

Validation of self-reporting of hand eczema among Danish hairdressing apprentices

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doi:10.1111/j.1600-0536.2011.01908.x

Summary

Background. Hairdressing apprentices have a high incidence of hand eczema. Most studies use self-reported hand eczema as a cost-effective method to estimate the prevalence of hand eczema. No validation studies on self-reported hand eczema among hairdressing apprentices exist.

Objectives. To evaluate the validity of self-reporting of hand eczema among Danish hairdressing apprentices.

Methods. During their first 2 weeks of training, 502 hairdressing apprentices were enrolled in this study. All apprentices completed a self-administered questionnaire including questions regarding, for example, current hand eczema, and they were all clinically examined for hand eczema three times during the first part of their education by use of the Hand Eczema Severity Index. The validity of self-reporting of hand eczema was measured with the clinical examination as the gold standard.

Results. The sensitivity of self-reporting of hand eczema was 70.3%, and the specificity was 99.8%. The positive predictive value was 96.3%, and the negative predictive value was 98.5%.

Conclusions. We found good agreement between self-reporting of hand eczema and clinical examination. There was good sensitivity and high specificity. Self-reporting of hand eczema among hairdressing apprentices is considered to be a valid method for estimating the prevalence of hand eczema, although it might underestimate the true prevalence.

Key words: adolescent; evaluation; hairdresser; hairdressers; hairdressing apprentices; hand eczema; self-reported; sensitivity; specificity.

Hairdressers and hairdressing apprentices have a high prevalence of occupational hand eczema, owing to excessive wet work and extensive exposure to chemical

substances (1–5). Hairdressing apprentices seem to be at particularly high risk of developing hand eczema (6–10). Several reports on occupational hand eczema among hairdressers and hairdressing apprentices exist, although only a few studies have reported the prevalence of hand eczema among hairdressing apprentices based on clinical examinations (9).

Self-reporting of hand eczema is often used in epidemiological studies, as it is a cost-effective method to estimate the prevalence of hand eczema. To be able to rely on self-reporting of hand eczema, there is a need to establish its validity in different populations

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Conflicts of interest: The authors have no conflict of interests to disclose. *Funding:* Funding from the Danish Hairdressers' and Beauticians' Union, the Danish Hairdresser Association, The Danish Working Environment Research Fund and the Aage Bangs Foundation.

Accepted for publication 5 February 2011

and geographical areas. There might be differences in interpretation of the question in different occupational settings, age groups, and geographical areas.

To our knowledge, self-reporting of hand eczema has not previously been validated in cohorts of hairdressers or hairdressing apprentices. Validation studies have been carried out among other occupations and other groups of students (11–16), but never in a Danish cohort. Fairly good agreement between clinical examination and self-reporting of hand eczema was found in these studies.

The aim of this study was to investigate whether the use of self-reporting of hand eczema among hairdressing apprentices is a valid method to estimate the prevalence of hand eczema. The results presented form part of an intervention study on occupational hand eczema in a cohort of Danish hairdressing apprentices, and will be used in future publications on the prevalence and incidence of hand eczema during their training.

Materials and Methods

We conducted a follow-up study among Danish hairdressing apprentices. The data presented are based on self-administered questionnaires and clinical examinations.

Study population

During the first 2 weeks of their education, 502 hairdressing apprentices were enrolled in a follow-up study on occupational hand eczema. The enrolment took place in two phases; in August 2008 ($n = 382$) and in January 2009 ($n = 120$).

During the first 1.5 years of their training, all apprentices completed self-administered questionnaires and had their hands examined for objective signs of hand eczema three times: at the time when they started their education (inclusion), after approximately 8 months (first follow-up), and after approximately 18 months (second follow-up). The apprentices were recruited from all 10 hairdressing schools in Denmark, and each school provided from 8 to 103 subjects. All newly started apprentices, present on the day of the inclusion, were invited to participate in the study. During the study, the cohort experienced a number of dropouts and exclusions. Of the apprentices included, 113 had the opportunity to continue their education, but, for different reasons, decided to change career (dropouts), and 105 were excluded during the study, owing to: change of school (2 cases); change from school apprenticeship to salon apprenticeship (with no formal school classes) (9 cases); and not being able to achieve an apprenticeship either in a saloon or at the school (94 cases). In total, 284 apprentices completed the study.

The mean age of the apprentices was 17.5 years, and the majority were females (95.2%). The participation rate at inclusion was 99.8% (502 of 503 hairdressing apprentices present on the day of inclusion). They all completed the questionnaire, and only one apprentice did not have her hands examined. At the second follow-up, the participation rate was 99.6% (283 of 284 hairdressing apprentices still under education); they all completed the questionnaire but, in 21 of these cases, we were unable to make a clinical examination, mainly because of sick leave or vacations on the day of the proposed examination.

All apprentices gave informed consent, and the Committee on Biomedical Research Ethics of Copenhagen and Frederiksberg approved the protocol (H-B-2007-096). The study was conducted from August 2008 to July 2010.

