

Nickel allergy and hand eczema – a 20-year follow up

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The aim of this study was to investigate the occurrence of hand eczema after 20 years in women patch tested to nickel during childhood. In 1982–1983, 960 schoolgirls were patch tested for nickel allergy; its prevalence was found to be 9%. 20 years later, the same individuals received a questionnaire regarding hand eczema and factors of importance for the development of hand eczema. 735 of 908 women (80.9%) answered the questionnaire. In total, 17.6% of respondents reported hand eczema after the age of 15 years, and the 1-year prevalence was 12.8%. There was no statistically significant difference in the occurrence of hand eczema between the groups who had previously tested positive and negative for nickel allergy. 38.3% of the respondents considered themselves to be nickel sensitive at the time they answered the questionnaire; in this group, the reported prevalence of hand eczema after age 15 was 22.5%. 31.4% of those with a history of atopic dermatitis reported hand eczema after age 15, compared with 10.6% of those without ($P < 0.001$). In conclusion, contact allergy to nickel in childhood did not seem to increase the prevalence of hand eczema later in life.

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Nickel allergy is the most common contact allergy. Its prevalence is higher in women than in men. Sensitization is related to exposure, and exposure to nickel has varied over time. For the past few decades, piercing has been an important factor in sensitization (1). Around 25% of women with eczema showed nickel allergy when patch tested at dermatology clinics (2, 3); however, extrapolating the conclusions of such studies to the general population is problematic because patients with dermatological problems are selected with respect to eczema.

About 10% of women in the general population are estimated to be sensitive to nickel. In some population-based studies, the diagnosis of nickel allergy was verified by patch testing, and the allergy prevalence among women varied between 8% and 14% (4–7). In other studies, including large numbers of participants, a self-reported prevalence of 15–20% was found among women (8–10). It seems that self-reports might overestimate the prevalence of nickel allergy.

Nickel allergy has been discussed as a risk factor for hand eczema; in population-based

retrospective studies, a cumulative prevalence of 30–46% for hand eczema has been reported in nickel-sensitive individuals (4, 8, 9). The 1-year prevalence of hand eczema was about 12% in women of working age in a Swedish population-based study (11). Hand eczema was more common in women than in men, and the highest prevalence was found in young women. Hand eczema has a complex aetiology involving both exogenous factors, such as skin irritants and contact allergens, and endogenous factors, such as atopic constitution. The importance of skin atopy as a risk factor for hand eczema is well documented (12–14).

In a previous Swedish study, 958 schoolgirls were patch tested to nickel in 1982–1983, and 9% of the girls had positive reactions (15). A follow up of this cohort gives an opportunity to study the importance of nickel allergy during childhood for the development of hand eczema later in life. The aim of this study was to investigate the occurrence of self-reported hand eczema after 20 years in women patch tested to nickel as schoolgirls.

Subjects and Methods

Study population

In 1982–1983, 958 schoolgirls aged 8, 11, and 15 years from 2 cities in central Sweden were investigated for the occurrence of nickel allergy (15). The girls were patch tested with nickel sulfate 5% in petrolatum, and the reactions were read after 3 days. Requirements for a positive reaction were erythema, infiltration, and papules, thus symptoms comparable with a ++ reaction (16). Erythematous, follicular, or pustular reactions alone were not sufficient and were classified as doubtful reactions. The prevalence of nickel allergy was 9% in total (8% in the 8-year-olds, 9% in the 11-year-olds, and 12% in the 15-year olds). Another 4% showed doubtful reactions.

In 2003, current addresses were found in the Swedish population register for 908 of these 958 girls (actual mean age 32 years, range 29–36 years). Of the remaining 50 girls, 18 had emigrated, 3 were dead, and 2 had secret addresses.

Questionnaire

A questionnaire was sent by mail to these 908 women. The questionnaire contained 35 questions concerning the occurrence of hand eczema, atopy history, nickel sensitivity, occupation, and wet exposure. The main questions are presented in Table 1. After 2 reminders, the response rate was 80.9% ($n = 735$).

