

Self-reported skin exposure – a population-based study

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The aim was to study self-reported skin exposure in individuals from the general population with or without hand eczema. In a population-based study in 1996 using postal questionnaires to 3000 individuals, 215 of 2218 (9.7%) reported hand eczema during the past 12 months. 182 (85%) of those with hand eczema and 182 without hand eczema, matched for age and sex, participated in telephone interviews in 1997 regarding exposure to skin irritants at work and in leisure time. No differences were shown in occupational exposure to water, hand washing or chemicals in individuals with or without hand eczema. Women reported more wet exposure than men at work and in leisure time. A correlation was found between occupational wet exposure and wet work at home. Persons in high-risk occupations reported more frequent exposure to skin irritants. However, 53% in high-risk occupations reported exposure to water and detergents for less than half-hour a day and 11% in low-risk occupations for more than half-hour a day. In conclusion, individuals with or without hand eczema seem to have similar exposure to skin irritants. Using job titles as a proxy for exposure gives misclassification, which may result in underestimation of the hand eczema risk.

Key words: gender; hand eczema; hand washing; job title; protective gloves; wet work. © Blackwell Munksgaard, 2006.

Accepted for publication 2 January 2006

Hand eczema is common and the most frequent occupational skin disease. The 1-year prevalence in the general population of working age in Sweden is about 10% (1). Exposure to skin irritants and contact allergens in occupational life as well as during domestic work and leisure time is an important risk factor for hand eczema. Common skin irritants are water, detergents, chemicals and foodstuffs. Some occupations are associated with a higher risk of hand eczema, such as jobs in the health care sector, in the service sector and in production. Job titles have been used as a proxy for skin exposure in epidemiological studies, and occupations have been classified as high- or low-risk occupations for hand eczema, and an association has been found (1). However, to use job title as a proxy for exposure does not permit estimation of variations in exposure within occupations or over time in the same jobs.

Ideally, skin exposure should be measured quantitatively, but there is no feasible method for epidemiological studies. Some studies have

tried to quantify exposure time through questionnaires (2–10). In a Danish study among cleaners, a positive correlation was found between skin symptoms and hours per week spent with wet hands (2). In another study, 90% of atotics developed hand eczema when exposed to wet work for more than 2 hr per day compared with 50% of non-exposed atotics (3). Hand washing frequency exceeding 35 times per shift was strongly associated with hand eczema in an American study in health care unit workers (4). A positive correlation was also found between hand eczema and hand washing in an environmental health survey in Stockholm, Sweden, in 1997. Here, 11 000 individuals answered a questionnaire (5).

Measurements are further complicated by the use of gloves. Use of protective gloves, although intended as prevention, may be a risk factor in developing or worsening hand eczema due to humidity collected in the gloves. Natural rubber latex and chemicals in glove materials can also cause hypersensitivity reactions (11).

Quantitative measures are important if permissible exposure levels should be established. In Germany, occupational skin exposure to irritants has been subject to regulations since 1996 (12). According to these, 'wet work' has been described as wet hands more than 2 hr a day, use of occlusive protective gloves more than 2 hr a day or hand washing exceeding 20 times a day (13).

The aim of this study was to estimate self-reported skin exposure in individuals from the general population with or without hand eczema. Further objectives were to evaluate gender differences in exposure and to study job title as a measure of exposure to wet work.

Subjects and Methods

Study population

A random sample of 3000 individuals aged 20–65 years was drawn from the population register in Göteborg, Sweden in 1996. They were asked to answer a postal questionnaire (1). Answers were obtained from 2218 (74%) individuals, 1088 males and 1130 females. Hand eczema was identified by the question 'Have you during the past 12 months had hand eczema on some occasion?'. Of 215 individuals with hand eczema, 182 (85%) (63 males and 119 females) agreed to participate in a telephone interview in 1997 and are termed 'cases'. One hundred and eighty-two individuals, matched for age and sex, who in the previous questionnaire study denied having or having had hand eczema (confirmed by telephone interview), constituted a control group, termed 'controls'. Mean age of the participants when interviewed was 39 years (range 21–66). In total, 261 (72%) individuals, 129 cases and 132 controls, were gainfully employed, the majority full-time. The mean age at onset of hand eczema was 27 years (range 0–56 years). At the time of interview, the mean duration of hand eczema was 12 years (range 1–49 years). Thirty-four percent of the cases and 8% of the controls had a history of childhood eczema.

