Acta Derm Venereol 2005; Suppl. 215: 41–44

Taylor & Francis
Taylor & Francis Group

# 9. Epidemiology and job-related problems for the eczema patient

THOMAS DIEPGEN

Atopic dermatitis (AD) is the most common inflammatory dermatosis affecting children and its management is associated with significant economic costs (1, 2). Most epidemiological studies indicate an increase in allergic asthma, rhinitis and AD. Recent European studies indicate a lifetime prevalence of AD in 15–20% of subjects, with a 4–12% point prevalence. In addition, other research suggests that the overall incidence of other atopic conditions may be increasing. Recent developments concerning the overall incidence are reviewed. The results from large prospective studies evaluating job-related risk factors for hand eczema are discussed, in relation to occupational counselling.

## IS THE FREQUENCY OF ATOPIC DERMATITIS INCREASING?

Several studies have indicated that the frequency of AD in childhood increased during the later part of the 20th century. Taylor et al. found that in children aged 5–7 years in the UK the incidence rose from 5.1% in 1946 to 12.2% in 1970 (3). Schultz Larsen in Denmark reported an increase from 3.2% in 1960–1964 to 12.0% in 1970–1975 in a similar age group (4). Ninan & Russell, who studied 8–13-year-olds in the UK, observed that the incidence rose from 5.3% in 1964 to 12.0% in 1989 (5). These observations have been confirmed by more recent studies which also indicate that the incidence is still rising (Table I) (6–9). There is therefore considerable evidence confirming that the frequency of AD in children has grown significantly over the past 50 years or so, and is still increasing. In Denmark, however, there was no increase in cumulative incidence during the 1990s (10). Most epidemiological studies indicate an increase in allergic asthma, rhinitis and AD. This could be due to either an increase in 'allergy stimulating' factors or a decrease in 'allergy preventing' factors (11).

AD is due to the complex interaction between a genetic predisposition and environmental factors including lifestyle factors such as social class, family size, urban/rural environment, hygiene, mother's age and breastfeeding, exposure to pollution (both indoor and outdoor), and allergens such as house dust mite, pollen, dander and fungi. There are national differences in the potential exposure to allergens. For example, in the UK exposure to house dust mite is much more common than in Sweden, possibly related to the greater use of carpets in the houses in UK.

Is atopy the price that Western society has to pay for its current lifestyle? This could be the case as atopy is more common in the wealthy than in the poor, in an urban as opposed to a rural environment, more common in Western Europe than in Eastern Europe, and in immigrants rather than in their country of origin (12).

## THE 'HYGIENE HYPOTHESIS'

Epidemiological evidence indicates that children who suffer more infections are less frequently allergic. This hypothesis is supported by several studies, which have investigated such diverse factors as anthroposophic lifestyle (using fewer antibiotics in early life) (13), the influence of the number of siblings in a family (14), the effect of living on a farm (15) and the age at which children attend kindergarden (16). Atopy is particularly uncommon in farm children, who are known to have an especially rich carriage of bowel microflora (17). It seems that there could be a negative association between the composition of the intestinal flora in infancy and subsequent allergy development.

## ASSOCIATION BETWEEN ATOPIC DERMATITIS AND OTHER ATOPIC CONDITIONS

There is a strong association between the presence of AD, particularly with a family history of atopy, and the proportion of children aged 5 years with manifestation of allergic airway disease (18). In children with no family history and no dermatitis the incidence was 12.2%, in patients with AD and no family history 28.1% and in patients with AD and a family history 50.2%. The period prevalence of AD in infants and young children (up to 7 years of age) is similar in patients whether or not there is a family history of atopy. However, the period prevalence is greater where there is a family history of AD. We have also looked at the prevalence of eczema in patients over 40 years of age; here the disease is more frequent among the younger patients than the older ones.

We have investigated the factors which might influence the prevalence of AD in childhood using a

 ISSN 0001-5555
DOI: 10.1080/03658340510012499

Table I. *Prevalence of atopic dermatitis in Europe*

| Reference | Country/patient age (years) | Frequency (rate) of atopic dermatitis |
|---|---|---|
| Mortz et al. 2001 (6) | Denmark/12–16 | Lifetime prevalence 21.3%<br>1-year prevalence 6.7%<br>Point prevalence 3.6% |
| Broberg et al. 2000 (7) | Sweden/5–6 | Lifetime prevalence 20.7%<br>Point prevalence 8.5% (Göteborg)<br>Point prevalence 11.5% (Kristiansand) |
| Girolomoni et al. 2003 (8) | Italy/9 | Lifetime prevalence 15.2%<br>Point prevalence 5.8% |