The questionnaire

Questions concerning hand eczema were adapted from the Nordic Occupational Skin Questionnaire (NOSQ-2002) (17). At inclusion and at the second follow-up, the following questions were asked: 'Have you ever had hand eczema?' (Yes/No), 'Have you ever had eczema on your wrists or forearms?' (Yes/No), and 'When did you last have eczema on your hands, wrists or forearms?' (I have it now, within the last 3 months, between 3 and 12 months ago, more than 12 months ago). In the validation of self-reporting of hand eczema, cases who answered 'I have it now' to the question: 'When did you last have eczema on your hands, wrists or forearms?' were considered in the calculations.

Clinical examination

Objective signs and severity of hand eczema were assessed by a trained clinician (A.B.) using the Hand Eczema Severity Index (HECSI), which is a validated scoring system for determination of the presence, severity and localization of hand eczema (18). The HECSI scoring system is based on visible clinical signs of hand eczema – erythema, infiltration, vesicles, fissures, scaling, and oedema – in combination with measurement of the area affected. The range of the HECSI score is 0–360, where 0 is no eczema and 360 is the most severe eczema. All apprentices were clinically examined on the same day on which they completed the questionnaire. They all answered the questionnaire prior to the clinical examination, and therefore they did not know the result of the examination.

Statistical analysis

In order to evaluate the agreement between the self-reported diagnosis and the clinical examinations, we

calculated the sensitivity, specificity, and positive and negative predictive values, using the clinical examination as the gold standard. Confidence intervals (CIs) for the overall sensitivity and specificity were calculated.

The true prevalence of hand eczema, when the validation was taken into consideration, was calculated from the following formula (19):

$$\begin{aligned} \text{True prevalence} &= \text{measured prevalence} \\ &+ (\text{specificity} - 1)/\text{sensitivity} \\ &+ (\text{specificity} - 1) \end{aligned} \quad (1)$$

The statistical analyses were performed with the Statistical Products and Service Solutions package (SPSS™ Inc., Chicago, IL, USA) for Windows™ (Release 18.0).

Results

In total, 37 of the 764 clinical examinations were positive (with hand eczema), in the sense that the HECSI value was above 0. More apprentices had clinical signs of hand eczema at the second follow-up ($n = 20$) than at the time of inclusion ($n = 17$), and the hand eczema was more severe at the second follow-up. See Tables 1 and 2 for details.

Validation of self-reporting of hand eczema in terms of sensitivity, specificity and predictive values at inclusion, at

Table 1. Questionnaire findings as compared with clinical diagnosis

Clinical examination			
Questionnaire	Hand eczema	No hand eczema	Total
Hand eczema	26 ($I = 11$, $F = 15$)	1 ($I = 0$, $F = 1$)	27
No hand eczema	11 ($I = 6$, $F = 5$)	726 ($I = 484$, $F = 242$)	737
Total	37	727	764

The table shows the numbers of subjects with or without hand eczema according to the clinical score and the questionnaire. The clinical examinations were based on the Hand Eczema Severity Index (HECSI) scoring system, and the questionnaire was based on the Nordic Occupational Skin Questionnaire. I , number of apprentices at inclusion; F , number of apprentices at the second follow-up.

Table 2. Clinical characteristics of the cohort

	HECSI, inclusion	HECSI, second follow-up
Clinical hand eczema (n)	17	20
Mean	5.7	8.4
Median	4.0	6.0
Range	1–31	2–21

HECSI, Hand Eczema Severity Index.

Table 3. Validation of self-reporting of hand eczema

	Inclusion (%)	Second follow-up (%)	Total (%)
Sensitivity	64.7	75	70.3
Specificity	100	99.6	99.8
Positive predictive value	100	93.8	96.3
Negative predictive value	98.8	97.9	98.5

the second follow-up and altogether is shown in Table 3. The overall sensitivity was 70.3% (95% CI 0.55–0.85) and the specificity was 99.8% (95% CI 0.995–1.00), when all questionnaire answers and clinical examinations were considered.

The point prevalence of self-reported hand eczema for the whole cohort was 2.0% at inclusion and 5.0% at the second follow-up. These data will be analysed in more detail in a future publication. The true prevalence (P) of hand eczema is estimated to be:

- At inclusion: $P = 0.02 + (0.998 - 1)/0.703 + (0.998 - 1) = 0.026 = 2.6\%$
- At the second follow-up: $P = 0.05 + (0.998 - 1)/0.703 + (0.998 - 1) = 0.068 = 6.8\%$

[Correction added after online publication July 13 2011: The calculation of the true point prevalence of hand eczema in the cohort has been corrected.]

It was found that only one apprentice of the 27 (3.7%) who stated in the questionnaire that they had current hand eczema was not clinically diagnosed with hand eczema. This was classified as a false-positive. Moreover, 11 apprentices of the 737 (1.4%) who stated that they had no current hand eczema were classified as false-negative.

The incidence of self-reported hand eczema among dropouts was 21.4%, and 10.7% of the dropouts gave hand eczema as the main reason for changing career.

