Prevalence of and work-related risk factors for hand eczema in a Norwegian general population (The HUNT Study)

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Running title: Hand eczema in the HUNT study

Summary

Background

Chemical exposures at work and at home may cause hand eczema. However, this has only scarcely been described for Norway.

Objectives

To investigate prevalence and occupational risk factors for hand eczema in Norway

Methods

Among 50805 respondents (≥20 years) to the third Nord-Trøndelag Health Study (HUNT3), 5757 persons reported ever having hand eczema and 4206 answered a hand eczema questionnaire.

Results

The lifetime prevalence of hand eczema was 8.4% in men and 13.8% in women (p<0.001), with onset ≤10 years in 24% (men) and 20% (women), and onset ≥30 in 37% (men) and 25% (women) (p<0.001). Work-related hand eczema affected 4.8% of the population, and most frequently associated with health/social work (29%), occupational cleaning (20%) in women, and with farming (26%) and industrial occupations (27%) in men. Cleaning detergents (75%) and chemicals (36%) were the most common exacerbating factors.

Conclusions

The prevalence of hand eczema was 11.3% and work-related hand eczema 4.8%. Hand eczema was more common in women than men but with later onset in men. Cleaning detergents were the most common aggravating factor. A large share of the Nord-Trøndelag population is employed in farming, providing a possibility to identify farming as an important risk factor for hand eczema.

Key words:

1. Introduction

Hand eczema (HE) is a common dermatological disorder and the most common work-related skin disease. Eczema located on the hands has important consequences for individual health, quality of life and work, as well as for health services and costs. HE can affect all age-groups. The highest incidence has been found in early adulthood (1, 2). HE can be mild to severe, and has often a chronic or relapsing course (1, 3), potentially causing a reduction in life quality similar to that caused by generalized eczema (3), psoriasis and asthma (4), and severe cases may have a profound impact on quality of life. New research has revealed that the association between HE and psychosocial problems in adult patients is much stronger than previously anticipated (5, 6).

Knowledge of prevalence and risk factors for HE and specifically occupational HE in Norway is sparse. Previous studies dating from 2008 have reported a prevalence of 8.2% in an adult Norwegian population without information of gender differences or occupation (7), whereas in a study from northern Norway, self-reported cumulative incidence of HE was 13.6% (8), and 6.5% in children aged 7-12 years (1995) (9). A review from 2010, mainly with data from Scandinavian countries, reported a lifetime prevalence of 15% (10).

Both endogenous and exogenous risk factors for HE have been reported, and eczema on hands is often a result of the interplay between these. Childhood eczema is an important endogenous risk factor while exposure for irritants, including wet work, and contact allergy are exogenous factors of significance (1, 3). HE is considered to be more common in women, probably due to different exposure compared to men (10). In recent years there has been increased focus on the associations between life-style factors such as smoking and obesity and HE (7, 10, 11).

Regarding occupational risk factors for HE, most previous studies have focused on specific occupations. In a report published by the Norwegian Ministry of Labour in 2011, it was noted that the number of skin-irritating chemicals used in occupational settings were increasing more than other types of chemicals, and overall 9% of all employees reported to be continuously exposed to skin-irritating compounds (12). A Norwegian study of occupational factors in a general population reported predictors of unspecific skin problems to be dry indoor air, water and cleaning products (13). From international studies it is known that cleaners have a higher prevalence of asthma and eczema than individuals who are not exposed to cleaning agents (14, 15).

This study aimed to investigate the prevalence of HE in a Norwegian population, the Nord-Trøndelag Health Study (HUNT), and to assess occupational risk factors associated with late onset of HE.

2. Methods

The HUNT Study is a large population-based study that invited all citizens of the county of Nord-Trøndelag aged 20 years or more to three surveys; HUNT1 (1984-86), HUNT2 (1995-97) and HUNT3 (2006-08) (16). Nord-Trøndelag is one of nineteen Norwegian counties, geographically situated in the central part of the country. The participants were invited to answer questionnaires, interviews and to take part in clinical examinations (17). This paper is based on information from questionnaire data and height and weight measurements in HUNT3.

