

Hand eczema in geriatric nurses in Germany – prevalence and risk factors

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Background and objectives: The aim of this cross-sectional study was to collect data on the prevalence of hand eczema and relevant risk factors in geriatric nurses in Germany.

Methods: 1375 geriatric nurses from 86 nursing homes were investigated by 41 occupational physicians.

Results: Hand eczema was diagnosed in 243 nurses, corresponding to a point prevalence of 18% [95% confidence interval (CI) 16–20%]. In most cases (71%), the skin changes were only mild. Two thirds of the geriatric nurses who reported skin changes stated that they had developed hand eczema after starting this profession. In most cases (85%), the clinical course was described as chronic. Risk factors associated with hand eczema were a lifelong tendency for dry skin [odds ratios (OR) 2.76; 95% CI 2.02–3.76] and a history of allergic rhinoconjunctivitis (OR 1.50; 95% CI 1.03–2.18). There was no association between the amount of wet work and hand eczema (OR 1.18; 95% CI 0.76–1.86).

Conclusions: Our study indicates that it is necessary to provide geriatric nurses with specific skin care advice as part of their training. This might help to identify trainees at increased risk of developing eczema, encouraging the initiation of appropriate skin protection measures, thus preventing chronic disease.

Key words: atopy; contact dermatitis; geriatric nurses; hand eczema; occupational; prevalence; risk.
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In 2004, the German Institution for Statutory Accident Insurance and Prevention in the Health and Welfare Services (Berufsgenossenschaft fuer Gesundheitsdienst und Wohlfahrtspflege, BGW) initiated a study to investigate the prevalence of hand eczema and musculoskeletal symptoms (in the spinal column and in the neck and shoulder) in geriatric nurses in Germany. This study consists of two separate parts, a prevalence study (1) followed by an intervention study to investigate whether a skin care programme was efficient in preventing work-related skin problems on the hands. In the intervention study, known as *KRISTA* (*K*Reuz-*I*nterventions-*S*tudie *A*ltenpflege; Cross-Interventional Study in Geriatric Nurses), the effect of an advisory service for skin protection was evaluated in geriatric nurses, who were randomly divided into an intervention and a control group

and were followed over a 1-year study period. We now report the dermatological results for the prevalence study.

Methods and Subjects

The BGW is the statutory accident insurance for all private and church-run nursing homes in Germany. Occupational medical examinations are performed by occupational physicians, who are responsible for one or more care facilities. In 2004, the BGW placed an announcement in two German papers relevant for occupational physicians with information about the study. All occupational physicians responsible for health care facilities for old people were invited to participate. They were asked to inform the manager of the facilities about the study. Overall, 41 occupational physicians agreed to participate.

Data from 68 nursing homes and 18 home care facilities concerning a total of 3390 employees were sent to the study centre. Full information on dermatological questions [medical history and Osnabrueck Hand Eczema Severity Index (OHSEI) evaluation] was available for 1375 geriatric nurses (41%) providing the basis for this study. To avoid recall bias, the participants completed the questionnaire containing the history of dermatological data before the physical examination. The clinical findings were recorded by the occupational physicians, who were specially trained prior to this investigation. This was to guarantee standardized use of the test instruments. Insofar, as this was possible in the course of the single investigation by the occupational physicians, the skin condition was classified as an estimated diagnosis on the basis of the clinical findings and history.

The dermatological parameters were evaluated on the basis of historical data recorded with standardized questionnaires and on the findings with a standardized scoring instrument (OHSEI) (2). This 18-point score depends on six physical signs of hand eczema, but does not contain the patient's history. OHSEI is easy to use and was designed for epidemiological studies. It differentiates between mild (1–3 points), moderate (4–6 points), and severe eczema (7–18 points). The OHSEI was examined in earlier studies, with good results for inter-observer reliability (2), validity, and responsiveness to change (3).

The questionnaire included questions on demographics, occupational history, history of atopic symptoms, including lifelong tendency for extremely dry and itching skin, history of allergic rhinoconjunctivitis and asthma (4, 5), flexural eczema in childhood, self-reported hand eczema, and exacerbating factors such as total time of exposure to water and protective gloves, use of water or disinfectants for hand cleaning, and use of moisturizers. The questionnaires were distributed to all nurses by the nurse manager of each care facility and sent anonymously by the nurses themselves in closed envelopes to the BGW for data entry and data analysis. Written informed consent was obtained from all participants, and the study was approved by the ethical committee of the Hamburg Medical Association (Ärztekammer Hamburg).