Occupations involving wet work or other skin irritant exposure were classified as 'high-risk' occupations for hand eczema, in line with a previous classification (11). 'High wet exposure'

was defined as occupational skin exposure to water >2 hr/day, and/or hand washing >20 times per day, and/or housework >2 hr/day.

Analysis of nonrespondents

Among the 173 women who did not answer the questionnaire, 11.6% had tested positive to nickel in 1982–1983 and 2.3% had shown doubtful test reactions. Every second woman of these 173 was chosen for a short telephone interview covering the main questions of the questionnaire. It was possible to interview 44 of the 86 women chosen (51.1%).

Statistics

The data were analysed using SPSS version 13 (SPSS Inc., Chicago, IL, USA). Chi-square tests were used for comparison of proportions.

The study was approved by the Medical Research Ethical Committee of Örebro, Sweden.

Results

Hand eczema and nickel allergy

In total, 17.6% (129/735) of the women reported having had hand eczema after the age of 15. The 1-year prevalence of hand eczema was 12.8% (93/735). Table 2 presents the occurrence of hand eczema in relation to the 1982–1983 patch test results to nickel. There was no significant difference between nickel-positive and nickel-negative women in either the frequency of hand eczema after age 15 ($P = 0.576$) or the 1-year prevalence of hand eczema ($P = 0.559$) (Table 2). The group

Table 1. The main questions of the questionnaire

Have you ever had hand eczema after age 15?	☐ Yes	☐ No
Have you had hand eczema on any occasion during the past 12 months?	☐ Yes	☐ No
Have you ever consulted a doctor regarding hand eczema?	☐ Yes	☐ No
Have you had childhood eczema (before age 15)?	☐ Yes	☐ No
Have you ever had hay fever?	☐ Yes	☐ No
Have you ever had asthma?	☐ Yes	☐ No
Are you sensitive/hypersensitive/allergic to nickel?	☐ Yes, with severe symptoms ☐ Yes, with mild symptoms ☐ Yes, without symptoms when avoiding contact ☐ No	
What is your present occupation?		
Have you ever changed job due to hand eczema?	☐ Yes	☐ No
Are your hands, at work, exposed to water and detergents?	☐ <0.5 hr/day	☐ 0.5–2 hr/day ☐ >2 hr/day
How many times a day do you wash your hands?	☐ 1–10 times per day	☐ 11–20 times per day ☐ >20 times per day
How long do you spend on housework at home during a normal day (cooking, washing dishes, cleaning, laundry)?	☐ <0.5 hr/day	☐ 0.5–2 hr/day ☐ >2 hr/day
How many people in your household are children aged 0–4 years?		

Table 2. Self-reported occurrence of hand eczema in relation to previous patch test results for nickel (in 1982–1983)

Nickel patch test in 1982–1983	Hand eczema after age 15 (%)	Hand eczema in the past 12 months (%)
Positive (<i>n</i> = 62)	16.1	14.3
Negative (<i>n</i> = 636)	17.5	12.3
Doubtful (<i>n</i> = 33)	24.2	18.2
Total (<i>n</i> = 731)	17.6	12.8

with doubtful patch test reactions to nickel comprised 33 individuals. If all of them were regarded as positive, then in the nickel-positive group, the prevalence of hand eczema after age 15 was 18.9% and the 1-year prevalence 15.8%. This is still not a statistically significant difference in comparison with the negatives ($P = 0.722$ and $P = 0.342$, respectively).

Hand eczema and atopy history

History of childhood eczema was reported by 33.1% of subjects (243/735). Table 3 presents the relationship between reported childhood eczema and hand eczema. History of childhood eczema tripled both the prevalence of hand eczema after age 15 and the 1-year prevalence. When those with childhood eczema were excluded, the prevalence of hand eczema after age 15 was 12.5% in the nickel-sensitive group and 10.2% in the nickel-negative group ($P = 0.785$).