A number of occupations were categorized as high risk for hand eczema according to a previous classification, e.g. some jobs in medical and nursing work, production and service (1). In this study, all other occupations were designated low risk. When interviewed, 43% of the gainfully employed cases were in high-risk occupations, compared with 30% of the controls ($P < 0.05$). At time of onset of hand eczema, 46% of the gainfully employed cases had high-risk occupations, whereas the proportion for the controls for the corresponding year was 32% ($P = 0.06$).

Interviews

A trained nurse interviewed the 364 subjects by telephone using a standardized questionnaire (Table 1). An interview lasted 15–30 min. The questions concerned skin exposure and use of protective gloves at work and during activities off work at the time of interview. The question concerning occupational exposure to water and detergents was also asked regarding time for onset of hand eczema (corresponding year for the controls).

Statistics

The data was analysed using SAS software. Matched analysis comparing exposure in cases and controls, and changes of exposure over time, was performed using the sign test. For comparison of prevalence in males and females, χ^2 statistics or Fisher's exact test (if fewer than five cases) was used. The study was approved by the ethics committees of Karolinska Institutet, Stockholm and Gothenburg University.

Results

Exposure in relation to hand eczema

As expected, water and detergents and hand washing were the most frequent exposures, Table 2. The only statistically significant difference between hand eczema cases and controls

Table 1. The main questions used in the interview

Are your hands, at work, exposed to water and detergents? ^a	☐ <1/2 hr/day	☐ 1/2–2 hr/day	☐ >2 hr/day
Are your hands, at work, exposed to chemicals? ^a	☐ <1/2 hr/day	☐ 1/2–2 hr/day	☐ >2 hr/day
Are your hands, at work, exposed to foodstuffs? ^a	☐ <1/2 hr/day	☐ 1/2–2 hr/day	☐ >2 hr/day
How many hours a day, at work, do you use protective gloves?	☐ <1/2 hr/day	☐ 1/2–2 hr/day	☐ >2 hr/day
How many hours a day, in leisure time, do you use protective gloves?	☐ <1/2 hr/day	☐ 1/2–2 hr/day	☐ >2 hr/day
How many hours a day, in leisure time, do you have 'wet hands'? ^a	☐ <1/2 hr/day	☐ 1/2–2 hr/day	☐ >2 hr/day
How many times, a day, do you wash your hands?			
How many children younger than four years old live in the household?			

^aTime without protective gloves.

Table 2. Self-reported occupational and domestic exposure, glove use and hand washings in cases and controls at time of interview. Occupationally active cases ($n = 129$) and controls ($n = 132$)

Exposure	Cases ($n = 182$), (%)	Controls ($n = 182$), (%)	<i>P</i>
Occupational			
Water and detergents (hr/day) $\geq \frac{1}{2}$	20	15	0.26
Chemicals (hr/day) $\geq \frac{1}{2}$	5	5	1.0
Foodstuffs (hr/day) $\geq \frac{1}{2}$	7	1	0.007
Protective gloves (hr/day) $\geq \frac{1}{2}$	25	14	0.012
Domestic			
Wet hands (hr/day) $\geq \frac{1}{2}$	80	80	1.0
Protective gloves (hr/day) $\geq \frac{1}{2}$	8	1	0.002
Occupational and domestic			
Hand washings (n /day) ≥ 11	36	31	0.35

regarding occupational exposure was found for foodstuffs. However, this correlated strongly to exposure to water and detergents. Of 15 individuals with exposure to foodstuffs, 14 also reported exposure to water and detergents for more than half an hour a day. Cases used protective gloves more than controls did. The majority of gainfully employed persons never used gloves at work, i.e. 56% of the cases and 74% of the controls, at the time of interview.

