

Validity of self-reports of hand eczema

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The validity of questionnaire answers with respect to hand eczema was investigated. Car mechanics, dentists and office workers answered a questionnaire on the occurrence of hand eczema on any occasion during the past 12 months. "Yes"-responders and a random sample of "no"-responders were subsequently interviewed and examined by a dermatologist. 10.0% of the car mechanics, 12.0% of the dentists and 12.5% of the office workers were found to have hand eczema despite previous "no"-answers. In the same populations, 81%, 94% and 80% of the "yes"-answers were confirmed at the clinical examination. Considering false-negative and false-positive answers, the sensitivity was 53–59% and the specificity 96–99% in the 3 groups. The 1-year prevalence changed from self-reported 15% to estimated 21% in the car mechanics, from 15% to 24% in the dentists and from 15% to 23% in the office workers. It is concluded that self-reported 1-year prevalence of hand eczema considerably underestimates the true prevalence.

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Hand eczema is the main occupational skin disease and affects a large proportion of the population of working ages. To estimate the prevalence of hand eczema, questionnaires are commonly used in epidemiological studies. "Yes"-answers to a question on the occurrence of hand eczema are often followed by an invitation to a clinical examination, which gives the opportunity to verify or reject the diagnosis. In several studies, 80–90% of the affirmative answers have been verified, i.e. the positive predictive value is high (1–3). To be able to calculate the sensitivity, the specificity, the negative predictive value and the true prevalence, however, the "no"-answers must also be verified in a corresponding way, yet this is seldom done.

In a questionnaire-based prevalence study on hand eczema in the south of Sweden, Agrup (4) reported that only about 1/2 of the patients with hand dermatitis answered "yes" to the hand eczema question. In an evaluation of a self-administered questionnaire among 109 nurses, Smit et al. (5) found that 7.7% of those not reporting hand dermatitis were in fact diagnosed as having hand dermatitis on dermatological examination. In a survey of occupational dermatoses in a plant producing binders for paints and glues, 23% of the

production workers who had denied skin problems in a questionnaire had ongoing hand dermatitis (6). In a study on hand dermatosis in secondary-school children in Sweden, a high specificity (99%) but lower sensitivity (73%) was found (7), while a similar trend was recorded in a Finnish study (8). These results indicate that hand eczema prevalence data obtained by affirmative answers in questionnaires underestimate the true prevalence.

The aims of this study were to investigate the validity of questionnaire answers with respect to hand eczema, in particular negative answers, and to estimate the sensitivity and specificity of the question used, as well as the true prevalence of hand eczema.

In 3 different studies with similar questionnaires on hand eczema, persons with "yes"-answers as well as "no"-answers to the hand eczema question were followed up with a dermatological examination.

Subjects and Methods

Study populations

Questionnaires concerning the occurrence of hand eczema were distributed to car mechanics (2), den-

tists (3) and office workers in 3 different studies. Details about number of individuals included, response rate to the questionnaire, "yes/no"-answers to the hand eczema question and participation in the clinical examination are shown in Table 1. In total 105 car mechanics, 158 dentists and 10 office workers who had reported hand eczema participated in a clinical examination.

In the 3 studies, a random sample of car mechanics (40/681) and dentists (92/1095) and all available office workers (64/69) who had answered "no" to the hand eczema question in the questionnaire were also examined by a dermatologist. The car mechanics were all males. The female/male ratio was 37/55 for the dentists and 15/49 for the office workers. The mean ages were 28 years (range 24–35), 46 years (range 26–60), and 36 years (range 23–60), respectively.

Questionnaire

A questionnaire was mailed to the car mechanics, dentists and office workers included in the study. The questions on hand eczema were identical in the 3 studies. The main question was "Have you had hand eczema on any occasion during the past 12 months?"

Clinical examination

An experienced dermatologist (BM) conducted interviews with questions about present and previous skin symptoms on the hands. In addition, the hands of every person were inspected and signs of erythema, scaling, papules, vesicles and fissures were noted. Car mechanics and dentists with self-reported hand eczema verified at the examination were also patch tested, as reported elsewhere (2, 3). The studies were approved by the Ethics Commit-

tees of the Karolinska Institute, Stockholm, Göteborg University and Lund University.

Hand eczema diagnosis

The diagnosis "hand eczema" followed common clinical practice from the combined information on present or past skin symptoms, morphology, site of skin symptoms and course of disease. Morphological criteria for hand eczema were defined as erythema and papules/vesicles, or as erythema, scaling and fissures, with or without papules/vesicles. It was however not possible to base the diagnosis entirely on morphological signs observed at the time of examination, as hand eczema on any occasion during the past 12 months was asked for in the questionnaire.