A total of 50805 adults participated in HUNT3 in the period October 2006 to June 2008. A questionnaire (Q1) was filled in at home before the respondents attended the basic health examination, and further questionnaires Q2 and Q3 were given to participants following a health examination. Participants who answered affirmative to a question on HE in Q1: "Have you ever had or do you have eczema on hands?" was identified as eligible for a specific questionnaire on HE. In total 5748 participants (3823 women and 1925 men) were invited to fill in a HE questionnaire (Figure 1). Persons were not included if they were selected for more than two high-priority conditional questionnaires (diabetes, cardiovascular disease and cancer) (17), since the number of Q3-questionnaires was limited to three. Fourthousand twohundredsix participants responded to the HE questionnaire, including 2880 (75.3%) women and 1326 (68.9%) men (Figure 1). Almost three quarters of the individuals who received the questionnaire responded. Characteristics of responders and non-responders are reported in Supplemental table S1. The body mass index (BMI) was calculated from measured weight and height, as weight in kilos per squared height in meters, and categorized according to WHO's BMI classification (18).

Participants in HUNT have given written informed consent for data collection and storage, linkage to registries and analyses. This project has been approved by the Regional Medical Ethics Committee (2014/1497/REK Midt).

Descriptive statistics for the study population was reported as mean or median and range for continuous variables and count and percentages for categorical variables. Statistical differences between groups were calculated with t-test (continuous variables) or chi^2 test (categorical variables). The association between potential risk factors (reported in Q1 by the total HUNT3 population) of HE; sex, respiratory and allergic diseases, BMI and smoking was assessed by multiple Poisson regression analysis. STATA (StataCorp, College Station, TX, USA), version IC 14.0 was used in all analyses.

3. Results

Persons reporting HE in HUNT3 were more often women and current smokers, and more often reported a history of atopic disease or a parental history of atopic disease (all $p<0.001$) (Table 1). The cumulative self-reported prevalence of HE was 11.3%, with 8.4% in men and 13.8% in women ($p<0.001$). The corresponding figures for point prevalence were 2.7% in men and 4.0% in women.

Among the 4206 persons who answered the specific questionnaire on HE, the median age of first onset of HE was 21 and 25 years among women and men, respectively (Table2). Overall, 21% reported onset of HE before the age of 11 years. In women, the debut age of HE peaked in adolescence (10-20 years) and early adulthood (20-30 years) and decreased with age (Figure 2). In contrast, the debut age of HE in men peaked in childhood (≤ 10 years) and after 30 years of age (Table2); 36.7% had onset after the age of 30 years compared to 25.1% of the women ($p<0.001$). Among persons with onset of HE before or at age 10 years, 42% had current HE in adulthood at the time of the questionnaire (Table 2). Non-responders were more likely to be men, current smokers and unemployed (Supplemental table S1).

3.1 Non-occupational risk factors for hand eczema

Thirty-one percent of the persons that answered the HE questionnaire reported to have had childhood (atopic) eczema (Table 2). Among the responders to the HE questionnaire, more women than men reported current smoking, and the men with HE were more likely to be overweight (BMI: 25-<30; 50.6%) or obese (BMI ≥ 30; 25.3%), whereas the majority of the women with HE was in the BMI group 18-25 (36.9%) or in the overweight group (38.4%) (Table 2).

In multivariate analysis asthma (ever), hayfever or allergic rhinitis (ever), and a family history of allergies, hayfever, nasal allergies (but not asthma), and smoking were all associated with HE (Table 3). Furthermore, obesity (BMI≥30) was associated with HE (aRR=1. 11 (95% CI: 1.03 - 1.20)), whereas being overweight or normal weight was not (Table 3).

3.2 Occupation and occupational consequences

In total, 4.8% of the total HUNT 3 population (n=50805) reported work related HE. Persons with HE reported a higher frequency of sick leave, including medical certificate sick leave, compared to the HUNT3 participants without HE ($p<0.001$, Table 1). Among those that answered the HE questionnaire, health/social work and cleaning were most frequently associated with HE in women (28.5% and 19.6%, respectively, Table 4), while among men, work-related HE was most common among farmers (26.3%) and industry workers (27.0%) (Table 4). These results refer to occupations

reported as the only occupation participants were involved in at the time of eczema debut (Table 4); the results where similar when taking into account part-time work (Table S2, supplemental information). Work-related HE was reported by 61% of persons with HE, and in both sexes 41% reported that their HE condition improved when absent from work (Table 4). Six percent of the women and 6.7% of the men had changed occupation due to HE (Table 4).