Discussion

In this study, we evaluated the validity of self-reporting of hand eczema in a cohort of hairdressing apprentices. This validation was performed on the basis of self-administered questionnaires and clinical examinations, with the clinical examination as the reference standard (gold standard).

We demonstrated a fairly good sensitivity and a very high specificity. When we looked at each occasion individually (Table 3), we found that the apprentices' self-reporting of hand eczema corresponded well with the clinical examinations, both at inclusion and at the second follow-up. The sensitivity increased from 64.7% to

75% during the study, but the specificity and the predictive values were equally high on both occasions. The positive and negative predictive values are probably the most valuable measures in evaluating a questionnaire, but are also dependent on the population and the prevalence of disease in this population, as they predict the participants' ability to identify whether they have hand eczema correctly. These results indicate that self-reporting of hand eczema is a valid method to estimate the point prevalence of hand eczema among Danish hairdressing apprentices, although it might underestimate the true prevalence, owing to the sensitivity of 70.3% and the higher estimated true prevalence. In the cohort of hairdressing apprentices, 96.3% of the cases with self-reported hand eczema were confirmed by the clinical examination (positive predictive value). Among the apprentices who denied having hand eczema, the clinical diagnosis was established in only 1.4% (11 of 737).

Previous validation studies on hand eczema have shown some variation in results. Meding et al. validated the self-reported 1-year prevalence of hand eczema, based on questionnaires and interviews combined with clinical examinations (12). They found a high specificity (96–99%), but a lower sensitivity (53–59%) in three different occupational settings. Other validation studies, mainly on the point prevalence of hand eczema, have found higher sensitivities (65%–80%) in different occupations and geographical areas (11, 13–16, 20). Some validation studies have used symptom-based diagnosis instead of self-reporting of hand eczema in the questionnaires, and compared it with clinical examinations. This seems to overestimate the true prevalence, as the sensitivity was 100%, and the positive predictive value was low (38%) (13), whereas the self-reported questions seem to underestimate the true prevalence of hand eczema (12, 13). Our results are in good agreement with the study of Yngveson et al., who evaluated the self-reported point prevalence of hand eczema in a cohort of secondary school children at technical schools in Sweden (11). This indicates that young people could be aware of changes in their health status. Our impression is that the false-negative answers were mainly given by apprentices with mild symptoms of hand eczema, or by apprentices with moderate hand eczema in a 'good' period with fewer symptoms. The range of HECSI scores in persons with false-negative answers was 1–7, considered to represent mild symptoms.

This study is based on a relatively high number of subjects. We examined 501 persons and had 764 sets of clinical examinations and questionnaires. All participants completed the questionnaire before the clinical examination, and they were all examined on

the same day on which they answered the questionnaire. Hand eczema is a disease that can change appearance over a relatively short period of time, and a lag time between the self-reported hand eczema and the clinical examinations could have influenced the results. This potential bias was eliminated in the present study design.

Questions concerning hand eczema were adapted from NOSQ-2002, and are based on previous validation studies concerning current hand eczema in different occupational settings and geographical areas (11–13, 15, 17, 21), although never in hairdressers, in hairdressing apprentices, or in Denmark.

The clinical examination was carried out with the HECSI scoring system, which is a validated scoring system, with high inter-observer and intra-observer reliability (17). The HECSI contains a number of specific signs of hand eczema (erythema, infiltration, vesicles, fissures, scaling, and oedema), which minimizes the confusion with other dermatoses (psoriasis, tinea infections, palmar–plantar pustulosis, etc.). As the HECSI contains very specific symptoms and grades of severity, it is possible to diagnose even mild cases of hand eczema. This is an advantage in this study, as most hairdressing apprentices with hand eczema have mild symptoms. The range of HECSI scores in this study was 1–31, with mean scores of 5.7 at inclusion and 8.4 at the second follow-up. No clear definition of the range of mild, moderate and severe hand eczema exists, but in a previous study on patients with hand eczema referred to dermatological care, mild cases were defined as having an HECSI score of 0–11, moderate cases as having a score of 12–27, and severe cases as having a score >28 (22).

This study was not blinded, and because all participants completed the questionnaires and were examined for hand eczema three times, it is possible that they were aware of the results from the previous examinations. This could have affected the self-reported diagnosis, and thereby improved the results. In order to minimize this possible influence from former examinations, the apprentices were told to answer the questions in accordance with their own experience. As seen from Table 3, the apprentices were fairly good at predicting eventual hand eczema, both at inclusion and at the second follow-up. We found high positive predictive values on both occasions, and there were only slight differences between the two examinations.

In conclusion, we found good agreement between self-reporting of hand eczema and clinical examination, and self-reporting of hand eczema among hairdressing apprentices is considered to be a valid method for estimating the point prevalence of hand eczema.

Acknowledgements

The study was financially supported by the Danish Hairdressers' and Beauticians' Union, the Danish Hairdresser

Association, The Danish Working Environment Research Fund, and the Aage Bangs Foundation, which are gratefully acknowledged.

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