

# The Importance of Anamnestic Information of Atopy, Metal Dermatitis and Earlier Hand Eczema for the Development of Hand Dermatitis in Women in Wet Hospital Work

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By means of a prospective study design and multivariate regression analyses we have studied the relative importance of atopy, metal dermatitis and earlier hand eczema as risk factors for the development of hand eczema in women during 20 months of 'wet' hospital work. The population consisted of 1857 women. The prevalence of hand eczema during the observation period was 41%. The risk of developing hand eczema was calculated as predicted relative odds ratios. The interrelationship of the risk factors was analysed. A summarized description of this analysis shows that a history of earlier hand eczema increased the odds by 12.9 times, a history of metal dermatitis by 1.8 times and atopic dermatitis and atopic mucosal symptoms by 1.3 times. Thus a history of earlier hand eczema seems of crucial importance for the occurrence of hand eczema in women in 'wet' hospital work. Our hypothesis is that a history of earlier hand eczema may be considered a major indicator of a skin vulnerability factor predisposing the individual to hand eczema. If the hypothesis is true, this factor may be present approximately in one half of the subjects with atopic dermatitis, in one fourth of the subjects with atopic mucosal symptoms and in one fifth of the non-atopics. *Key words: Multivariate regression analysis; Hand eczema; Wet work.* (Received April 4, 1985.)

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Hand eczema is a distressing disorder not only for the patient, but sometimes also for the medical profession, especially in the context of occupational counselling. Hand dermatitis has a complex etiology involving both endogenous and exogenous factors. Atopic dermatitis is a well-known risk factor in the development of hand eczema (1, 2) as well as nickel sensitivity (3, 4). The relative importance of these and other possible hazards is, however, less well documented.

In an attempt to improve this situation we designed a prospective cohort study on women recently employed in hospital 'wet' work and studied the development of hand dermatitis over a period of 20 months. The importance of the anamnestic information for different risk factors was quantitatively evaluated by means of multivariate regression analyses. It was found that a history of earlier hand eczema was by far the most discriminating single anamnestic factor followed by metal dermatitis and atopy.

## MATERIAL AND METHODS

### *Studied cohort*

The population has been described in detail in an earlier paper (2). It consisted of newly employed workers in four hospitals in the county of Västernorrland in northern Sweden. There was no selection with respect to previous skin diseases at the pre-employment examination. The cohort comprised 1995 women in nursing occupations, kitchen and cleaning work. A follow-up questionnaire was received from 1857 employees (93.1%) 20 months after entering the study.

Table I. Current hand eczema in 1857 women in 'wet' hospital work

AD = atopic dermatitis with or without atopic mucosal symptoms, AMS = atopic mucosal symptoms, NA = non-atopics, HMD = history of metal dermatitis, HHE = history of earlier hand eczema

Hand eczema (20 months)	Total	AD	AMS	NA	HMD	No HMD	HHE	No HHE
Number	1 857	194	227	1 436	487	1 342	410	1 423
Current hand eczema (%)								
by questionnaire	41	61	45	37	56	35	84	28
medical consultations	11	31	15	7.6	17	8.8	28	6.1
sick-leave	2.4	7.3	1.8	1.9	5.3	1.4	4.3	1.8
terminations	2.2	6.7	3.1	1.5	3.9	1.6	5.1	1.4

#### Identification of atopy and metal dermatitis

At the pre-employment examination the subject was questioned about history of atopic disease by a specially trained occupational nurse. Atopic dermatitis was accepted as a diagnosis if there was a history of an itching, chronic or relapsing dermatitis starting in infancy or childhood with a typical morphological distribution. Subjects with past and/or present atopic dermatitis were recorded together. Atopic mucosal symptoms was accepted as a diagnosis if hay fever or asthma occurred when the subject was exposed to pollen or furred animals. No other diagnostic criteria or tests for atopic disease were used.

A history of metal dermatitis was derived from a questionnaire in which the employees were asked about any itching rash related to exposure to metal buttons, cheap jewelry or wrist watches.

#### Criteria of hand eczema

At the pre-employment examination the employee was informed that the study concerned hand eczema and some brief information about the symptomatology of hand dermatitis was given. Both the occurrence of a history of hand eczema before the current work and hand eczema during the study period were determined from the follow-up questionnaire. There the employee was asked to place his/her hand eczema in one or more of the following five categories:

- 1) dry and chappy skin with rashes and small cracks,
- 2) itching red maculous and papulous skin,
- 3) small vesicles,
- 4) ruptured vesicles or excoriated skin,
- 5) rough skin with cracks and scaling.

At the follow-up the employee was also asked about medical consultations, sick-leave and termination of employment due to hand eczema.

#### Statistics

The multifactorial problems in this study were analysed using a multivariate logistic regression technique (5). The risk of developing hand eczema was calculated as predicted relative odds ratios. The odds ratio (OR) expresses the relationship between the odds (O1) of getting hand eczema (E1) in one group ( $O1 = E1/(1-E1)$ ) compared to the odds (O2) of hand eczema (E2) in a second group ( $O2 = E2/(1-E2)$ ). E1 and E2 denote the proportion of hand eczema in the two groups. The odds ratio will then be

$$OR = O2/O1 = E2(1-E1)/E1(1-E2)$$

Student's *t*-test was used to compare relative frequencies.