3.3 Materials associated with hand eczema and patch test results

More women than men reported worsening of their HE when in contact with certain materials (66.6% vs 55.9%, respectively; $p<0.001$ (Table 4)), whereas 23.6% of the participants could not tell whether skin contact with different materials aggravated their HE. Overall, cleaning detergents, chemicals and water were the most frequently reported aggravating factors. Women reported a slightly higher number of irritants than men (mean number of irritants: 1.8 and 1.5, respectively), with some differences in type of material regarded as aggravating factor (Table 5); oils and lubricants were more commonly reported by men (40.5%) than by women (16.1%) ($p<0.001$, Table 5). Furthermore, 43.8% of the participants reported washing their hands between 6 - 10 times daily, and 17.4% of the women reported hand washing more than 20 times daily, in contrast to men where 3% reported hand washing more than 20 times a day (Figure 3).

Among persons who answered the HE questionnaire, 32.9% reported that skin contact with nickel (in buttons, buckles, jewelry, earrings) or other metal objects caused a rash. Twenty-four percent of the participants who had ever had HE answered affirmative to the question:" Have you ever had a patch test for allergies". Among this subgroup, 19.9% reported no reaction (29.8% of the men and 15.3% of the women) and 27.4% (25% of the women and 33% of the men) reported that they did not know what they reacted to. Among the subjects who reported to have been patch tested and recalled the result (xx% of the subgroup, xx% in women and xx% in men), positive reaction to nickel, fragrance allergens, preservatives and rubber chemicals were most often reported (Table 6). For all the substances, except for epoxy resin and chrome, women were more likely to report positive test results than men. Hairdresser was the occupation where patch testing was most frequently performed (40%).

4. Discussion

In our population based survey we found that HE was more common in women and that for both men and women a large proportion had HE debut in early childhood and after the age of 30 years.

Persons with HE were more often obese and current smokers as compared to the non-HE group. Farming and industry were the occupations which was most frequently associated with HE debut in men. HE in women was most often associated with health/social work and working as cleaner. Cleaning detergents, water and chemicals were the most common aggravating factors for both genders.

The lifetime prevalence and point prevalence of HE of 11% and 3.4%, respectively, in the present study was lower than the reported 15% and 4%, respectively, from the review paper by Thyssen et al (10), but slightly higher than what has been reported in another study from Norway (8.2%) (7). However, in a study from northern Norway, the cumulative incidence of self-reported HE was 13.6% (8). Women reported a higher cumulative incidence (17.4%) (8) than the lifetime prevalence reported in the present study (13.8%), while the finding was comparable for men (8.8% versus 8.4%).

The present study confirms atopic dermatitis and HE in childhood as important risk factors for HE in adulthood. We found that men had a peak of HE debut in early childhood (≤10 years of age), whereas for women, debut occurred often in adolescence or early adulthood. Dotterud et al (9) found no gender difference among HE (reported by the parents) among children aged 7-12 years. In a cohort study of young adults (28-30 years), the one-year prevalence of HE was 14.3%, with a higher prevalence in women and incidence of 8.8 pr 1000 person-years from adolescence to adulthood (19). In the present study, 42% of the participants with age of onset by 11 years of age still suffered from HE at the time of follow-up, indicating a large proportion of early onset HE among this large study population of adults, and many with persistent HE since childhood. However, the information was collected retrospectively, and we therefore cannot exclude the possibility of recall bias. It is well-known that HE is more common among women. Our study provides support to a Swedish study were the risk of HE was only significantly related to sex in persons below 30 years (2, 10). However, we encountered more frequent debut of HE reported among men, as compared to women after 30 years of age, but the overall lifetime prevalence of HE was higher for women than men. In accordance with a Swedish study among hairdressers we found that mean age at onset of HE was 22 years, whereas other unselected population studies have reported higher mean age at onset (27 years) (20).

