

CLINICAL REPORT

The Occurrence of Atopic Dermatitis in Greenland

Finn SCHULTZ LARSEN¹, Åke SVENSSON², Thomas L. DIEPGEN³ and Ellis FROM⁴

¹*Dermatologic Clinic, Fredericia, Denmark,* ²*Department of Dermatology, Malmö University Hospital, Sweden,* ³*Department of Social Medicine, Occupational & Environmental Dermatology, University Hospital Heidelberg, Germany,* and ⁴*Department of Dermato-venereology, Nuuk Hospital, Greenland*

Until recently there was no information available on the prevalence of atopic dermatitis in Greenland. Our objective was to determine the prevalence of atopic dermatitis in younger schoolchildren in Greenland. In the autumn of 2000 we used our previously elaborated questionnaire in a cross-sectional study of 954 schoolchildren aged 7–8 years, who lived in five Greenlandic towns. The findings were compared to data on atopic dermatitis from Denmark. The response rate was 65% (622). The lifetime prevalence of atopic dermatitis was calculated to be 14.0% (95% confidence interval 11.3–16.7) using our standard score criteria with an absolute lower limit estimate of 4.5%. Taking the response rate of 65% into consideration this study indicates that in 2000 the lifetime prevalence of atopic dermatitis among younger schoolchildren in Greenland was in the range of 10–15%. Key words: school-children; prevalence; environment; ethnicity.

(Accepted August 23, 2004.)

Acta Derm Venereol 2005; 85: 140–143.

Prof. Dr Thomas L. Diepgen, University Hospital Heidelberg, Department of Clinical Social Medicine, Occupational & Environmental Dermatology, Bergheimer Str. 58, D-69115 Heidelberg, Germany. E-mail: thomas_diepgen@med.uni-heidelberg.de

Nowadays numerous epidemiological surveys on atopic dermatitis (AD) have been performed around the world (1). However, there are still unexplored, sparsely populated and remote geographic locations with unique environment and ethnic background, where investigations may shed new light on the nature of AD. Greenland is such a place. In many respects the Inuit people of Greenland have a pattern of diseases that differs from prevailing health problems in Western societies (2). We have recently suggested a strategy for epidemiological surveillance of AD (3), and here we report the findings from a study carried out in Greenland.

MATERIALS AND METHODS

As of 1 January 2000 there were 56,124 persons living in Greenland: 87% Inuits, 12% Danes and 1% other nationalities. In all, 82% of the inhabitants were living in towns, half of them

in Nuuk, Sisimiut and Ilulissat (4). During the early 20th century the Danes constituted less than 3% of the population. In the modernization of the Greenlandic society after World War II an increasing proportion of Danes came to Greenland, reaching a peak level of 18% in 1988. More than 90% of migration in and out of Greenland relates to Denmark (4).

According to national statistics there were a total of 11,164 schoolchildren and approximately 2215 in the 2nd and 3rd grades (7 and 8 years of age, born 1992–93, (4)). The proportion of children seeking schools in the remaining small villages or trading stations constituted 17%; 2% of schoolchildren were attending special classes. The latter 19% of children did not participate in this study, leaving a total background population of about 1794 schoolchildren in 2nd and 3rd grade, all living in Greenlandic towns.

Study design

The investigation was designed as a cross-sectional questionnaire study of 7- and 8-year-old children in some of the large towns in Greenland. After permission was obtained from the ethics committee and the school authorities, a pilot study was performed in Nuuk in March 2000. In September 2000 one of us (F.S.L.) travelled along part of the coastline of Greenland and visited all schools in the towns of Nuuk, Sisimiut, Ilulissat, Uummannaq and Tasiilaq. All children in 2nd and 3rd grade were given a one-page questionnaire and an informative letter without any further definition of AD. The children were asked to return the completed questionnaire in a week. The wording of the questions was exactly as described previously (3). In addition, the following question was asked: 'Was your child born in Greenland' – yes/no. It has been shown that birthplace is a reliable indicator of ethnic identity as 97% of individuals born in Greenland consider themselves to be Inuits (5). One side of the questionnaire was in Danish, the other in Greenlandic (translated by a medical doctor, born in Greenland, educated in Denmark and trained in dermatology).