Table 3. Self-reported occurrence of hand eczema in relation to history of childhood eczema, type of occupation, skin exposure, children <4 years of age in the household, and self-reported nickel sensitivity

	Hand eczema after age 15 (%)	Hand eczema in the past 12 months (%)
Childhood eczema		
Yes (<i>n</i> = 242)	31.4**	24.0**
No (<i>n</i> = 483)	10.6	6.9
High-risk occupation ^a		
Yes (<i>n</i> = 178)	17.6	13.6
No (<i>n</i> = 557)	17.7	12.5
High wet exposure ^b		
Yes (<i>n</i> = 248)	20.6	15.0
No (<i>n</i> = 470)	16.7	12.0
Children <4 years of age		
Yes (<i>n</i> = 248)	18.0	14.2
No (<i>n</i> = 388)	17.4	11.8
Self-reported nickel sensitivity		
Yes (<i>n</i> = 275)	22.5*	18.2**
No (<i>n</i> = 444)	14.4	9.0

^aAccording to a previous classification (11).

^bDefined as occupational skin exposure to water and detergents >2 hr/day, and/or hand washing >20 times per day, and/or housework >2 hr/day.

* $P < 0.01$; ** $P < 0.001$.

Of the 243 women who reported childhood eczema, 37 (15.2%) could remember eczema located on the hands during childhood. Of these 37 women, 25 reported having had hand eczema after age 15.

History of hay fever and/or asthma with or without childhood eczema was reported by 42.0% of respondents. No statistically significant influence of respiratory atopy on the occurrence of hand eczema was found when individuals with childhood eczema were excluded.

Hand eczema and skin irritant exposure

Table 3 presents the occurrence of hand eczema in relation to type of occupation and wet exposure. 178 (24.2%) of the respondents were in high-risk occupations for hand eczema – 133 in medical and nursing work, 19 in production, and 26 in service occupations. There was no statistically significant difference in the prevalence of hand eczema between women in high-risk occupations and the rest of the women (Table 3).

High wet exposure was reported by 33.7% (248/735); its relation to hand eczema is presented in Table 3. Occupational skin exposure to water and detergents for more than 2 hr/day was reported by 7.9%, hand washing >20 times per day by 15%, and housework for more than 2 hr/day by 24.1%.

39.5% of the individuals had at least 1 child younger than 4 years in the household, but there was no statistically significant difference in hand eczema prevalence between those with and without young children.

Consequences of hand eczema

50% (64/129) of all women who reported hand eczema after age 15 had visited a doctor for the eczema. There was no difference between the nickel-positive and nickel-negative individuals regarding consultations for hand eczema. Of the women consulting for hand eczema, 64.5% had a history of childhood eczema.

Change of job on some occasion due to hand eczema was reported by 15.5% (20/129) of women with hand eczema. 16 of these 20 women had a history of childhood eczema. Only 3 of these were sensitive to nickel in 1982–1983; 1 of them also reported childhood eczema and had left hairdressing work, while the other 2 had abandoned work as cashiers.

Self-reported nickel sensitivity

276 individuals (38.3%) gave a positive answer to the question about nickel sensitivity. 11 reported severe symptoms, 143 mild symptoms, and 122

had no symptoms when avoiding nickel contact. Hand eczema was reported significantly more often in individuals who considered themselves nickel sensitive than in the others (Table 3). Among the women who were negative to nickel when patch tested in childhood, 31.9% reported sensitivity to nickel when answering the questionnaire (Table 4).

Analysis of nonrespondents

When comparing respondents to the questionnaire with those interviewed by telephone, no statistically significant differences were found regarding history of childhood eczema, occurrence of hand eczema, and self-reported nickel allergy.

Discussion

In this population-based 20-year follow up, we did not find an increased prevalence of hand eczema in women who were patch tested positive to nickel during childhood. As previously reported, this follow up also showed a history of childhood eczema as an important risk factor for developing hand eczema.