Modified according to Diepgen (9).

statistical model adjusted for residence, sex, social status, maternal smoking habits, and presence of pets in the household (Diepgen TL, Bergmann RL, Kuss O, Wahn U, manuscript in preparation). The results are shown in Table II. Breastfeeding had no effect on prevalence, whereas family history of eczema and specific sensitization early in life were significant risk factors. Allergic rhinitis and allergic asthma were related, but independent factors. In another study using linear regression analysis we have found that the mother's age ($p<0.001$), the mother's smoking habits ($p<0.001$) and the family's social status ($p=0.01$) significantly influenced the duration of breast feeding (19). The mother's atopic status had a borderline statistical significance on the duration of breastfeeding ($p=0.065$). There are, therefore, complicating factors which need to be addressed when looking at the effect of breastfeeding on AD development.

The role of intrinsic and extrinsic factors in the chronological development and in the severity of AD at different ages is not yet fully documented.

There are epidemiological parallels between AD and asthma. The prevalence of both is rising and the influence of environmental and lifestyle factors (the 'hygiene hypothesis') on the prevalence are similar. AD is a risk factor for the development of childhood asthma in terms of occurrence, severity and persistence.

Table II. *Factors influencing the development of atopic dermatitis in the first 8 years of life*

| Factor | Odds ratio | 95% confidence intervals |
|---|---|---|
| Duration of breastfeeding in months | 1.03 | 1.00–1.05 |
| Family history of eczema | 1.83 | 1.23–2.73 |
| Specific sensitization | 1.82 | 1.38–2.40 |
| Allergic rhinitis | 2.19 | 1.62–2.96 |
| Allergic asthma | 1.49 | 1.14–1.96 |

Adapted from Bergmann et al. (18).

## ATOPY AND OCCUPATIONAL CONTACT DERMATITIS

Atopy is known to be a risk factor for irritant contact dermatitis (20), but respiratory atopy is not (21). Atopy is not a risk factor for allergic contact dermatitis (22), but it is an important risk factor for contact urticaria (23). Forty percent of patients with occupational contact dermatitis have an atopic skin diathesis (24). If all bakers had no history of atopy, between 42 and 51% of all cases of occupational contact dermatitis would be avoided (25). The evidence, therefore, indicates that atopic skin diathesis is an important prognostic factor for developing occupational contact dermatitis (26).

A large prospective study into occupational skin disease involved the workers at the AUDI AG factories in Ingolstadt and Neckarsulm (PACO-Study) (27). We studied apprentices yearly during their 3-year apprenticeship, looking at the development of hand eczema (27). A total of 2080 workers were included, of whom 80% were males and had a mean age at the second assessment of 17.4 years. Follow-up was performed in 2057 (98.9%) workers. Using a multiple logistic regression analysis, the independent risk factors for developing hand eczema within 3 years were: history of hand eczema 2.57, wet work for more than 3 hours daily 2.35, history of atopic eczema 2.02, dyshidrosis 1.66 (male) and 1.23 (female).

We conducted a similar prospective cohort study in 574 hairdressers, also using a logistic regression, which yielded odds ratios for developing hand eczema as shown in Table III. An atopic skin diathesis and at least 3 hours wet work daily were the major risk factors.

## DEFINING THE OCCUPATIONAL RISK CATEGORY

Based on the studies conducted in Germany we have defined occupational risk categories for developing hand eczema.

Table III. *Risk factors for developing hand eczema in hairdressers*

| | Odds ratio | 95% CI | *p* value |
|---|---|---|---|
| Atopic skin diathesis* | 2.1 | 1.4–3.2 | <0.001 |
| Respiratory atopy | 0.8 | 0.4–1.4 | NS |
| Wet work (4 h) | 2.1 | 1.4–3.0 | <0.001 |
| Permanent wet work (1 h) | 1.7 | 1.1–2.4 | <0.01 |
| Nickel sensitivity | 1.3 | 0.9–1.9 | NS |

NS, not significant.
*Presence of at least 10 eczema related signs/symptoms.

*Category 1: High risk, avoid high-risk jobs*

- Atopic dermatitis with hand involvement.
- Chronic hand eczema.
- Change of work due to irritant dermatitis.

*Category 2:*

- Atopic dermatitis without hand involvement.
- History of pompholyx (allergic or contact).
- Allergic rhinitis or asthma in occupations with high risk of type I allergy (e.g. baker).

*Category 3:*

- Evidence for low threshold to non-specific irritants.