Wet hands during domestic/leisure time were reported with similar frequencies by cases and controls, Table 2. Very few persons used protective gloves for domestic work for more than half an hour a day. Glove use was more frequent among the cases, but as many as 64% of the hand eczema cases never used gloves during domestic work – controls 85%. At time of onset of hand eczema, 10% of the cases and 14% of the controls had children below 4 years in the household – the difference was not statistically significant.

A matched analysis was performed to compare how far cases and controls had reduced their occupational exposure to water and detergents between the onset of hand eczema

(corresponding year for controls) and the interview. There was no statistically significant difference ($P = 0.86$).

Exposure in relation to gender and age

Occupational exposure to water and detergents and hand washings were more frequent among women, Table 3. Males more often reported exposure to chemicals than females did. In domestic work and leisure time, females reported wet hands for longer time periods than males.

We also analysed reported exposure according to age and gender. Gainfully employed females below 30 years of age reported more frequently occupational exposure to water and detergents for more than half an hour a day than older women did: 46 and 26%, respectively ($P < 0.05$). No corresponding difference was found for males. No statistically significant differences according to age were noted regarding other exposures.

Exposure and occupation

People in jobs classified as high-risk occupations reported more frequent exposure to water,

Table 3. Self-reported occupational and domestic exposure, glove use and hand washings for all participants at time of interview in relation to gender. Occupationally active females ($n = 164$) and males ($n = 97$)

Exposure	Females ($n = 238$), (%)	Males ($n = 126$), (%)	<i>P</i>
Occupational			
Water and detergents (hr/day) $\geq \frac{1}{2}$	21	10	0.010 ^a
Chemicals (hr/day) $\geq \frac{1}{2}$	3	10	0.003 ^a
Foodstuffs (hr/day) $\geq \frac{1}{2}$	5	2	0.28 ^b
Protective gloves (hr/day) $\geq \frac{1}{2}$	18	22	0.40 ^a
Domestic			
Wet hands (hr/day) $\geq \frac{1}{2}$	89	63	<0.001 ^a
Protective gloves (hr/day) $\geq \frac{1}{2}$	6	2	0.19 ^b
Occupational and domestic			
Hand washings (n /day) ≥ 11	42	17	<0.001 ^a

^a χ^2 test.

^bFisher's exact test.

Table 4. Self-reported occupational exposure, glove use and hand washings in all gainfully employed individuals at time of interview, in relation to type of occupation, high-risk versus low-risk

Exposure	High-risk occupation ^a (<i>n</i> = 95), (%)	Low-risk occupation ^a (<i>n</i> = 166), (%)
Occupational		
Water and detergents (hr/day)		
≥ ½ (including >2)	47	11
>2	16	1
Chemicals (hr/day)		
≥ ½ (including >2)	13	4
>2	4	1
Foodstuffs (hr/day)		
≥ ½ (including >2)	15	1
>2	8	0
Protective gloves (hr/day)		
≥ ½ (including >2)	58	10
>2	28	7
Occupational and domestic		
Hand washings (<i>n</i> /day)		
≥11 (including >20)	48	25
>20	20	5

^aAccording to a previous classification (1).

chemicals, foodstuffs and hand washings, Table 4. Glove use was also more common in high-risk occupations. However, about half of those in high-risk occupations reported exposure to water and detergents for less than half an hour a day and 10 or fewer hand washings per day. Further, 11% of those in jobs classified as low-risk occupations reported exposure to water and detergents for more than half an hour a day, and 25% stated more than 10 hand washings per day.