Statistical methods

The study was descriptive in character based on absolute and relative frequencies and 95% confidence intervals (CIs) for proportions, means, and percentiles. Differences between nurses working in nursing homes and in home care were examined

by chi-square analysis if the variables were categorical or by the Mann–Whitney *U*-test for continuous data. Odds ratios (OR) and 95% CI were calculated to estimate the strength of the associations between risk factors and positive OHSEI results. Probability was recognized as significant if the level of significance was less than 0.05. All analyses were performed using SPSS version 14.0.

Results

At the time of the investigation, 243 geriatric nurses gave a positive OHSEI, i.e. there were findings of pathological skin changes on their hands. This corresponds to a point prevalence of 18% (95% CI 16–20%). The clinical severity ranged between mild and severe skin symptoms (OHSEI score from 1 to 11). The median value was 3 and the mean 2.9 (± 1.9 SD) so that most cases of skin changes (71%) were mild (Table 1).

For half the cases, no definitive diagnostic classification could be made during the first medical investigation (categories: 'cannot be reliably classified' and 'no diagnostic evaluation made') (Table 2). In 27.6% of the cases, the hand eczema was diagnosed as irritant, in 9.9% as atopic, and in 5.3% as allergic (Table 2). Comparison between the diagnoses in nursing homes and home care did not indicate that there were any statistically significant differences in the proportion of occupational irritant or allergic eczema.

More than a quarter (28%) of the total group stated that they had previously suffered from inflammatory skin changes (Table 1). Thirty five per cent of these subjects reported that they were also currently suffering from inflammatory skin symptoms in comparison with 7% of those who had not previously suffered from inflammatory skin symptoms ($P < 0.001$) (data not shown). Eighty five per cent of the participants who had already suffered from inflammatory skin symptoms exhibited chronic symptoms of their current skin disease, defined as relapsing or permanent, lasting for more than 6 weeks. This is significantly different from those who had not previously suffered from inflammatory skin symptoms ($P < 0.01$) (data not shown). About one third (34%) of the participants who had current or previous skin changes on their hands reported that they already had these symptoms before starting as geriatric nurses (data not shown). No significant differences in the prevalence of hand eczema were observed between nurses in nursing homes and home care (18 versus 19%) (Table 1). Mild forms of skin changes were dominant in both groups, although skin changes were more severe in the home care nurses.

Table 1. Characteristics of the study population – separated by work place ($n = 1375$)

	Total ($n = 1375$) %	Nursing home ($n = 1116$) %	Home care ($n = 259$) %	<i>P</i> -value
Age (years)				
≤30	18	18	15	$P < 0.05$
31–49	60	58	68	
≥50	22	24	17	
Women	88	87	90	NS
10 years and more in nursing profession	56	55	64	$P < 0.01$
Skin finding (Osnabrueck Hand Eczema Severity Index)/skin score				
Negative	82	82	81	NS
Mild	13	13	11	
Moderate	4	4	7	
Severe	1	1	1	
Minimum/maximum	1/11	1/11	1/8	$P < 0.05$
Median/mean ($\pm$ SD)	3/2.9 ($\pm$ 1.9)	2/2.8 ($\pm$ 1.8)	3/3.5 ($\pm$ 2.0)	
Percentile P_{25}/P_{75}	2/4	1/4	2/5	
Self-reported skin changes of the hands at the time of the medical examination	15	14	19	$P < 0.05$
Self-reported skin changes of the hands in earlier years	28	27	31	NS
Flexural eczema in childhood	5	5	5	NS
History of allergic rhinoconjunctivitis	16	16	20	NS
History of asthma ^a	11	11	13	NS
Dry skin ^b	25	24	27	NS
Itching skin ^c	15	15	15	NS

NS, not significant.

^aTwo categories combined 'Yes, but only in spring time' and 'Yes, over the whole year after changing sheets and/or after having contact with animals'.^bLifelong tendency for extremely dry and scaled body skin.^cLifelong tendency for itching body skin after shower.