The occurrence of hand eczema was similar in individuals with positive and negative patch test to nickel when tested in childhood. Even when all doubtful reactions were considered as positive, no statistically significant difference in hand eczema prevalence was found. The time from the initial patch test to the follow up by questionnaire was long (20 years), suggesting that some of the women probably became sensitized to nickel during the follow-up time. 1 common way to become sensitized to nickel is by piercing (1), which during the past few decades has been popular among young people in Sweden. 38.3% of respondents considered themselves to be nickel sensitive at the time they answered the questionnaire. The reported prevalence of hand eczema was increased in this group compared with those with no suspicion of nickel sensitivity. A new patch test is needed in order to be able to diagnose current nickel allergy and to fully study the relation between nickel allergy and hand eczema; a clinical

investigation, which gives a more valid diagnosis of hand eczema, would also be desirable. Self-reports of hand eczema by questionnaire have been shown to result in underestimation of the prevalence of hand eczema (17).

A decreasing trend has been found regarding the occurrence of nickel allergy in young people (3, 18). This is probably due to regulations, which have resulted in more restricted use of nickel in jewellery and other metal items in close skin contact. The European Nickel Directive came into full force in 2001 (19). Investigation of the relation between nickel allergy and hand eczema is also of importance in the context of the expected preventive effect of the nickel regulations.

The proportion of women reporting childhood eczema was surprisingly high, at 33%. The reason for this is unclear. The analysis of nonrespondents did not indicate a selection of skin atopics among the respondents. The question used has previously been validated and found to give some overestimation (20). As in several other studies, the prevalence of hand eczema was higher – approximately 3 times higher in our study – among individuals with a history of childhood eczema (12–14). In a population-based Swedish study, it was found that a history of childhood eczema mainly influenced the onset of hand eczema before age 30 (13). 2 of 3 of those with eczema located on the hands during childhood reported hand eczema after age 15. This is in concordance with previous observations of hand eczema during childhood as an important risk factor for hand eczema as an adult (21).

Wet work is considered an important risk factor for the development of hand eczema. We did not find any statistically significant difference in the occurrence of hand eczema between individuals in high-risk occupations and the rest of the women. However, job title is an imprecise proxy for exposure and will result in some misclassification (22). We also included in the questionnaire a few questions regarding occupational wet exposure, hand washing, and housework. 1 of 3 women reported high wet exposure, but we found no statistically significant difference in hand eczema prevalence in relation to wet exposure. The questions covered current occupation and exposure, which might, for some individuals, not be the same as at onset of hand eczema.

Hand eczema is known to have costly consequences (23); this finding was confirmed in this study. Half of those with hand eczema had consulted a doctor on some occasion, and 15.5% reported change of job due to hand eczema. History of childhood eczema seemed to be the most important factor both for medical consultations and for change of job.

Table 4. Self-reported nickel sensitivity (2003) in relation to previous nickel patch test results (1982–1983)

Nickel patch test in 1982–1983	Self-reported nickel sensitivity in 2003, <i>n</i> (%)
Positive (<i>n</i> = 62)	56 (90.3)
Negative (<i>n</i> = 627)	200 (31.9)
Doubtful (<i>n</i> = 32)	20 (62.5)
Total (<i>n</i> = 721)	276 (38.3)

The cohort studied was established in 1982–1983, when schoolgirls in 2 Swedish cities participated in a study including patch testing to diagnose nickel allergy. The cohort was thus recruited from the general population. Due to those records and patch test results, it was possible to perform a prospective study focused on the development of hand eczema in relation to patch test results for nickel. The response rate was good, 80.9%, and the analysis of nonrespondents did not indicate differences between respondents and nonrespondents regarding important variables. Thus, the results can be regarded as representative.

In conclusion, contact allergy to nickel in childhood did not seem to influence the occurrence of hand eczema later in life. Self-reports of current nickel sensitivity were found to be related to reports of hand eczema and should be verified by a repeated patch test. An increased prevalence of hand eczema in relation to childhood eczema was verified.

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