There was a correlation between occupational exposure to water and detergents and wet work at home. Of all gainfully employed individuals with occupational exposure to water and detergents for more than half an hour a day, 49% also reported wet hands in domestic work for more than 1 hr a day compared with 25% of those with such occupational exposure less than half an hour a day ($P < 0.001$). Separate analyses for females and males showed similar results, females 54 versus 38% ($P = 0.052$) and males 31 versus 8% ($P < 0.05$).

Discussion

There is no established way for eliciting and quantifying exposure to skin irritants in questionnaires. No generally accepted levels of exposure are stated as risk levels for the development of hand eczema. The desire to estimate skin exposure is based on the clinical experience of strong causal relationship between exposure to skin irritants and hand eczema. Further, do individuals

reduce their exposure to skin irritants when they have hand eczema?

When interviewed, our hand eczema cases reported almost the same level of exposure as the controls. Use of protective gloves was an exception and was more frequent among the cases than among the controls. Thus, hand eczema does not seem to change skin exposure at work or in leisure time. This could be one explanation to the unfavourable prognosis of hand eczema shown in previous studies (9, 14, 15). Jungbauer et al. (9) showed that 5 years after initial diagnosis of irritant hand dermatitis, 50% still had medium hand dermatitis and 32% severe. Possible changes in behaviour over time regarding exposure, particularly in the cases, might have occurred. However, when studying how far our subjects had reduced their occupational exposure to water and detergents between onset (corresponding year for controls) and interview, we found that the cases had not reduced their exposure more than the controls had.

Females have a higher prevalence and incidence rate of hand eczema than males, and wet work is identified as a probable contributory cause (1, 16). The differences in exposure between women and men were expected, but the literature contains little quantitative exposure data confirming this difference. Many female-dominated occupations involve intensive 'wet work', e.g. hairdressing, catering, cleaning and health care. Men on the other hand are more often employed in the industrial and mechanical work sector, and men also reported more exposure to chemicals than females did. In the manufacturing industry in Sweden at the time of the interview, the proportion of males/females was 3/1, whereas in the health care sector, the proportion of males/females was about 1/9 (Statistics Sweden 1997). Further, women have more wet work in the same occupation. In a Swedish survey, 44% of females in typical wet work reported wet hands for more than 1 hr a day compared with 29% of males in the same occupations (5).

Females younger than 30 years reported higher exposure to water and detergents at work than did those over 30. Data from Statistics Sweden also confirm that young women seem to have more wet contact in early working life, e.g. between 19 and 29 years of age: 38% of females and 18% of males reported having occupational water/skin contact several times an hour (Statistics Sweden 1997).

As expected, individuals in high-risk occupations for hand eczema reported more exposure than those in low-risk occupations. However, classification into high- and low-risk occupations

does not always reflect the true exposure. Half of the individuals in high-risk jobs reported exposure to water and detergents less than half an hour a day and 10 or fewer hand washings a day (Table 4). In low-risk jobs, 11% were exposed to water and detergents more than half an hour a day. The misclassification when using job title to identify risk exposure to hand eczema can be exemplified from our data as follows. Assuming that the risk of hand eczema is doubled when exposed to water and detergents for more than half an hour a day at work ($RR = 2$), using high-risk occupation as a measure of exposure instead of water and detergents for more than half an hour a day gives an RR of 1.3.

The two most frequent exposures reported in this study were to water and detergents and hand washing. Previous studies show that there is no standardized method for eliciting and quantifying wet exposure. In a study of metalwork trainees, hand washing with a mild detergent was considered as skin care (7), and in a German study of hairdressing apprentice's use of protective gloves less than 2 hr a day was considered as a risk factor for hand eczema (8). In many studies, the duration of wet work exposure is estimated. Several studies use 'wet work more than 2 hr a day' as a risk factor for developing hand eczema (3, 8, 17, 18).