Statistics

For comparison between proportions, the χ^2 or Fisher's exact test were used. Using the results from the questionnaires and the clinical examinations, we estimated the sensitivity (correct "yes"-answers/all hand eczema cases), the specificity (correct "no"-answers/all healthy subjects), the positive predictive value (correct "yes"-answers/all "yes"-answers), and the negative predictive value (correct "no"-answers/all "no"-answers) for the question on hand eczema. For sensitivity and specificity, 95% confidence intervals were calculated using the standard bootstrap technique (9), with random resampling ($n=10,000$) from a binomial distribution (RANBIN function, SAS, 1988) (10). Lastly, the true prevalence of hand eczema was estimated. The attenders and non-attenders were assumed to be equivalent with respect to hand eczema.

Results

The 1-year period prevalence of self-reported hand eczema was 15.0% (120/801) for the car mechanics, 14.9% (191/1286) for the dentists and 14.8% (12/81) for the office workers. Hand eczema was verified in 81% of the examined car mechanics who had reported hand eczema, in 94% of the dentists and in 80% of the office workers (Table 2).

Moreover 4/40 (10.0%) car mechanics, 11/92 dentists (12.0%) and 8/64 (12.5%) office workers were found to have a history and/or clinical symptoms indicating hand eczema diagnosis despite previous "no"-answers in the questionnaire (Table 1).

Clinical data regarding the hand eczema diagnosed in individuals who answered "no" and "yes", respectively, to the hand eczema question is

Table 1. Number of participants, answers to a questionnaire and outcome of clinical examination in 3 epidemiological studies

	Car mechanics <i>n</i>	Dentists <i>n</i>	Office workers <i>n</i>
questionnaires distributed	901	1506	101
questionnaires answered	801	1286	81
"yes"-answer ^{a)}	120	191	12
clinical examination	105	158	10
hand eczema diagnosis	85	149	8
"no"-answer ^{a)}	681	1095	69
clinical examination	40	92	64
hand eczema diagnosis	4	11	8

^{a)} Question: "Have you had hand eczema on any occasion during the past 12 months?"

Table 2. Estimation of sensitivity, specificity, predictive values and true 1-year period prevalence of hand eczema in 3 epidemiological studies

	Car mechanics	Dentists	Office workers
A. questionnaire responders (<i>n</i>)	801	1286	81
B. "yes"-responders (<i>n</i>)	120	191	12
C. clinically examined (<i>n</i>)	105	158	10
D. hand eczema diagnosed (<i>n</i>)	85	149	8
E. hand eczema in "yes"-responders (%)=positive predictive value	81.0	94.3	80.0
F. "no"-responders (<i>n</i>)	681	1095	69
G. clinically examined (<i>n</i>)	40	92	64
H. hand eczema diagnosed (<i>n</i>)	4	11	8
I. hand eczema in "no"-responders (%)=false negatives	10.0	12.0	12.5
J. negative predictive value (%) (100 - I)	90.0	88.0	87.5
K. estimated total number of cases of hand eczema (<i>n</i>) (E*B+I*F)	165	311	18
L. estimated total number without hand eczema (<i>n</i>) (A-K)	636	975	63
M. estimated sensitivity (%) (E*B/K)	58.8 ^{a)}	57.9 ^{a)}	52.7 ^{a)}
N. estimated specificity (%) (F*J/L)	96.4 ^{b)}	98.9 ^{b)}	96.2 ^{b)}
O. self-reported 1-year prevalence (%) (B/A)	15.0	14.9	14.8
P. estimated true 1-year prevalence (%) (K/A)	20.5	24.2	22.5

^{a)} 95% confidence intervals: car mechanics 35–83%, dentists 44–72%, and office workers 33–72%.

^{b)} 95% confidence intervals: car mechanics 95–98%, dentists 98–100%, and office workers 92–100%.

presented in Table 3. The results indicate a somewhat milder disease in the "no"-responders.

Considering false-negative and false-positive answers, the sensitivity, the specificity and the estimated true 1-year period prevalence of hand eczema are shown in Table 2.

In summary, the validity of the question on hand eczema was similar in the 3 groups; estimated sensitivity 53–59%, estimated specificity 96–99%, and false-negatives 10–12.5%. The estimated true prevalences were 30–60% higher than the prevalences of self-reported hand eczema.

Table 3. Clinical data regarding hand eczema diagnosed in individuals who answered "no" and "yes" respectively to the question "Have you had hand eczema on any occasion during the past 12 months?" in the 3 studies; note that the pooled results for "yes"-responders were affected mainly by the dentists and the car mechanics, since only 8 office workers were included

	"No"- responders (<i>n</i> =23)	"Yes"- responders (<i>n</i> =242)	
history of atopic dermatitis (%)	35	29	NS
continuous hand eczema (%)	4	16	NS
medical consultation (%)	9	36	<i>p</i> <0.01
sick-leave (%)	0	5	NS
topical corticosteroid treatment (%)	17	37	<i>p</i> =0.06
any objective skin symptom on the hands at the time of examination (%)	91	62	<i>p</i> <0.01

NS: not statistically significant.

Discussion

Hand eczema is not easy for laymen to diagnose themselves. The results from this study confirm that many people who deny hand eczema in a questionnaire, in fact have it. Therefore the self-reported 1-year period prevalence is an underestimation of the true prevalence. In all 3 occupational groups investigated, the true prevalence was estimated to be above 20%.