The sensitivity and specificity of the questionnaire have previously been evaluated (3, 6). By using a cut-off point of 50 points or more we and others have found a sensitivity of 88–94% and a specificity of 78–89% (3, 6). If a lower-limit prevalence estimate of 80+ points was chosen, both sensitivity and specificity were high (89% and 96% respectively), and the percentage of children correctly classified (the accuracy) could be calculated as 94% (6). According to earlier publications (3, 6) children with ≥ 50 points were considered to have or have had AD (lifetime prevalence). The data from Greenland were compared with those reported from Denmark using the same questionnaire (3).

RESULTS

In the towns visited in Greenland there was a total of 954 schoolchildren in 2nd and 3rd grade, which means

Table I. Participating schools in Greenland and their response rates

| Schools | Response rate | % |
|----------------------------|---------------|----|
| S. Kleinschmidt, Nuuk | 76/101 | 75 |
| Qorsussuag, Nuuk | 52/70 | 74 |
| Qajasat, Nuuk | 61/114 | 54 |
| Nuussuup Atuarfia, Nuuk | 39/71 | 55 |
| Ukaliasaq, Nuuk | 79/96 | 82 |
| School 1, Sisimiut | 73/81 | 90 |
| School 2, Sisimiut | 64/121 | 53 |
| Jørgen Brøndlund, Ilulisat | 42/93 | 45 |
| Mathias Storch, Ilulisat | 50/94 | 54 |
| School, Tasiilaq | 47/66 | 71 |
| Edvard Kruse, Uummannaq | 25/47 | 53 |

that we approached about 954/1794, i.e. ~50% of all children in the age group. The response rate was 622/954 (65%), varying from 45% to 90% in the 11 schools involved (Table I). The front of the questionnaire (presented in Danish) was completed by 391/622 (63%) of the participating parents, the back of the page (presented in Greenlandic) was completed by 231/622 (37%). The parents did not specify sex for 11 children (11/622, 2%), and the question on birthplace was not answered for 14 children (14/622, 2%). In general, about 1–3% of data was missing for each question. The proportion of missing data and the answer 'don't know' constituted in total 9% (957/10,594), and they were incorporated in the calculations as a 'no'. At the end of the questionnaire we asked about the child's name and address. This was filled out by 617/622 (99.8%) of the parents.

Of the 622 children, 87 (14.0%) had at least 50 points according to our questionnaire and 28 (4.5%) had at least 80 points (Table II). The lifetime prevalence of AD in 7–8-year-old school children born in 1992–93 did not differ significantly between the 546 Inuit and 62 Danish children. However, the lifetime prevalence of AD in children living in Greenland (14.0%, 95% CI 11.3–16.7) was significantly lower compared with the lifetime prevalence in children of the same age living in Denmark (22.9%, 95% CI 19.0–26.8%) according to our earlier study (3).

The distribution of positive answers on location of eczema, atopic features, family history of atopy, age at onset and duration of eczema in AD children from Greenland is presented in Table III. Also, 29 of 87

children with AD (33.4%) reported concomitant allergic rhinitis and/or asthma.

DISCUSSION

Diagnosis and treatment of atopic eczema is carried out by several medical specialities and by visiting doctors from Denmark. In the years 1992–94 a paediatrician travelling to some of the major towns on the west coast of Greenland diagnosed 33 children (average age 6 years) with AD among the 350 children referred to him for all sorts of paediatric problems, and he found that AD was a substantial problem (7). In a questionnaire study from the Danish Institute of Clinical Epidemiology based on a representative sample of 653 Greenlandic children aged 0–12 years and born around 1980–92, 7.7% were reported to have had skin rashes, eczema or pruritus within the preceding 14 days (5).