In contrast to these observable skin changes, 15% of the total group reported that they had themselves noticed skin changes on their hands; this figure was significantly greater for the home care nurses (Table 1). Around 80% of the nurses who had noticed skin changes themselves observed a chronic–relapsing course. Protracted chronic courses were more often reported in the home care subgroup (Table 3). On the other hand, only 3% reported that they had been unable to work because of the skin symptoms during the 12 months before the investigation. This was in accordance with the relative mild degree of the objective skin symptoms. Fifty four per cent of the participants noticed that their self-reported symptoms improved

when away from work (Table 3); for the remaining 46%, the clinical course was basically unpredictable.

There was a good agreement between the historical data and the clinical scoring data ($P < 0.001$). In comparison with the OHSI scoring, we observed moderate sensitivity and high specificity (0.80% and 0.99%, respectively) for the historical data (Table 4). Most of the participants who were unaware of skin changes at the time of examination, but nevertheless had positive OHSI scores ($n = 48$), exhibited mild skin changes, with up to 3 OHSI points (data not shown). Only four participants who were unaware of pathological skin changes nevertheless gave OHSI scores of moderate severity.

Table 2. Diagnostic evaluation of skin changes for persons with a positive Osnabrueck Hand Eczema Severity Index finding

Diagnostic evaluation of the skin changes by the occupational physician ^a	Total ($n = 243$) %	Nursing home ($n = 194$) %	Home care ($n = 49$) %	<i>P</i> -value
Irritant hand eczema	27.6	28.4	24.5	NS
Allergic hand eczema	5.3	6.7	0.0	NS
Atopic hand eczema	9.9	6.7	22.4	$P < 0.01$
Urticaria	0.4	0.5	0.0	NS
Other	6.2	6.1	6.2	NS
Cannot be reliably classified	30.9	29.4	36.7	NS
No diagnostic evaluation made	19.7	22.2	10.2	NS

NS, not significant.

^aEstimated diagnosis based on historical data and physical signs.

Table 3. Self-reported clinical course of skin changes of the hands ($n = 203$)

	Total ($n = 203$) %	Nursing home ($n = 155$) %	Home care ($n = 48$) %	P-value
Historical clinical course of skin changes				
Acute ^a	21	24	11	$P < 0.05$
Chronic permanent/chronic relapsing ^b	79	76	89	
Duration of skin changes				
≤6 weeks	21	24	9	$P < 0.05$
>6 weeks	79	76	91	
Sick leave because of skin changes within the last 12 months	3	3	5	NS
Improvement in eczema when away from normal work	54	56	48	NS

NS, not significant.

^aLess than 6 weeks.^bPermanent or relapsing over more than 6 weeks.

A history of rhinoconjunctivitis and the tendency for lifelong extremely dry body skin were the most frequently reported atopy-related risk factors (17% and 25%, respectively) (Table 5). Around 10% of the geriatric nurses had extended exposure to water or protective gloves, and 16% of the nurses used moisturizers less than once per shift. Hand eczema was significantly more frequent among respondents reporting flexural eczema in childhood, rhinoconjunctivitis or asthma, the tendency for extremely dry and itching body skin, or those who only used water for hand cleaning (as opposed to hand disinfection). These factors being risk factors for geriatric nurses to have positive OHSI results with OR (age and sex adjusted) ranging between 1.5 and 2.8 (Table 5). In the multivariate analysis, an increased risk of hand eczema was related to dry skin (OR = 2.76; 95% CI 2.02–2.18) and to rhinoconjunctivitis (OR = 1.50; 95% CI 1.03–2.2). None of the work-related risk factors was associated with positive OHSI results in multivariate analysis, except that nurses using moisturizers less than once per shift had a reduced risk (around 40%) for hand eczema compared with nurses using moisturizers several times per shift. Hand eczema was more frequent among nurses using moisturizers, but this effect is probably due to selection bias owing to a healthy worker effect.

Table 4. Agreement between historical data for skin changes compared with data of OHSI scoring^a

Historical data for skin changes	OHSI scoring (number)		
	Positive	Negative	Total
Yes	195	8	203
No	48	1124	1172
Total	243	1132	1375

OHSI, Osnabrueck Hand Eczema Severity Index.

^aSensitivity of historical (self reported) data = 195/243 (80%) and specificity = 1172/1375 (99%).