## RESULTS

### Prevalence of atopy, metal dermatitis and earlier hand eczema

Of the cohort studied 23% were considered to be atopics. A history of atopic dermatitis (AD) was observed in 10.6%. This figure included 4.1% with both atopic dermatitis and atopic mucosal symptoms. Atopic mucosal symptoms (AMS) alone were seen in 12.4%. A

Predicted  
relative  
odds ratio

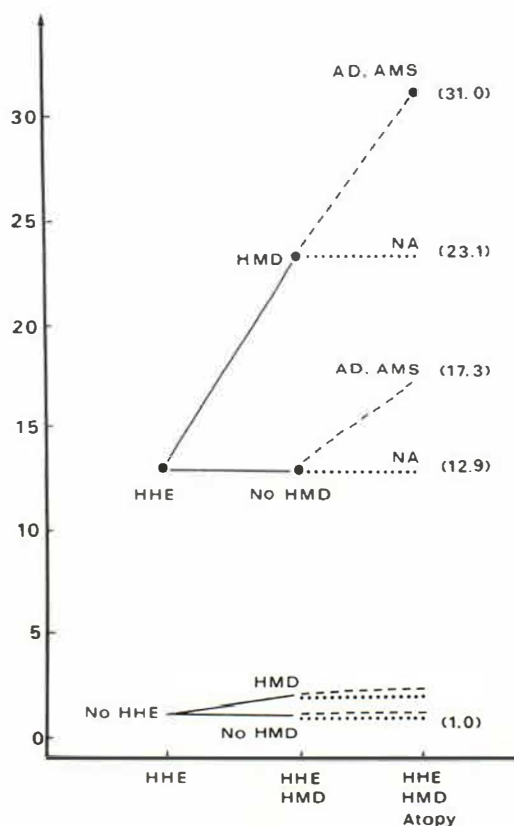


Fig. 1. Relative odds ratios for hand eczema in the various groups during 20 months of 'wet' hospital work. HHE = history of hand dermatitis; HMD, AD, AMS and NA as in Table I.

history of metal dermatitis (HMD) was reported by 26.3% and was more common in atopics than in non-atopics (NA). The following relative frequency for HMD was found: AD 36.5% ( $p < 0.001$ ) AMS 31.4% ( $p < 0.05$ ) and NA 24.1%. A history of earlier hand eczema (HHE) was reported by 22.4%. The following figures for earlier hand eczema were found: AD 48%, AMS 24%, NA 18%, HMD 36% and subjects without HMD 17%.

#### Occurrence of hand eczema

Table I gives the figures for the occurrence of hand eczema during 20 months of 'wet' hospital work. From the total figure it can be seen that hand eczema was reported by 41%. Most eczemas were mild and only 2.4% had been on sick-leave and 2.2% had left their current employment because of hand eczema. It can be seen further that atopic dermatitis, metal dermatitis and earlier hand eczema increased the occurrence of hand dermatitis. A large number of the subjects with hand eczema had suffered their first bout of eczema prior to the current 'wet' work. The following figures for HHE in subjects with hand eczema were found: AD 68%, AMS 45%, NA 42%, HMD 55% and without HMD 42%. Thus 46% of all subjects with current eczema had had hand eczema before the observation period.

### Regression analyses of the risk factors

The following factors were found to influence the occurrence of hand eczema in the regression analysis: history of earlier hand eczema (HHE) ( $F=540$ ,  $p<0.0001$ ), history of metal dermatitis (HMD) ( $F=68$ ,  $p<0.001$ ) and atopic dermatitis (AD) ( $F=38$ ,  $p<0.001$ ).

Fig. 1 shows the interrelation of HHE, HMD and atopy in a summarized schematic description of the predicted relative odds ratios for hand eczema. In this analysis HHE increased the odds of current hand eczema by 12.9 times and created a subdivision of the population into two groups which differ considerably concerning the risk of developing hand dermatitis. HMD further increased the odds by 1.8 times and AD and AMS by another 1.3 times. The predicted probability of hand eczema for the subjects in this analysis ranged from 24% in non-atopic subjects without HMD and without HHE to 91% in subjects with AD, HMD and HHE.

The consequences of the current hand eczema as regards medical consultations, sick-leave and terminations due to hand eczema were analysed statistically. It was found that AD ( $F=35.4$ ,  $p<0.0001$ ) and HHE ( $F=9.4$ ,  $p<0.01$ ) increased the need for medical consultation. Atopic dermatitis ( $F=6.7$ ,  $p<0.01$ ) and HMD ( $F=6.1$ ,  $p<0.05$ ) increased sick-leave and AD ( $F=7.3$ ,  $p<0.01$ ) increased the terminations due to hand eczema. The predicted probability of medical consultations, sick-leave and terminations were found within the following range: medical consultation 18.8–56.9%, sick-leave 2.6–22.2%, terminations 3.9–13.8%. (Figures in % of the total number of current eczema.)