Recently, a survey was done among all infants born in 1996–98 in Sisimiut, Greenland (8). The main purpose was to study respiratory tract infection. In total, 215 children were born during the study period and 130 (60%) were followed until 2 years of age. A study team of 11 trained medical Danish students carried out a structured interview with clinical examination at the Sisimiut Health Centre. The diagnosis of AD relied on the Hanifin-Rajka criteria (9). The median time of follow-up was 335 days and it was found that 24 (16.8%) developed AD. The median age at the first clinical presentation of AD was 198 days, and the cumulative incidence rate could be calculated as 17.7 per year. The interview with the parents included questions on heredity, education and employment, and the validity of the study is substantiated by the fact that a subsequent multivariate analysis of this limited cohort confirmed that maternal history of AD and high social class are significant risk factors for the development of AD in Greenland too (1).

Our survey, covering about 50% of all 7- and 8-year-old children born in 1992–93 and living in the major towns of Greenland, including Sisimiut, resulted in a cumulative prevalence of AD of 14% when a cut-off point of ≥ 50 was chosen for the questionnaire, as used previously in Denmark, Sweden, Germany and the USA (3, 6, 10). There is a lower prevalence of AD in Greenland than in Scandinavia (3), and it is noteworthy that the cities of Kiruna and Sør-Varanger in the northern part of Scandinavia – with a prevalence of AD

Table II. The frequencies of at least 50 points or at least 80 points in the questionnaire completed by 622 children from Greenland

| Number of points | Total (n=622) | | Inuits (n=546) | | Danes (n=76) | |
|------------------|---------------|------------------|----------------|------------------|--------------|-----------------|
| | No. | % (95% CI) | No. | % (95% CI) | No. | % (95% CI) |
| ≥ 50 | 87 | 14.0 (11.3–16.7) | 76 | 13.9 (11.1–17.1) | 11 | 14.5 (7.5–24.4) |
| ≥ 80 | 28 | 4.5 (3.0–6.4) | 24 | 4.4 (2.8–6.5) | 4 | 5.3 (1.5–12.9) |

Table III. Distribution of positive answers on location of atopic dermatitis (AD), atopic features, personal and family history of atopy, age of onset and duration of eczema in schoolchildren aged 7–8 years with at least 50 points on the questionnaire (see Table II)

| Parameter | AD (n=87) | |
|--------------------------|-----------|----|
| | n | % |
| Localization | | |
| Elbow/knee folds | 65 | 75 |
| Wrist/ankles | 36 | 41 |
| Face/neck | 34 | 39 |
| Hands/arms/legs | 47 | 54 |
| Body | 42 | 48 |
| Atopic features | | |
| Unusually dry skin | 62 | 71 |
| Irritation from textiles | 35 | 40 |
| Itching when sweating | 43 | 49 |
| Seasonal variation | 45 | 52 |
| Worsening by stress | 12 | 14 |
| Personal history | | |
| Asthma | 18 | 21 |
| Hay fever | 17 | 20 |
| Family history | | |
| Atopic eczema | 47 | 54 |
| Asthma | 20 | 23 |
| Hayfever | 19 | 22 |
| Age at onset | | |
| Before 2 years | 56 | 64 |
| Between 2 and 5 years | 24 | 28 |
| After 5 years | 7 | 8 |
| Duration of eczema | | |
| <2 years | 11 | 12 |
| 2–3 years | 26 | 30 |
| 3–5 years | 25 | 29 |
| >5 years | 25 | 29 |

at 30–35% – and the towns of Sisimiut and Ilulissat in Greenland all are situated at around 69° latitude (1, 11, 12). Taken together, the present investigation and the findings by Tamsmark and co-workers (8) indicate that there is an increasing prevalence of AD among children born in Greenland in the period from 1992–93 to 1996–98, which is further substantiated by an increase in the frequency of atopy in general from 1987 to 1998 as measured by specific IgE against the eight most common allergens in 859 adults, likewise from Sisimiut (13). This is in accordance with the widespread belief that the prevalence of atopic disorders (AD, allergic rhinitis, allergic asthma) has been increasing over recent decades, which seems to be associated with changes in environmental and lifestyle factors, especially in western countries (14, 15). The hygiene hypothesis as proposed by Strachan (16) suggests that eradication of common

infectious diseases of childhood leads to a skewing of the immune system with increased development of atopy. In a recent study, however, the incidence of AD in Danish children increased after measles, mumps and rubella vaccination and measles infection, which is surprising in view of the hygiene hypothesis (17).

