rest of the Saudi population, we compared our demographic and health data with the national health statistics. Smoking rates in men

(19.8%) and women (2.6%) were concordant with the national statistics.¹⁴ Similarly, the past history of eczema (25%) and asthma (17%) in our study was in line with the previously reported prevalence of eczema¹⁵ and asthma¹⁶ in Saudi Arabia.

Regarding HE rates, 2 methods were used in the literature to define HE based on questionnaires: self-reported HE and symptom-based HE. The former is reported to underestimate the true prevalence, whereas the latter is reported to overestimate it.^{1,11} Visser et al¹¹ added the second symptom-based

Table III. Adjusted association between potential determinants and hand eczema among Saudi population

| Determinant | Adjusted odds ratio | 95% CI | P value |
|-------------------------|---------------------|-------------|---------|
| Sex | | | |
| Female | 1.254 | 0.736-2.137 | .41 |
| Age | | | |
| >30 y | 1.113 | 0.719-1.723 | .63 |
| Profession | | | |
| Manual or wet | 1.415 | 0.855-2.342 | .18 |
| Jobless | 1.666 | 0.961-2.888 | .07 |
| Smoking | | | |
| Yes | 0.64 | 0.306-1.339 | .24 |
| Past history | | | |
| Asthma | 1.621 | 0.96-2.739 | .07 |
| Rhinitis/conjunctivitis | 1.638 | 1.074-2.499 | .02* |
| Eczema | 3.682 | 2.372-5.717 | <.001* |
| Soaps | | | |
| 3-5 daily | 1.713 | 0.993-2.956 | .05 |
| >5 daily | 3.318 | 1.794-6.137 | <.001* |
| Sanitizers | | | |
| 3-5 daily | 1.433 | 0.864-2.376 | .16 |
| >5 daily | 1.083 | 0.602-1.947 | .79 |
| Moisturizers | | | |
| Some days | 3.292 | 1.697-6.388 | <.001* |
| 1-2 daily | 2.375 | 1.133-4.979 | .02* |
| >2 daily | 3.379 | 1.521-7.509 | .003* |
| Daily use of gloves | 3.568 | 1.751-7.271 | <.001* |

*Statistically significant ($P < .05$).

definition of HE, which they named “mild HE.” Participants were defined as patients with HE if they reported 2 or more HE symptoms, regardless of recurrence or duration. When the patients with HE in the study by Visser et al¹¹ were examined by a specialized occupational physician, 90% were diagnosed with HE. As our study aimed to assess HE in the general population, we used the criteria reported by Visser et al.¹¹

The prevalence of HE in the general population is believed to be higher during the pandemic due to the increased use of soaps and sanitizers. In our study, a symptom-based diagnosis revealed a 6-month prevalence of 34%, which is 3-fold higher than the pre-COVID-19—reported 1-year prevalence of 9.1%.¹ Most studies on HE since the beginning of COVID-19 have focused on health care workers. No studies have assessed HE prevalence in the general population during the pandemic. Questionnaire-based studies on Danish children found HE prevalence to range between 38% and 50.4% with reinforced hand hygiene during the pandemic.^{17,18}

As already shown, cleansers and sanitizers may interrupt the epidermal barrier, increase

transepidermal water loss, and increase exposure to environmental allergens.¹⁹ Washing hands with soaps for >5 times daily significantly increased the odds of developing HE. This was also seen in the Danish studies.^{17,18} Studies on health care workers also have confirmed that the frequency of hand washing is a statistically significant risk factor.^{6,8} All kinds of hand washing surfactants may increase transepidermal water loss. Nevertheless, traditional alkaline soaps have been shown in the literature to be significantly more aggressive than glycerin soaps and syndets.¹⁹

On the other hand, using sanitizers did not increase the odds of developing HE. This was also shown in health care workers by Hamnerius et al.⁶ A randomized controlled trial found that alcoholic sanitizers resulted in significantly lower Hand Eczema Severity Index than did soaps.²⁰ Our results, together with these studies, may indicate that hand sanitizers are less harsh than soaps. The American Contact Dermatitis Society recommends people to use moisturizer-containing alcoholic sanitizers for their lower sensitizing and irritancy potential compared with soaps and synthetic detergents.²¹

It was unexpected to see that using moisturizers was significantly associated with higher odds of having HE. The same association was already reported by Erdem et al⁷ and Celik and Ozkars.⁹ This is most probably because people are using moisturizers as treatment rather than a prevention strategy. Moisturizers may help relieve or retard the natural reaction to irritants and reach a situation known as skin hardening, which is defined by the adaptation of the skin to chronic exposure to irritants. Several changes in the skin barrier, immune response, ceramides, and skin permeability are believed to play a role in this phenomenon.²² On the other hand, as expected, using impervious gloves regularly was significantly associated with high odds of HE. Having a history of eczema or rhinitis/conjunctivitis, but not asthma, was also very significantly associated with HE. In the literature, atopic patients appear to have an increased risk of developing HE,⁵ mainly atopic dermatitis.^{1,23} In the few studies that assessed the relationship of HE with noncutaneous atopic diseases, patients with asthma were not significantly at higher risk.²⁴

This study is limited by the nature of it being an online survey-based study due to the pandemic. To limit the bias of attracting people with HE, we introduced the survey as a survey on protective measures against COVID-19, without mentioning HE. It was difficult to make an accurate calculation of the response rate. In addition, a larger sample size would have been more representative of the Saudi

general population. Nevertheless, to help assess the generalizability of the results, smoking, eczema, and asthma rates appeared closely comparable to the national statistics in Saudi Arabia. Although our study was conducted on the Saudi population, the effect of increased hand cleaning on skin health is expected to be seen worldwide. Strict hand hygiene preventive measures were practiced more by health care workers. During the pandemic, these measures became a common practice in the general population. Hence, we encourage more studies on HE in the general population and clinical trials comparing the effects of different types of sanitizers and soaps.

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Conflicts of interest

None disclosed.

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