In the PACO study ($n$=2145), 58.8% of workers were in the no-risk category, 1.4% in category 1, 17.5% in category 2 and 22.3% in category 3. The predictive value for development of hand eczema in the first 3 years was 88% of 17 patients in risk category 1. Of the 574 hairdressers, 55.9% of workers were in the no-risk category, 1.0% in category 1, 33.8% in category 2 and 9.2% in category 3. The predictive value for the development of moderate or severe hand eczema among hairdressers was category 1, 83%; category 2, 30%; category 3, 3%; and no-risk category, 18%.

On the basis of these results we advocate the following occupational counselling guidelines for the risk categories.

*Category 1*: Occupations with wet work or exposure to irritants not advisable. Pre-employment counselling and medical advice required.

*Category 2*: Personal protective measures advocated, together with technical and practical protection measures in the workplace.

*Category 3*: Technical and practical protection measures in the workplace. Repeat follow-up examinations after 6 months of employment.

## CONCLUSION

In conclusion, AD has increased markedly in the past few decades. It may be the price society has to pay for its lifestyle, as AD is more prevalent in the more wealthy members of society, in urban as opposed to rural areas, in Western than in Eastern Europe and in immigrants rather than in their country of origin. A possible explanation for the increase is the so called 'hygiene hypothesis', as children who have more infections in infancy tend to be less frequently allergic. There are epidemiological parallels between asthma and AD, and AD is a risk factor for childhood asthma. Occupational counselling may be advantageous for individuals working in high-risk occupations.

## DISCUSSION

*Thestrup-Pedersen;* Your lecture is a very relevant aspect regarding occupational dermatitis as in Denmark insurance companies pay out 6–7 million dollars yearly in compensation for hand eczema. How great is the problem for insurance companies in Germany?

*Diepgen;* It is a problem that one-third of occupational diseases involve the skin. Retraining is very expensive, which is paid for by the insurance companies. Sick leave related to hand eczema costs industry in lost productivity around 6–7000 Euros per person. The economic burden is significant. The hairdressing trade has been very successful in reducing the incidence by two-thirds in the last 10 years.

*Taieb;* What about these young people who are excluded from jobs, do they get compensation?

*Diepgen;* You can't exclude people as there is no legal basis for doing so. Occupational skin disease starts around 20 years. We just give advice on where to find employment.

*Thestrup-Pedersen;* In Sweden in the metal industry, problems are encountered within 6 months of starting work. What is your experience?

*Diepgen;* Exactly the same, hand eczema is usually seen within the first 6 months. The philosophy is not to exclude patients from jobs, but to help them to stay in their job by taking suitable precautions and if necessary to help them find suitable alternatives.

*Agner;* With atopics we find cases of contact dermatitis within 6 weeks of commencing employment.

*McFadden;* Young people commencing work in the hairdressing trade are usually given the task of washing customers' hair, which means they are soaking their hands in sodium lauryl sulphate for hours on end. Not surprisingly, a lot drop out of employment due to hand eczema problems. Those who stay in the job and start styling hair then encounter the other allergens.

*Diepgen;* For this reason in Germany the ratio of 'wet' to 'dry' work is regulated at 50:50. The risky jobs are not only done by apprentices.

*Langley;* I think the human genome project may help in the long term with identifying high-risk subjects and should improve job prospects.

*Thestrup-Pedersen;* Giving advice to patients has to be handled carefully, but for those commencing employment it can be helpful in preventing subsequent

problems. What emphasis should be put on using emollients in hand eczema?

*Diepgen;* It is difficult to identify whether it is the basic education on the risk or the practical measures such as using emollients, which are the more important. We think the use of moisturizers as opposed to barrier creams is beneficial. They may help in reducing the irritant types of hand eczema, but good clinical trials are lacking. It is the whole programme that is important. We worked at a plant where there was a 20% incidence of hand eczema and on returning after commencing the programme found that half the staff had not fully understood what to do. Eventually the incidence of hand eczema was reduced to 6% of the workforce.

