

Identification of subjects with atopic dermatitis in questionnaire studies

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The performances of 3 different atopic dermatitis questions from the Danish translation of the Nordic Occupational Skin Questionnaire (NOSQ-2002) were compared with respect to their ability to identify subjects with atopic dermatitis in workplace studies. The wording of the questions were: 'Have you ever had an itchy rash that has been coming and going for at least 6 months, and at sometime has affected skin creases?' (UK question), 'Have you ever had eczema on the fronts of the elbows or behind the knees?' (Nordic-S5a) and 'Have you ever had childhood eczema?' (Nordic-S5b). In a group with occupational exposure including the forearms (gut cleaners) twice as many (44%) answered 'Yes' to the UK question compared with 2 other studies on dairy workers and hospital employees. The question Nordic-S5b gave rise to less positive answers than expected. The Nordic-S5a question gave rise to 15%, 10% and 15% positive answers, respectively, and these frequencies seemed to be independent of the workplace exposure. In conclusion, we recommend the Nordic-S5a question as the question to be used for identification of subjects with atopic dermatitis in adult workplace populations. Furthermore, we found that the UK question led to over-reporting in an adult workplace population with occupational exposure including the forearms.

Key words: atopic dermatitis; eczema; epidemiology; NOSQ-2002; questionnaire studies; risk factors.

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Introduction

Although atopic dermatitis is largely a children's disease, it is known to be a risk factor for hand eczema later in life. It has been estimated that the risk of hand eczema due to irritants tripled for subjects with atopic dermatitis in childhood (1, 2). Therefore, when carrying out population-based studies on hand eczema, it is important to be able to identify which subjects have had atopic dermatitis earlier in life and which subjects have developed hand eczema during their adult life, and hence use this information to identify other risk factors for developing hand eczema.

Atopic dermatitis is now to be known simply as eczema due to the work of the Nomenclature Review Committee of the World Allergy Organization (3). However, in this article, we will continue to use the term atopic dermatitis, as this is the term used in the questionnaires on which the results presented here are based.

Atopic dermatitis is primarily characterized by excessively itching and dry skin that also affects skin creases, such as the fronts of elbows and the backs of the knees, neck folds and creases around

the ears and the eyes. The disease normally develops within the first 3 years of age and for most, symptoms disappear between the ages of 7 and 11 years. However, about 45% with prominent atopic dermatitis in childhood develop hand eczema in adult age (4).

The question used for asking the general population about their history of atopic dermatitis in questionnaire studies varies from country to country. Therefore, both a validated UK question (5, 6) and different Nordic questions on atopic dermatitis are present in the Nordic Occupational Skin Questionnaire (NOSQ-2002). In the Danish translation of NOSQ-2002, 2 different versions of the Nordic atopic dermatitis question are included (7, 8).

The UK question on atopic dermatitis 'Have you ever had an itchy rash that has been coming and going for at least 6 months, and at sometime has affected skin creases?' (UK question) was developed by a working party with the aim to put together a minimum list of reliable discriminators for atopic dermatitis suitable for population-based and clinical studies. The list was published in the British Journal of Dermatology

in 1994 and consisted of a set of criteria to be met. Patients needed to suffer from itchy skin plus at least 3 of the following: a history of flexural involvement, a history of asthma or hay fever and a history of generalized dry skin. Furthermore, there had to be an onset of rash under the age of 2 years and visible flexural dermatitis (9–11). This single UK question has been validated with regard to sensitivity and specificity. Regardless of the validation being carried out in hospital settings or in population-based studies of school children, good sensitivities ranging from 69% to 80% and even better specificities, all above 95% were achieved (9, 10). However, the UK working party criteria and the single UK question have mainly been validated on children and teenagers, and to the best of our knowledge, validation from workplace studies has not been performed.

In Denmark, the question 'Have you ever had eczema on the fronts of the elbows or behind the knees?' (Nordic-S5a question) or other wordings mentioning 'fronts of elbows' or 'behind the knees' has mainly been used. The Danish language has words for both 'fronts of the elbows' and 'behind the knees', which are universally understood also among laymen ('albuebøjning' = cubital fossa 'knæhase' = popliteal space).