Discussion

The point prevalence data indicate that almost every fifth geriatric nurse suffers from skin changes on the hands. Thus, whether it is occupational or not, dermatitis of exposed hands is relatively frequent. It should also be borne in mind that hand eczema is relatively frequent in the working-age general population, with a 1-year prevalence of about 10% (6). The prevalence in purely white-collar professions may be as high as 25% (7, 8). It is one of the strengths of the present study that data for hand eczema and related risk factors are presented for a large sample of 1375 geriatric nurses. There are only a few studies reporting prevalence data on hand dermatosis for geriatric nurses. Our prevalence data are in line with a study on German nurse trainees, which found that 18% of the geriatric nurse trainees ($n = 149$) had hand eczema clinically diagnosed prior to the training period (9). Prevalence data of hand dermatoses in the present study are lower than that in other studies of nursing professions, including 22.9% in Korea (10), 26% in the USA (11), 32% in the Netherlands (12), and 38.5% in Italy (13). An explanation for these differing prevalence data in hand eczema could be that the other results were based exclusively (10, 12) or predominantly (11, 13) on self-reported questionnaires. A strength of the present study is that clinical examinations were included, performed by occupational physicians who were trained to use a standardized scoring tool.

The analysis of the German occupational disease register found the annual incidence rate of 12.6 (per 10 000 workers) for the professional group of 'nurses and medical assistants' (14). However, comparison with the officially reported figures in Germany indicates that the number of unreported occupational hand dermatoses may exceed this by a factor of 30–50 (15, 16). It could be shown that 2.2 cases of occupational skin diseases per 1000 full-time employees in geriatric care

Table 5. Atopic and work-related risk factors for hand eczema among geriatric nurses – frequency and OR with 95% CI

Risk factor	Frequency (<i>n</i> = 1375)	Positive Osnabrueck Hand Eczema Severity Index result (<i>n</i> = 243)	OR (95% CI)	
	Col %	Row %	Age (years)/sex adjusted	Multivariate ^a
Flexural eczema in childhood				
Yes	6	30	2.18 (1.29–3.68)	^b
No	94	17	1.00	
Allergic rhinoconjunctivitis ^c				
Yes	17	24	1.60 (1.13–2.25)	1.50 (1.03–2.18)
No	83	17	1.00	1.00
Asthma ^c				
Yes	11	24	1.55 (1.04–2.30)	^b
No	89	17	1.00	
Dry body skin ^c				
Yes	25	30	2.83 (2.11–3.80)	2.76 (2.02–3.76)
No	75	13	1.00	1.00
Itching body skin ^c				
Yes	15	26	1.85 (1.31–2.62)	^b
No	85	16	1.00	
Time exposed to wet work (per shift) ^d				
≥4 hr	10	20	1.18 (0.76–1.86)	^b
<4 hr	90	17	1.00	
Use of gloves (per shift)				
≥4 hr	10	20	1.16 (0.73–1.82)	^b
<4 hr	90	17	1.00	
Hand cleaning				
Only water	3	30	2.07 (1.06–4.04)	^b
Disinfectants and water	97	17	1.00	
Use of moisturizers (per shift)				
Less than once	16	13	0.63 (0.41–0.97)	0.61 (0.39–0.97)
At least once	84	19	1.00	1.00

CI, confidence interval; OR, odds ratios.

^aOR from a multivariate logistic regression model with age, sex, flexural eczema, asthma, dry and itching skin, wet work, glove use, and hand cleaning.

^bThis factor was not significant in multivariate logistic regression model using the method of backward selection.

^cSelf-reported data. Details for criteria see Table 1

^dTime includes hand washing.

are reported each year in Germany to the responsible insurance company (17). Our data, therefore, may indicate that the prevalence of hand eczema in geriatric nurses in Germany is almost 80-fold greater than the number of occupational dermatoses – predominantly hand eczema – reported from this sector (18 versus 0.22%). It should be borne in mind that the prevalence data should not be confused with the data on the number of reports, which correspond to the incidence.

The skin changes observed here were mostly rather mild. Good agreement was found between subjects' own perception (self reporting) and positive OHSI results. It was found that geriatric nurses in home care rather more often exhibit symptoms than nurses in nursing homes; in addition, the symptoms tend to be more severe. This agrees with other studies in geriatric nursing, which show that the possibilities of providing adequate skin protection and the use of these as regularly as possible is better under the conditions in nursing homes (18–20).