When the occurrence of a disease is studied with questionnaires, these must be validated if they are to be used for estimation of occurrence or for assessment of risk factors. Hand eczema is a common disease for which prevention is desirable and often also possible. For evaluation of the effects of interventions, like changes of exposure or work practise, validated questionnaires are usually suitable and cost-effective.

The sensitivity and specificity of the hand eczema question in our data was relatively similar to the results (sensitivity 65% and specificity 93%) found by Smit et al. (5). The estimates of the present study are, however, based on results from questionnaires and clinical examinations in about 500 subjects from 3 different occupational groups.

Using a certain definition with morphological signs as criteria, self-reported point prevalence of hand eczema can be validated if a dermatologist examines the subjects. In the study by Yngvesson et al. (7), more than 2000 pupils aged 16–19 years were examined. Since history of previous hand eczema was not asked for, only the question on current hand eczema could be validated. The sensitivity of the questionnaire was then 73% and the

specificity 99%, i.e., slightly higher figures than we found for hand eczema in the past 12 months. This indicates that the point prevalence of hand eczema is easier to survey using questionnaires than the 1-year period prevalence. The latter is, however, the most common measure of occurrence used in epidemiological studies, and it is usually of more interest than the point prevalence, considering that hand eczema is a disease with long duration, a discontinuous course and seasonal variations (1).

Unfortunately, there is so far no generally (by dermatologists) accepted definition of hand eczema. Nor, therefore, is there a simple way for the participants in a questionnaire-based study to define the disease. In the present study, the clinical opinion of an experienced senior dermatologist, who performed all examinations, was used as standard for the validation. Even if this procedure is not ideal it has been used in previous studies where "yes"-responders have been examined, giving the positive predictive value (1).

An alternative way to assess hand eczema using questionnaires is to ask for physician-diagnosed hand eczema. This will, however, reduce the sensitivity further, as mild cases will be lost. The true prevalence will be even more underestimated.

Non-optimal validity of a questionnaire on hand eczema will result in misclassification if the questionnaire data are used in epidemiological studies. The quantitative impact of this can be calculated. Let us assume that the true 1-year prevalence of hand eczema is 15% in an unexposed referent group and 30% in a group exposed to a certain factor, e.g., wet work. Let us further assume that 20% of the population are exposed, and this population is examined with a questionnaire on hand eczema having a sensitivity of 58%, and a specificity of 97%. The true prevalence ratio (PR) is 2.0 (30/15), but we will find a PR of 1.7 (see appendix for calculations). If we use another measure of the relative risk, the odds ratio (OR), the true OR of 2.4 will decrease to 1.9.

In this example, with a relatively common disease, the low sensitivity is the major problem. For rare diseases, the non-optimal specificity is more of a problem (11).

There are probably a multitude of reasons for false answers to the hand eczema question. We found that false-positive answers were usually caused by confusion with other skin diseases, such as psoriasis, pustulosis palmo-plantaris, or tinea infections. In some cases the subjects had misunderstood or not carefully read the text regarding the time period asked for. The false-negative answers were in most cases obtained from individuals with mild hand eczema, which is indicated in Table 3. However, in some cases of severe chronic

dermatitis, periods with less symptoms and signs were considered as "normal".

Among the car mechanics and the dentists, the self-reported prevalence, as well as the prevalence as diagnosed by a dermatologist, was higher than in the general population (2, 3). These occupations are generally considered as high-risk occupations for hand eczema, with exposure to both contact irritants and allergens. In contrast, office work is a low-risk occupation for hand eczema. In our study, the prevalence was similar in all 3 groups, but the number of office workers was small, which makes the estimate less precise.

Conclusions

Self-reported 1-year period prevalence of hand eczema, obtained with "yes"-answers to a questionnaire only, considerably underestimates the true prevalence, and this seems to be the case in both high- and low-risk occupations for hand eczema.

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Appendix

Calculations showing the effect of non-optimal sensitivity and specificity of a questionnaire on self-reported hand eczema on estimates of the prevalence ratio (PR) and the odds ratio (OR)

Hypothetical example (see *Discussion*): a sample of 1000 subjects with 200 of them "exposed" to wet work. The true 1-year period prevalence of hand eczema is assumed to be 30% among those with wet work and 15% among the others. The sensitivity is assumed to be 57% and the specificity 97%.

	True hand eczema			Questionnaire answer		
	yes	no	all	yes	no	all
Exposed	60	140	200	38 (34+4)	162 (26+136)	200
Unexposed	120	680	800	88 (68+20)	712 (52+660)	800
All	180	820	1000	126	874	1000

The true prevalence among exposed is 30%, and among unexposed 15%. The prevalence ratio is 2.0. The estimated prevalences according to questionnaire answers are 38/200 among the exposed and 88/800 among the unexposed. The estimated PR is 38/200 divided by 88/800=1.7.

The true odds ratio is 60/140 divided by 120/680=2.4. The estimated OR from the questionnaire data is 38/162 divided by 88/712=1.9.

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