The atopic dermatitis question used in Swedish studies is 'Have you ever had childhood eczema?' (Nordic-S5b question). In a Swedish general population study from 1996 on adults, 8.7% of the men and 16% of the women stated that they had suffered from childhood eczema (12). In a recent Swedish population-based study validating the same atopic dermatitis question, the sensitivity was 70.7% and the specificity was 89.9% (13).

The aim of the present study was to compare the outcome obtained with different versions of questions designed to obtain information on self-reported atopic dermatitis in questionnaire studies. The reason for including the UK question together with the 2 Nordic questions on atopic dermatitis in the Danish translation of NOSQ-2002 was to test which question was most suitable under Danish conditions. The precise wording of the 3 questions tested are given in Table 1 (7, 8).

Materials and methods

The data on atopic dermatitis, rhinitis and asthma included in this study were collected from 3 intervention studies on prevention of occupational skin diseases among Danish workplace populations carried out in 2002 and from the 2000 round of a population study repeated every 5th year since 1990: the Danish Work Environment Cohort Study (DWECS).

Table 1. The 3 atopic dermatitis questions tested

NOSQ question number	Wording	Referred to as
A1	'Have you ever had an itchy rash that has been coming and going for at least 6 months, and at sometime has affected skin creases?'	UK question
S5a	'Have you ever had eczema on the fronts of the elbow or behind the knees?'	Nordic-S5a
S5b	'Have you ever had 'childhood' eczema?'	Nordic-S5b

The data on gut cleaners and dairy workers were baseline data collected by telephone interviews in 2002 as part of an intervention study concerning the prevention of work-related skin diseases in the food processing industry (14, 15).

Data on hospital employees were baseline data from an intervention study among all the employees at a provincial hospital collected in 2002 by self-administered questionnaires (16).

The questionnaires used in the 3 workplace studies were based on NOSQ-2002 (7) and modified to include questions concerning the specific work environment of the gut cleaners, dairy workers and hospital workers, respectively. In these questionnaires, the UK question is placed separately from the 2 Nordic questions in connection with the questions on rhinitis and asthma. The 2 Nordic questions (Nordic-S5a and Nordic-S5b) are placed in another section of the questionnaire in connection with questions on skin symptoms.

For comparison with an unselected population, data from DWECS in 2000 were included. The question on atopic dermatitis used in this study corresponds to the Nordic-S5a question (17, 18) and is located in the 'Health section' in the questionnaire together with questions on general health, respiratory symptoms and hearing loss.

The sex distribution in the studied populations differed, thus about 2/3 was men among gut cleaners (66.5%) and dairy workers (69.7%) and among hospital employees 90% were women. The DWECS study population was a stratified sample with a nearly equal sex distribution (Table 2).

In accordance with the guidelines from the local Ethics Committee, these studies have not been notified.

Statistical analysis

The Chi-square test was used for testing independence of categorical variables within the studied populations. Probability was recognized as significant if the level of significance was less than 0.05 (19, 20).

Table 2. Characteristics of the study populations and frequencies of self-reported atopic dermatitis, rhinitis and asthma

	Gut cleaners	Dairy workers	Hospital employees	DWECS
Study population, <i>n</i>	644	557	1246	5855
Response rate (%)	87.5	83.8	65.3	75.6
Sex: male/female, % (<i>n</i>)	65.5/34.5 (422/222)	69.7/30.3 (388/169)	11.0/89.0 (126/1016) ^a	52.2/47.8 (3056/2799)
Age distribution (years)	17–66	17–66	17–72	18–59
Mean (years)	37.4	38.5	42.9	na
Younger than 40 years (%)	62.3	53.1	39.5	51.2
40 years or older (%)	37.7	46.9	60.5	48.8
Atopic dermatitis				
UK question (A1) (%)	44.1	20.5	21.5	na
Nordic-S5a (%)	15.4	9.7	14.5	8.6
Nordic-S5b (%)				
Yes	5.0	3.8	6.9	na
Don't know	14.8	12.0	9.7	na
Rhinitis (A2) (%)	17.0	21.0	34.0	19.4
Asthma (A4) (%)	10.7	10.2	10.7	8.4

DWECS, Danish Work Environment Cohort Study; na, not available.