Our study showed that current smoking was more common among participants with HE than without. Previous studies reporting associations between smoking and HE have shown inconsistent results. An earlier Norwegian study found no association between smoking and HE (7). In two reviews from 2015, Sørensen et al. indicated a possible association (21), while Lukács et al. were unable to identify an association (22). A study on obesity and HE (11) found that HE was more common in individuals who reported stress, obesity and smoking. In the present study, men with HE were more likely to be obese compared to men without HE. Overweight and obesity was more common among men with HE as compared to women.

In the present study, farming was the occupation which most men reported to be involved in during HE debut. Farming has not been of great importance for HE in other studies, but this may be due to inclusion of populations that differ from HUNT. The county, Nord-Trøndelag, from which this study is based, is the county with the largest share of inhabitants employed in farming, fishery and forestry in Norway (8.1% compared to 2.9 % for Norway overall in 2008 in age group 20-74 years (Statistics Norway) (23). The county has spread out communities and is thus ideal for studying both urban and rural living. Based on municipality, the participants in HUNT3 were broadly categorized as living in either urban or rural areas. Two thirds of the HUNT3 population lived in rural areas and a large share was involved in farming (14% and 4% of those living in rural and urban municipalities, respectively). However, both in urban and in rural areas 20% were involved in health care professions. Nevertheless, compared to previous studies assessing occupational exposures and HE, the large share of rural residence and farming activity related to this in the HUNT3 population enabled us to identify farming as an important risk factor for HE. A study of Finnish farmers reported higher prevalence for HE among women than men (24). The study was, however, based on data collected in 1979, a time when women did most of the milking and were also more exposed to irritants and allergens than men (24). Newer epidemiology data on risk of HE in farmers are scarce. In the HUNT-population slightly more women were likely to have farming as a part time occupation, whereas for men farming were more likely to be the main activity, which may explain the higher frequency of farming-related HE in men compared to women.

Wet work, e.g. hand washing more than 20 times a day (25), is a known exogenous risk factor for HE (26). Water was one of the most important aggravating factors for HE in the present study. Furthermore, there was a statistically significant difference between the proportion of women and men reporting hand washing more than 20 times daily, namely, 17.4% and 3%, respectively, indicating important gender difference in exposure. This is lower than in the Swedish study, which reported separate exposure for leisure and work; skin exposure to water was reported to be 30% for

women and 12% for men, compared to 8% and 4%, respectively, at work (26). In the present study, occupational cleaning was the second most common occupation in women at the time of HE debut.

Contact allergies are among the known exogenous risk factor for HE. A diagnosis of contact allergy is determined by patch testing, which is recommended in all patients with chronic HE (27). We found that nearly one in four of the HE population had completed patch testing. Nickel allergy was the most common contact allergy among the participants with positive patch test result. Of the hairdresser with HE 40% had undergone patch testing while the corresponding proportion of farmers reporting HE was 25.6%.

In the study population the prevalence of psoriasis was higher than in the background population. HE may be confused with other dermatoses, as psoriasis, and vice versa. On the other hand, in a study of comorbidity in children, 24.5% of children with psoriasis also reported to be affected by atopic eczema (28), and participants may have had coexisting inflammatory skin diseases. A validation study on self-reported psoriasis in HUNT3 suggested that self-reported psoriasis may be underestimated largely because of underdiagnosed scalp psoriasis (29).

A strength of this study is the large population size and the high response rate to the HE questionnaire. Almost three quarters of the individuals who received the questionnaire responded. When comparing the characteristics of the responders and non-responders, the non-responders were more likely to be men, current smokers and unemployed (Supplemental table S1). The total participation rate in HUNT3 was 54%; non-participants had lower socioeconomic status, higher mortality and showed higher prevalence of several chronic diseases (30).