The skin symptoms observed are predominantly assessed as irritant dermatitis, subject to detailed dermatological diagnosis. Even though the occupational physicians failed to make an estimated diagnostic classification in 50% of the cases, the known typical manifestations of the individual distinct aetiological subgroups of contact eczema suggest that irritant hand dermatitis in wet work occupations are prevalently localized interdigitally and can be regarded as less severe compared with allergic contact eczema, which in many cases tends to be clinically distinct (21–23). As most of the inflammatory skin conditions not classified by the occupational physicians exhibited very low OHSI scores, in most cases, these are probably irritant skin changes. Under this assumption, irritant contact dermatitis was probably diagnosed in an additional 28%.

The historical information we obtained in our cohort on the clinical course of the skin symptoms indicates occupational influences. This

agrees with comparable studies on the prevalence and clinical course of occupational dermatitis. However, our data do not allow us to make the reliable conclusion that the hand dermatoses found are in fact exclusively related to occupational factors. Apart from occupational factors, non-occupational factors, such as domestic work, may also influence the clinical course of hand eczema (24–26), and, as shown for geriatric nurse trainees, this might also be the case for wet work professions performed earlier (9). It has also been shown that women's hands are exposed to more moisture outside work than are men's hands (27).

An additional factor for both the first manifestation and the (possibly chronic relapsing) clinical course of hand eczema is the presence of atopic predisposition. In contrast to various comparable studies in risk occupations (28–30), in our study group, the presence of flexural eczema in the history was not a statistically significant factor for the occurrence of hand dermatitis. This surprising result may be the expression of a recall bias, perhaps in the context of the relatively high age of the group examined (22% ≥ 50 years) in comparison with other epidemiological studies on occupational dermatitis (28–30). In a population-based retrospective study childhood eczema, allergic rhinitis and asthma were only significantly associated as risk factors in women younger than 30 years of age (31). Because 80% of our study population was over the age of 30 years, this finding could explain why we found no significant increase of these factors in our study. Lifelong tendency for extremely dry body skin was the most frequently reported atopy characteristic in participants who were diagnosed with hand eczema. The prognostic value of atopic symptoms from mucous membranes (allergic rhinitis/conjunctivitis or asthma) for the occurrence of occupational contact dermatitis is controversial. Although some epidemiological studies have failed to find such associations (28–30), we found a significant association between the presence of mucosal atopy in the history and the characteristic of current skin changes. This is also in accordance with current studies on hospital personnel (32) and on hairdressers (33). These studies indicate that mucosal atopy is also of prognostic significance for the occurrence of occupational skin diseases in wet work occupations, although the atopic skin predisposition is of the greatest significance for the severity and prognosis of occupational hand eczema (25, 34, 35), as specifically demonstrated for health care workers (36). Occupational risk categories have,

therefore, been defined for the development of occupational hand eczema. The clinical characteristics of marked atopic skin predisposition are assigned to the first risk category and allergic rhinitis or asthma to the second risk category (25). Atopic characteristics with evidence of a low threshold for non-specific irritants are assigned to the third risk category (25).

Work-related risk factors for hand eczema described in the literature include increased frequency of hand washing and extended use of protective gloves (32). However, in our study group of geriatric nurses, we found no effect of the extent of wet work on the occurrence of hand eczema, even though 40% of the geriatric nurses assessed that they performed more than 2-hr wet work per shift (1). A tendency in nursing to overestimate the exposure time to water might explain our results (37). Contrary to accepted opinion, not using moisturizers was protective in our data. This effect might be due to a healthy worker effect, although based on a cross-sectional study, the results of current concepts (18, 38–42) indicate that advice must regularly be provided to new trainees of the profession, with the aim of identifying those with a predisposition to eczema. In accordance with the principle of prevention before selection, these trainees should be instructed in the principle of skin protection in good time, thus allowing them to work for an extended period in the profession. Skin protection strategies should also consider the non-occupational skin stress to which geriatric nurses are most likely exposed.

Limitations

The response rate of 41% raises concern about potential selection bias. Although 100% of the contacted geriatric homes agreed to participate, nurses with skin problems might have been more likely to participate. Therefore, the observed prevalence rate for skin changes may be overestimated.

A limitation might be a risk of recall bias in our study that could account for some of the positive associations with tendency for dry skin and atopic disease because the history of atopic symptoms is being ascertained retrospectively for lifelong exposure.

A further limitation might be the large sample of physicians. Although the association between physician and positive OHSI results was moderate (Cramers $V = 0.3$, $P < 0.001$), adjustment in multivariate analysis was not possible due to infrequent numbers (expected frequency in 30% of the cells of the cross table less than 5).

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