^aSex unknown for 104 respondents.

Results

In the 3 intervention studies, 644 gut cleaners, 557 dairy workers and 1246 hospital employees participated at baseline in 2002, with response rates of 87.5%, 83.8%, and 65.3%, respectively. A total of 5855 wage earners participated in DWECS in 2000 (response rate 75.6%) (Table 2).

A total of 44.1% of gut cleaners answered 'Yes' to the UK question, and the Nordic-S5a gave rise to 15.4% positive answers and only 5.0% answered 'Yes' to the Nordic-S5b. When asked about rhinitis, 17.0% answered 'Yes' and 10.7% reported ever having had asthma (Table 2 and Fig. 1).

Among dairy workers and hospital employees, only about half as many answered 'Yes' to the UK question, whereas the distribution of positive answers to the 2 Nordic questions were in agreement with those obtained among the gut cleaners (Table 2 and Fig. 1), although dairy workers reported lower on the Nordic-S5a question. With concern to rhinitis, only hospital employees deviated from the other study populations, and for asthma equal distributions were found.

Overall, when comparing the outcomes on atopic dermatitis, rhinitis and asthma from the workplace studies with the outcomes from the general population study (DWECS), no major differences were observed except for answers to the UK question among gut cleaners and answers regarding rhinitis among hospital employees.

Sex differences

As the sex distribution differs among the studied population, this may contribute to the differences

observed. Within the studied workplace populations, sex differences were observed for atopic dermatitis assessed by Nordic-S5a among hospital employees (men 5.9%, women 15.6%; $P < 0.01$) and assessed by Nordic-S5b among gut cleaners (men 3.8%, women 7.2%; $P < 0.05$). A tendency for sex differences for atopic dermatitis assessed by the UK question was seen among hospital employees (men 18.4%, women 21.9%; $P = 0.0890$). In the population study (DWECS) where only the Nordic-S5a question was included, women reported significantly higher on atopic dermatitis (men 7.0%, women 10.3%; $P < 0.001$).



Fig. 1. Comparison of 4 Danish populations with respect to self-reported atopic dermatitis, rhinitis and asthma. DWECS, Danish Work Environment Cohort Study.

Within the 3 studied workplace populations, only minor non-significant sex differences were observed for rhinitis (gut cleaners: men 16.2%, women 18.5%; dairy workers: men 20.9%, women 21.3%; hospital employees: men 35.7%, women 33.8%).

Discussion

NOSQ-2002 is a standardized questionnaire tool for surveys on work-related skin diseases and skin exposures. It was developed in English and has until now been translated and published in a number of different languages (Danish, Swedish, Finnish, Icelandic and Norwegian). The questionnaires can be obtained from www.ami.dk/NOSQ in a short 4-page questionnaire for screening skin problems at workplaces (NOSQ-2002/SHORT) and a longer in-depth version for research purposes (NOSQ-2002/LONG). A report published by the Nordic Council of Ministers gives the background on each question and recommendations on modification to specific populations or occupations together with instructions for the translation procedure (7).

Although validation of specific questions is not always feasible, the suitability of questions can often be judged by comparing the results obtained with data acquired from other sources. The frequency of atopic dermatitis in childhood is normally related to the frequency of other atopic diseases such as rhinitis and asthma. Thus, in a population with a high frequency of atopic dermatitis, a high frequency of rhinitis and asthma could be expected.

When NOSQ-2002 was translated to Danish, the 3 different versions of atopic dermatitis questions were included to make it possible to study which question was most suitable for Danish conditions. A source of error in the present study comparing responses to different questions may be that although partly separated, the use of 3 different questions intended to detect the same condition may have confused the respondents. An alternative study design might have been to divide the study populations into 3 groups and to include only 1 of the atopic dermatitis questions at a time. However, this was not feasible in the studies presented here because of other design considerations.