A previous American study showed that hand washing frequency greater than 35 times per shift in intensive care unit employees was strongly associated with hand eczema (4). In another American study of nurses, the mean reported number of hand washes per shift was 25, and damage to the skin was associated with hand washing and gloving practices (19). In the POSH study, comparing hand washing more or less than 10 times a day gave no difference in the risk of hand eczema (8). In the present study, half of the individuals in high-risk occupations and a quarter of those in low-risk occupations reported hand washing more than 10 times a day. To regard the level of 10 hand washings as a risk exposure level for hand eczema is thus questionable.

Interestingly, individuals, females as well as males, with high exposure to water and detergents at work also more often had wet hands in their leisure time. This relationship stresses the importance of eliciting total exposure to skin irritants during the day when taking history from hand eczema patients and when giving advice. It is noteworthy that very few studies address exposure in leisure time.

The effect of protective gloves is difficult to evaluate. While gloves do protect the hands, as

a side-effect they may entail a risk of developing hand eczema. Our questions about protective gloves did not distinguish between occlusive gloves (plastic and rubber) and non-occlusive (leather and textile). The use of leather and textile gloves indicates work implying mechanical friction but not always an occupation with a higher risk of developing hand eczema due to wet work.

The wording of questions for use in future health surveys is of importance in identifying individuals with risk exposure. We consider that questions regarding wet exposure and hand washing should be asked. The individuals who reported exposure to foodstuffs in this study were also to a large extent exposed to water and detergents and to hand washing. They were thus identified as running a high risk of hand eczema, just because we elicited exposure to water and hand washing. To identify the few individuals who are exposed to chemicals, a specific question is needed. The question used about hand washing in this study, included time at work as well as time not at work. Future studies should separate hand washing at work from hand washing in leisure time so as to be able to estimate the risk of the occupational exposure. Questions on glove use should separate occlusive and non-occlusive gloves.

In this study, we included all individuals with hand eczema during the previous 12 months and an equal number of individuals without hand eczema, matched for age and sex, recruited from a previous population-based study (1). This study population was designed to facilitate comparison of exposure to skin irritants between hand eczema cases and controls and to study possible changes in exposure over time. To the best of our knowledge, no population-based study regarding skin exposure and hand eczema has previously been performed. The question used to identify individuals with hand eczema was validated in a previous study (20). However, the questions used about exposure to skin irritants have not been validated. In a Dutch study on wet work in nurses, observation detected almost double the frequency and less than half the duration of wet exposure that was reported by questionnaire (21). It would therefore be of great value to validate our questions of exposure, in observational studies, to assess how far the answers reflect true exposure.

The mean duration of hand eczema from onset to interview was 12 years. Such a long period illustrates the difficulties in making a retrospective survey of exposure at the time of onset. Self-reported data regarding events several years back in time is probably not fully reliable, and there may be differences in recalling between cases and

controls. The exposure should preferably be estimated at time of onset of hand eczema and then followed up in a prospective study design. Prospective studies exist regarding occupational hand dermatitis in the food industry and among hairdressing apprentices and metalworker trainees (6–8). In a prospective study of new hairdressing apprentices, occupational exposure to wet work, glove use, hand washing and use of emollients were elicited (8). However, as far as we know, no population-based prospective studies have been performed regarding skin exposure.

In conclusion, individuals with or without hand eczema seem to have similar exposure to skin irritants. Women report more wet exposure than men at work as well as in leisure time. Women as well as men with high wet exposure at work also tend to have high wet exposure in leisure time. Using job titles as a proxy for exposure gives misclassification, which may result in underestimation of the hand eczema risk.

Acknowledgements

We thank Marie Gidlund for performing interviews and Gunborg Lindahl for computer assistance. The study was financially supported by grants from the Swedish Council for Work Life Research (97–308), the Swedish Council for Working Life and Social Research (2001–2888) and the Welander/Finsen Foundations.

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