Participants in the present study include the adult population from a large geographical area in Norway. Although the high proportion of farmers makes it difficult to generalize the findings to other populations, examining a region that includes both urban and rural living enables us to identify work-related HE risk which would otherwise not be possible in studies on urban population or specific occupational groups. The present study has a cross-sectional design. Thus, the data do not allow us to estimate the contribution of specific occupational groups on the risk of HE. For retrospectively collected data underreporting may underestimate the prevalence of disease. The information in this study is reported in adulthood, and may cause a recall bias regarding information from childhood. One study found that the validated question “Have you had childhood eczema”, could overestimate atopic eczema as a risk factor for HE in adult population surveys (31). Furthermore, although childhood eczema appear to be an important risk factor for later development of HE, this information

was only reported by the HE population and could therefore not be included in the analyses assessing multiple potential risk factors for HE. The HE questionnaire are not a validated tool, but constructed from questionnaires used in other studies. The sources were, however, not documented, and it is therefore difficult to know which of the questions that have previously been validated.

In analyses of lifestyle-related factors, socio-economic factors can confound the results. The HUNT3 study does not include information on income and we were therefore unable to take this into account. However, information on smoking, which was accounted for in our analyses, can be regarded as a surrogate measure for socioeconomic status.

Thirty-two per cent of the study population answered affirmative to the question if skin contact with metal objects, potentially releasing nickel (in buttons, buckles, jewelry, earrings or other metal objects) caused a rash. Validity of self-reported nickel allergy has been found to be low by others and may overestimate the true prevalence of nickel allergy (32). The present study includes information of self-reported patch test results, which other studies often lack. Patch test results are important information when investigating prevalence of contact allergy. However, recall bias could possibly lead to both under- and over-reporting of a positive reaction, with a higher probability of remembering positive (rather than negative) patch test results, and females having better recall than men (33).

Conclusion

The prevalence of HE in the HUNT population was 11.3%, and the prevalence of work-related HE in the population was 4.8%. In agreement with other studies we find that HE is more common in women. However, our study provides novel findings in terms of a high incidence of HE in early childhood and a higher incidence of HE in men than in women after 30 years of age. Due to the large share of the Nord-Trøndelag population being employed in farming, we were able to identify farming as an important risk factor for HE in men.

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Table 1. Baseline characteristics of the HUNT3 population according to presence of hand eczema, as reported in the main questionnaire (Q1))

	Never hand eczema n=45024	**Hand eczema** n=5757	*p*- value
Age [median (min, max)]	54.1 (19, 100.8)	49.7 (19.3, 95.6)	
Gender (%)			
Female	53.1	66.5	<0.001
BMI (%)			
< 18.5	0.6	0.7	
[18 -<25	32.1	32.2	
[25-<30	44.7	42.0	
≥30	22.7	25.1	<0.001
Smoking habits (%)			
Never smoker	43.0	39.8	
Previous smoker	32.6	32.8	
Current smoker (daily and occasional)	24.4	27.4	<0.001
Disease history (%)			
Ever psoriasis	4.9	12.6	<0.001
Hayfever, nasal allergies	28.0	45.3	<0.001
Ever had asthma	10.8	18.9	<0.001
Family history of allergies, hayfever, rhinitis	48.0	64.3	<0.001
Family history of asthma	28.0	37.4	<0.001
Currently employed (%)	63.6 (n=28,461)	69.2 (n=3,973)	<0.001
Current occupation at time of survey HUNT 3 (%)			
Business and office	2.2	1.9	
Quarrying	0.3	0.2	
Construction work	6.9	4.5	
Fishing	1.1	0.9	
Trade	11.1	11.0	
Health/ social work	19.8	26.1	
Hotel/ restaurant	2.4	3.5	
Industry (except oil)	7.9	6.9	
Industry (Oil/ gas)	1.9	1.4	
Farming	9.8	9.4	
Hydropower	1.2	0.7	
Public administration	10.0	8.9	
Oil- and gas	0.4	0.3	
Transportation	4.5	3.2	
Teaching	10.7	10.5	
Other	10.2	10.9	
Sick leave last 12 months (%)	55.2 (n=15653)	59.6 (n=2359)	<0.001
Sick leave medical certificated by doctor (%)	32.7 (n=9198)	37.0 (n=1448)	<0.001

Missing: Hand eczema (n=24); BMI (n=402); smoking (n=1428); psoriasis (n= 22); hay fever(n= 11527); ever asthma (n= 22); family history of allergy(n=1856); family history of asthma (n=1907);currently employed (n=275); working group(n= 4, 617);, sick leave last 12 months(n =91). Sick leave medical doctor (n=404)