## REFERENCES


1. Lapidus CS, Schwartz DF, Honig PJ. Atopic dermatitis in children: Who cares? Who pays? J Am Acad Dermatol 1993; 28: 699–703.
2. Herd RM, Tidman MJ, Prescott RJ, Hunter JAA. The cost of atopic eczema. Br J Dermatol 1996; 135: 20–23.
3. Taylor B, Wadsworth J, Wadsworth M, Peckham C. Changes in the reported prevalence of childhood eczema since the 1939–45 war. Lancet 1984; 1: 1255–1257.
4. Schultz Larsen F. Atopic dermatitis. A genetic-epidemiologic study in a population-based twin sample. J Am Acad Dermatol 1992; 28: 719–723.
5. Ninan TK, Russell G. Respiratory symptoms and atopy in Aberdeen schoolchildren: evidence from two surveys 25 years apart. BMJ 1992; 304: 873–875.
6. Mortz CG, Lauritsen JM, Bindslev-Jensen C, Andersen KE. Prevalence of atopic dermatitis, asthma, allergic rhinitis, and hand and contact dermatitis in adolescents. The Odense Adolescence Cohort Study on Atopic Diseases and Dermatitis. Br J Dermatol 2001; 144: 523–532.
7. Broberg A, Svensson A, Borres MP, Berg R. Atopic dermatitis in 5–6-year-old Swedish children: cumulative incidence, point prevalence, and severity scoring. Allergy 2000; 55: 1025–1029.
8. Girolomoni G, Abeni D, Masini C, Sera F, Ayala F, Belloni-Fortina A, et al. The epidemiology of atopic dermatitis in Italian schoolchildren. Allergy 2003; 58: 420–425.
9. Diepgen TL. Epidemiology of atopic dermatitis. In: Ruzicka T, Reitamo S, eds. Tacrolimus ointment. Berlin: Springer-Verlag, 2003: 3–21.
10. Olesen AB, Bang K, Juul S, Thestrup-Pedersen K. Stable incidence of atopic dermatitis among children in Denmark during the 1990s. Acta Derm Venereol 2005; 85: 245–248.
11. Diepgen TL. In: Williams HC, ed. Epidemiology of atopic eczema. Cambridge University Press, 2000: 96–109.
12. Diepgen TL. Atopic dermatitis: the role of environmental and social factors. J Am Acad Dermatol 2001; 45: S44–S48.
13. Alm JS, Swartz J, Lilja G, Scheynius A, Pershagen G. Atopy in children of families with an anthroposophic lifestyle. Lancet 1999; 353: 1485–1488.
14. Pekkanen J, Remes S, Kajosaari M, Husman T, Soininen L. Infections in early childhood and risk of atopic disease. Acta Paediatr 1999; 88: 710–714.
15. Kilpelainen M, Terho EO, Helenius H, Koskenvuo M. Farm environment in childhood prevents the development of allergies. Clin Exp Allergy 2000; 30: 201–208.
16. Kramer U, Heinrich J, Wjst M, Wichmann HE. Age of entry to day nursery and allergy in later childhood. Lancet 1999; 353: 450–454.
17. Bjorksten B, Sepp E, Julge K, Voor T, Mikelsaar M. Allergy development and the intestinal microflora during the first year of life. J Allergy Clin Immunol 2001; 108: 516–520.
18. Bergmann RL, Edenharter G, Bergmann KE, Forster J, Bauer CP, Wahn V, et al. Atopic dermatitis in early infancy predicts allergic airway disease at 5 years. Clin Exp Allergy 1998; 28: 965–970.
19. Bergmann RL, Diepgen TL, Kuss O, Bergmann KE, Kujat J, Dudenhausen JW, et al. MAS-study group. Breastfeeding duration is a risk factor for atopic eczema. Clin Exp Allergy 2002; 32: 205–209.
20. Diepgen TL, Coenraads PJ. What can we learn from epidemiological studies on irritant contact dermatitis? Curr Probl Dermatol 1995; 23: 18–27.
21. Majoie IML, von Blomberg BME, Bruynzeel DP. Development of hand eczema in junior hairdressers: an 8-year follow-up study. Contact Dermatitis 1996; 34: 243–247.
22. Klas PA, Corey G, Storrs FJ, Chan SC, Hanifin JM. Allergic and irritant patch test reactions and atopic disease. Contact Dermatitis 1996; 34: 121–124.
23. Rycroft RJG. Occupational contact dermatitis. In: Rycroft RJG, Menné T, Frosch PJ, Benezra C, eds. Textbook of contact dermatitis. Berlin: Springer, 1995: 343–400.
24. Diepgen TL, Coenraads PJ. The epidemiology of occupational contact dermatitis. Int Arch Occup Environ Health 1999; 72: 496–506.
25. Tacke J, Schmidt A, Fartasch M, Diepgen TL. Occupational contact dermatitis in bakers, confectioners and cooks – a population-based study. Contact Dermatitis, 1995; 33: 112–117.
26. Dickel H, Bruckner TM, Schmidt A, Diepgen TL. Impact of atopic skin diathesis on occupational skin disease incidence in a working population. J Invest Dermatol 2003; 121: 37–40.
27. Funke U, Fartasch M, Diepgen TL. Incidence of work related hand eczema in apprenticeship – first results of a prospective cohort study in the car industry. Contact Dermatitis 2001; 44: 166–172.