## DISCUSSION

Hand eczema occurred in 41% of the women engaged in 'wet' hospital work during the observation period of 20 months. This corresponds to the 44% reported in a retrospective study on employees engaged in hospital 'wet' work (1). Our findings also support the statement that most eczemas are mild and that the total figures for sick-leave are low.

By means of regression analysis we have demonstrated the importance of information about earlier hand eczema as a complement to information about atopy and metal dermatitis. It is obvious that many individuals with earlier hand eczema will suffer from recurrence if they engage in 'wet' work. These high risk individuals with earlier hand eczema constitute approximately half of the subjects with AD, one fourth of the subjects with AMS and one fifth of the non-atopics.

Why is earlier hand eczema of such great importance as a risk factor for the development of hand dermatitis? No definite answers can be given to this question. Explanations therefore are speculative. Our suggestion is that there is an endogenous characteristic of the skin, a skin vulnerability factor, which predisposes the person to irritant hand dermatitis. As the population consists of women, it may be assumed that they have been exposed to some degree of irritant occupational and domestic work in the past, which sometimes, but not always, may have caused hand eczema. As a consequence earlier hand eczema may be considered a major indicator of this endogenous factor, corresponding to the 'atopic skin diathesis' as defined by Lammintausta (1). According to our findings this endogenous factor may exist in half of the subjects with AD, in a quarter of the subjects with AMS and in one fifth of the non-atopics. This is also supported by Lammintausta, who identified 'atopic skin diathesis' in 1/3 of the subjects with AMS and in 19% of the non-atopics. 'Atopic skin diathesis' also involved a significantly increased risk of hand eczema. In subjects with atopic dermatitis no identification of this 'atopic skin diathesis' was made. It was, however, found that 34% of the 'wet' work employees with AD had managed to work without getting hand eczema. In our study 39% of the subjects with AD

reported no occurrence of hand eczema and these were predominantly subjects without earlier hand dermatitis.

The importance of endogenous factors in the etiology of hand eczema in subjects with atopic dermatitis is also underlined in a study by Rystedt (6), who found that water and/or chemical exposure were insignificant as cause/s of hand eczema in a follow-up study on atopic children. In a report by Forsbeck et al. (7) it was found that 50% of the subjects with AD and current hand eczema had their first bout of eczema prior to their first employment. We have recently found that atopic dermatitis as a single factor increased the odds of getting hand eczema by approximately 3 times in 'wet' as well as in 'dry' hospital work (2). In another retrospective study on occupational dermatoses it was found that the relative odds of developing occupational skin diseases were estimated to be 13.5 times greater in 'atopics' than in 'non-atopics' (8).

Other explanations for the great importance of a history of hand eczema are possible. For example hand eczema in the past may leave a non-restored skin barrier for a long period of time and thus increase the risk of recurrency (9, 10).

A history of metal dermatitis, which was reported by 26.3% of the employees, may conceal several different skin conditions elicited by exposure to metals. Delayed nickel sensitivity probably represents the most important cause. Thus in women with a history of metal dermatitis a positive patch test to metals was found in 58–70% (4, 11). Irritant effects and contact urticaria to metals are other possible alternatives. In this study atopics report a history of metal dermatitis more frequently than non-atopics. One possible explanation may be that atopic skin is more sensitive to the irritant effects of metals. A correlation between hand eczema and a history of metal dermatitis can be found on two levels in this study. High risks are seen in subjects with HMD and HHE and low risks are seen in subjects with HMD but without HHE. At both levels HMD increased the odds by 1.8 times compared to subjects without a history of metal dermatitis. According to our hypothesis the high risk is seen in subjects with HMD and an inherited disposition to irritant hand eczema occurring predominantly in atopics. This hypothesis is supported by a finding by Peltonen (12) that almost all nickel sensitive females afflicted with hand eczema were atopics. Further support is provided by the finding that hand dermatitis in nickel sensitive females seems to follow one of two courses: mild and transient or chronic and disabling (13). In addition it was reported that atopy made the prognosis of hand eczema in nickel sensitive subjects worse.

In a previous paper it was shown that subjects with AD develop a more severe hand eczema than non-atopics (2). In this study this was verified by a significantly higher frequency of medical consultations, sick-leave and terminations due to hand eczema in subjects with AD. Sick-leave was also more common in subjects with HMD.

How can all this information be utilized in occupational counselling? That depends on the angle of approach. An individual with earlier hand eczema, atopic dermatitis and metal dermatitis may find it important to know that the probability of getting hand eczema will be about 90% if he/she goes in for 'wet' hospital work. On the other hand, the employer may be comforted by the fact that despite hand eczema, the employees will stay at work as the frequency of sick-leave and terminations due to hand eczema is rather low.

In conclusion this study has shown that differentiated prognostic information regarding the occurrence of hand eczema in women in 'wet' hospital work can be obtained from simple anamnestic information of atopy, metal dermatitis and earlier hand eczema. This knowledge may also prove to be of great importance in occupational counselling situations.

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