Table 2. Characteristics of 4206* persons who answered a hand eczema questionnaire

	All n=4206	**Women** n=2880	**Men** n=1326	***p*-value****
Eczema in childhood (%)	31.6	32.0	30.7	0.14
Debut age of hand eczema [years, median (min, max)]	22 (0, 99)	21 (0, 99)	25 (0, 99)	
Onset of hand eczema, age (%)				
≤10yrs	21.4	20.4	23.5	
>10- ≤20 yrs	26.1	29.6	18.5	
>20- ≤30 yrs	23.9	25.0	21.4	
>30- ≤40 yrs	13.3	12.1	15.8	
>40- ≤50 yrs	8.1	7.1	10.5	
>50	7.3	5.9	10.4	
Current hand eczema (%)	41.7	39.2	47.4	<0.001
Current hand eczema by onset age (%)				
≤10yrs	42.4	42.7	42.0	0.80
>10- ≤20 yrs	36.2	34.3	42.9	0.02
>20- ≤30 yrs	38.9	36.2	45.6	0.01
>30- ≤40 yrs	47.4	41.5	57.0	<0.01
>40- ≤50 yrs	52.2	52.4	52.0	0.90
>50	45.7	51.3	61.1	0.04
BMI (%)				
< 18.5	0.6	0.7	0.4	
[18 -25>	32.8	36.9	23.7	
[25-30>	42.3	38.4	50.6	
≥30	24.4	24.0	25.3	<0.001
Smoking (%)				
Never	40.2	40.3	40.1	
Previous	33.7	31.8	37.7	
Current	26.1	27.8	22. 2	0.001
Other diseases (%)				
Psoriasis	11.7	10.7	14.0	≤0.01
Ever hayfever, nasal allergy	45.7	46.1	44.8	0.40
Ever had asthma	19.0	19.0	18.9	0.97
Family history of allergy, hayfever	64.9	68.9	56.3	<0.001
Family history of asthma	37.2	40.1	30.9	<0.001

* Of the 5757 participants who reported hand eczema in Q1 (Table 1), 4206 responded to the Q3 hand eczema questionnaire (Figure 1). Missing information for eczema in childhood (n=50); age onset eczema (n=286); current hand eczema (n =91); BMI (n=8); smoking (n= 92); psoriasis (n=1); hay fever (n =177); asthma (n=1); family history of allergy (n= 96); family history of asthma (n=119). ** *p*-value for difference between men and women

Table 3. Bivariate relative risk (RR) and adjusted relative risk (aRR) for hand eczema ever by gender, history of respiratory and allergic diseases, smoking and BMI by univariate (n=50806) and multivariate (n=36729*)

	RR (95 % CI)	**p**	**aRR (95 % CI)**	**p**
Sex (ref: male)	1.65(1.57-1.74)	<0.001	1.63 (1.53 -1.73)	<0.001
Asthma (ever)	1.7(1.66-1.87)	<0.001	1.36 (1.26-1-46)	<0.001
Asthma (family)	1.30(1.25-1.36)	<0.001	1.02 (0.97-1.08)	0.34
Hayfever/nasal allergies (ever)*	1.93 (1.83-2.04)	<0.001	1.63 (1.54-1.73)	<0.001
Allergies/hayfever (family)	1.48(1.42-1.53)	<0.001	1.29 (1.22-1.36)	<0.001
BMI				
18.5-25 (ref)			1	
<18.5	1.06 (0.79-1.44)	0.68	1.01 (0.71-1.44)	0.95
<25-30	0.94 (0.89-1.00)	0.04	1.04 (0.97-1.11)	0.23
>30	1.09(1.02-1.16)	0.01	1.11 (1.03-1.20)	0.005
Smoking				
Never (ref)			1	
Previous	1.08(1.02-1.14)	0.013	1.11 (1.05-1.19)	0.001
Current	1.19(1.12-1.27)	<0.001	1.17 (1.09-1.26)	<0.001

Poisson regression analysis of HUNT3 population with available information on all variables in the model

*Information on hay fever/nasal allergies (ever) was reported in Q2 which was answered by 77.3% of those having answered Q1 and the number included in the multivariate model is therefore lower than the full HUNT3 population.