A history of atopic dermatitis (mild or severe) in childhood is normally mentioned as a risk factor for occupational hand eczema, but also atopic dermatitis persisting into adulthood has been considered (1). As most studies dealing with atopic dermatitis as a risk factor for hand eczema in adults has used only 1 question on atopic dermatitis or a clinical assessment, studies comparing

atopic dermatitis at different points in time are seldom reported. Another aspect could be that those remembering having had atopic dermatitis in childhood represent the more severe cases.

When comparing the results from the gut cleaners with the results from the studies in other occupational settings with wet work, it seems clear that the high percentage of positive answers to the UK question on atopic dermatitis differs, with the gut cleaners giving rise to about twice as many positive answers. However, a comparison of the 4 groups with respect to the prevalence of rhinitis and asthma shows that apart from the hospital employees having a high prevalence of self-reported rhinitis, there is no particular difference between them. The high frequency of self-reported atopic dermatitis among gut cleaners was not expected and could not be explained by changes over time as the baseline interviews in the 3 intervention studies all were made in the year 2002 and DWECS late in 2000.

The working conditions of gut cleaners are characterized mainly by manual tasks where the hands and forearms are exposed to water, blood, gut contents, gastric juices and high concentrations of salt. Also, despite common belief, there are high demands for hygiene leading to frequent hand washing and the use of hand disinfectants (14).

When using questionnaires, the comprehension of a question in the target population should always be considered. Therefore, it could be argued that the wording of the UK question ('... at some time has affected skin creases?') leads to positive answers originating from skin problems caused by occupational exposures including the forearms. Hence, according to our data, the single UK question leads to an over-reporting in occupations with wet work including exposure of the forearms.

As the frequencies obtained with the Nordic-S5a question appear to be independent of the actual exposures in the study populations, this seems to be the question best suited for the detection of subjects with a history of atopic dermatitis in Danish workplace studies.

As can be seen from Table 2, the Nordic-S5b, which is the version used in Swedish studies and validated with good results, probably lead to an under-reporting in our Danish study populations when compared with the Nordic-S5a. Furthermore, there was a high frequency of 'Don't know' answers to this question (the number of subjects answering 'Don't know' were about twice as high as the number of subjects answering 'Yes').

The design of a questionnaire is as important as the questions themselves, and the order of which the questions are placed should be considered.

In the questionnaires used in our workplace studies, the UK question is placed separately from the 2 Nordic questions, hence, causing no distraction between them. However, the Nordic-S5a and Nordic-S5b questions are placed within close proximity of each other, and it cannot be ruled out that the responders could be confused by the 2 questions seemingly asking for the same answers.

Among those reporting atopic dermatitis according to the Nordic-S5b question between 38% and 64% also reported 'Yes' to the Nordic-S5a question (gut cleaners: 56.1%; dairy workers: 38.1%; hospital employees: 63.5%; all $P < 0.0001$). Thus, there is only a partly overlap between these groups. Another possibility could be that the 'Yes' answers to the Nordic-S5a question reflect lifetime prevalence of atopic dermatitis, and 'Yes' answers to the Nordic-S5b represents those with atopic dermatitis in childhood. However, further studies are needed to elucidate this.

The frequencies of asthma and rhinitis among gut cleaners were in the same ranges as those reported in the other populations we have data for and in Danish studies on the general population (21, 22), thus a doubled frequency of atopic dermatitis should not be expected.

Regarding the high frequency of rhinitis among hospital employees in the present study, only minor and non-significant sex differences were observed, thus a possible explanation could be occupational exposure to, e.g. latex from protective gloves.

Among the limitations to be considered when interpreting our results is that clinical examinations for design reasons were not included in the 4 studies providing the data.

An advantage of the 3 workplace populations studied is that it includes 2 unselected workplace populations (dairy workers and hospital employees) and 1 high-exposure group (gut cleaners) studied within the same year.

In all, this leads to the question of whether the single UK question is suitable in adult populations with occupational exposure to wet work involving the forearms.

In conclusion, we recommend the Nordic-S5a question 'Have you ever had eczema on the fronts of the elbows or behind the knees?' as the question to be used for identification of subjects with atopic dermatitis in questionnaire studies on adult populations with occupational exposure such as wet work.

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