A latent weakness of our study is the relatively low response rate of 65%; however, this is in accordance with earlier inquiries in Greenland and significantly lower than in Scandinavia (2, 3). It is difficult to explain why for example the two schools in Sisimiut – situated about 1 km apart – had response rates of 53% and 90% respectively (Table I). It could be expected that the generally well-educated Danish families were more likely to complete and return the questionnaire, but this seemed not to be the case, as 90% of the participating parents stated that their children were born in Greenland. In 1997, 89% of all children born in Greenland were born to mothers who were likewise born in Greenland (4). However, we cannot completely exclude the possibility that families with eczema or other skin problems may be more inclined to respond. Nevertheless, the prevalence of AD (50+ points) was actually at the same level in the low- versus the high-responding schools (Table I).

A closer inspection of the data shows a higher frequency of flexural eczema in Denmark, indicating that the clinical pattern of AD may not be the same all over the world. The occurrence of parental hay fever was less frequent in Greenland than in Denmark (25% according to (3) versus 14%; $p < 0.001$). It is also very interesting that there were no differences in the prevalence of AD in the Inuit and Danish schoolchildren, and especially that the Danish children living in Greenland had not reached the prevalence level found in Denmark (1).

REFERENCES

- Schultz Larsen F, Hanifin JM. Epidemiology of atopic dermatitis. *Immunol All Clin North Am* 2002; 22: 1–24.
- Bjerregaard P, Young TK. The circumpolar Inuit: health of a population in transition. Copenhagen: Munksgaard, 1998.
- Schultz Larsen F, Diepgen T, Svensson Å. The occurrence of atopic dermatitis in North Europe: an international questionnaire study. *J Am Acad Dermatol* 1996; 34: 760–764.
- Grønland 2000. Grønlands Statistik. Grønlands Hjemmestyre. Atuagkat, Nuuk, Grønland.
- Curtis T, Bjerregaard P, Iburg KM. The family, children and health in Greenland. Copenhagen: Danish Institute of Clinical Epidemiology, 1997: 39–47 (in Danish).
- Laughter D, Istvan JA, Tofte SJ, Hanifin JM. The prevalence of atopic dermatitis in Oregon schoolchildren. *J Am Acad Dermatol* 2000; 43: 649–655.
- Becker-Christensen FG. Children's diseases and health problems in Greenland. An epidemiological investigation. *Ugeskr Laeger* 1998; 160: 2856–2862.

8. Tamsmark TH, Koch A, Melbye M, Mølbak K. Incidence and predictors of atopic dermatitis in an open birth cohort in Sisimiut, Greenland. *Acta Paediatr* 2001; 90: 982–988.
9. Hanifin JM, Rajka G. Diagnostic features of atopic dermatitis. *Acta Derm Venereol* 1980; 92(Suppl): 44–47.
10. Broberg A, Svensson Å, 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.
11. Åberg N, Hesselmar B, Åberg B, Eriksson B. Increase of asthma, allergic rhinitis and eczema in Swedish school-children between 1979 and 1991. *Clin Exp Allergy* 1995; 25: 815–819.
12. Dotterud LK, Kvammen B, Lund E, Falk ES. Prevalence and some clinical aspects of atopic dermatitis in the community of Sør-Varanger. *Acta Derm Venereol* 1995; 75: 50–53.
13. Krause TG, Kock A, Friberg J, Poulsen LK, Kristensen B, Melbye M. Frequency of atopy in the Arctic in 1987 and 1998. *Lancet* 2002; 360: 691–692.
14. Diepgen TL. Is the prevalence of atopic dermatitis increasing? In: Williams HC, ed. *Atopic dermatitis. The epidemiology, causes and prevention of atopic eczema*. Cambridge: Cambridge University Press, 2000: 96–109.
15. Diepgen TL. Atopic dermatitis – the role of social factors. *J Am Acad Dermatol* 2001; 45: 44–48.
16. Strachan DP. Hay fever, hygiene and household size. *BMJ* 1989; 299: 1259–1260.
17. Olesen AB, Juul S, Thestrup-Pedersen K. Atopic dermatitis is increased following vaccination for measles, mumps and rubella or measles infection. *Acta Derm Venereol* 2003; 83: 445–450.