Table 4. Associations between hand eczema and occupations and occupation-related factors among persons who answered the hand eczema questionnaire.

	All n= 4206*	**Women,** n=2880	**Men,** n=1326	***p*- value**
Eczema on hands in connection with work (%)	60.8	60.2	61.9	0.30
Type of job when eczema started (%) **	n =2249	n=1511	n= 738	
Business and Office	8.6	10.4	5.0	<0.001
Teaching	3.7	3.9	3.1	0.30
Workshop/industry	9.9	1.6	27.0	<0.001
Food industry/ cooking	7.8	8.3	6.9	0.20
Farming	16.5	11.7	26.3	<0.001
Fishing	0.3	0.2	0.4	0.40
Transportation	1.1	0.0	3.4	<0.001
Hairdresser/barber	3.1	4.5	0.1	<0.001
Health/social work	20.1	28.5	2.9	<0.001
Cleaning	13.9	19.6	1.6	<0.001
Construction work	3.3	0.1	9.9	<0.001
Painting	0.8	0.3	1.9	<0.001
Other	11.2	10.8	11.9	0.45
Change job because of eczema (%)	6.2	6.0	6.7	0.40
Eczema worsens due to certain materials (%)				
Yes	63.2	66.6	55.9	
No	13.3	11.6	16.9	<0.001
Don't know	23.6	21.9	27.2	
Eczema improvement when away from work (%)	41.2	41.6	40.5	0.50

*Missing: Eczema in connection with work(n =168(4 %) women, n =116 (4 %) , men n= 52(3.9%)); change job because of eczema (n=108(2,6%),women n=84 (2.9%), men n= 24 (1.8%));Worsen eczema in contact with materials (n=244(5.8%), women n=182(6.3%), men n= 62 (4.7%)); Eczema improvement when away from work (n =416 (9.9%), woman n= 316 (11%), men=100(7.5%)).

**n=2,249 provided information about main occupation when eczema started.

Table 5. Materials reported to aggravate hand eczema in persons who responded to the hand eczema questionnaire and who gave information on aggravating material, for entire subgroup and stratified by gender

Material	**All** (n=2502)* %	**Women** (n=1796) %	**Men** (n=706) %	***p*-Value****
Water	26.2	29.6	17.6	<0.001
Cleaning detergents	75.1	84.6	50.9	<0.001
Chemicals	36.0	33.4	42.6	<0.001
Solvents	23.7	19.9	33.4	<0.001
Paint	17.8	17.3	18.8	0.40
Oils and lubricants	16.1	6.5	40.5	<0.001
Foods	18.7	23.1	7.5	<0.001
Plants	14.6	16.2	10.5	<0.001
Animals	13.4	12.7	15.3	0.10
Other	19.0	18.7	19.7	0.60

* Information about aggravating material: Missing: n=244.

** for difference between men and women

Table 6. Reported patch tests outcome among participants who reported to have been tested (n=1002) for entire subgroup and stratified by gender. Multiple positive patch test results possible.

Allergen	**All** (n=1002)	**Women** (n=687)	**Men** (n=315)	***p*-value***
	%	**%**	**%**	
Nickel	28.9	37.4	10.5	<0.001
Rubber chemicals	11.5 (n=115)	13.5	7.0	0.003
Chromium	8.1 (n=81)	7.6	9.2	0.38
Cobalt	5.6 (n=56)	7.3	1.9	0.001
Epoxy resin	1.9 (n=19)	1.0	3.8	0.003
Colophonium	5.0 (n=50)	5.7	3.5	0.12
Preservatives e.g. in creams	11.8 (n=118)	14.6	5.7	<0.001
Fragrances	19.1(n=191)	23.9	8.9	<0.001
"Other"	32.8 (n=329)	35.8	26.5	0.003
Negative	19.9 (n=199)	15.3	29.8	<0.001
Unknown/ did not remember	27.5(n=275)	24.9	33.0	0.007

* for difference between men and women