

CLINICAL REPORT

Stable Incidence of Atopic Dermatitis among Children in Denmark during the 1990s

Anne Braae OLESEN¹, Karen BANG¹, Svend JUUL² and Kristian THESTRUP-PEDERSEN¹¹Department of Dermatology, Aarhus University Hospital, Section AAS, and ²Department of Epidemiology and Social Medicine, University of Aarhus, Aarhus, Denmark

An increase in the prevalence of atopic dermatitis (AD) has been reported since the 1960s. The increase could be due to many factors including a genuine increase of incidence or duration of AD. We decided to study if the increasing trend persisted during the 1990s by comparing the cumulative incidence of AD in 1993 and 1998. Further, we studied the severity and management of AD among children. Two samples of children born in Denmark were drawn from the Danish Medical Birth Register. In the 1993 and 1998 studies a mailed questionnaire with identical questions concerning AD was sent out. In the 1998 follow-up study the questionnaire included a severity score and questions concerning management of AD. In the 1993 study the cumulative incidence of AD at age 7 was 18.9% and in 1998 it was 19.6%. There was no difference in the age-adjusted AD incidence in the 5-year observation period. In the 1998 study, 81% had mild to moderate AD, 90% had been seen by a doctor at least once, 36% had mainly been treated by a dermatologist, and 2% had been hospitalized. It should be kept in mind that we base most of our common knowledge of the disease on AD patients selected for management in dermatology clinics and departments. **Key words:** atopic dermatitis; incidence; severity; therapy.

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Anne Braae Olesen, MD, PhD, Department of Dermatology, University Hospital of Aarhus, Section AAS, P.P. Ørumsgade 11, DK-8000 Aarhus C, Denmark. E-mail: Annebraae@dadlnet.dk

A three-fold increase in atopic dermatitis (AD) prevalence among children aged 0–7 years was reported in Denmark, from 3% in 1960–1964 to 10% in 1970–1974 (1, 2). These findings are supported by prevalence observations in children born in 1946, 1958 and 1970 in Great Britain (3). A real increase in prevalence has been suggested, and studies of incidence and chronicity of the disease have been requested (4). Little is known about the chronicity and severity of the disease, partly because of a lack of investigational instruments for large-scale survey studies. Few clinical scoring systems such as SCORAD (5) and SASSAD (6) represent standardized methods of assessing AD based on current

symptoms and findings. In the present study a severity index was used including information on chronicity of the disease (7). Little is known concerning the use of doctors, hospitalizations and treatments among children with AD. We therefore aimed to compare the cumulative incidence of AD among children in 1993 and 1998, and to assess the severity and management of AD in the 1998 cohort study.

MATERIALS AND METHODS

Participants

The 1993 study consisted of a stratified sample of 1060 children, drawn from a study cohort consisting of all 7862 singleton born children born between 1 January 1984 and 31 December 1986 at the Aarhus Maternity Hospital to mothers living in the municipality of Aarhus, Denmark (8). The stratified sample had an over-representation of pre-term children (gestational age <37 weeks), which was matched with samples of children born at term (gestational age 37–40 weeks) and children born post-term (>40 weeks). In the summer of 1993 a questionnaire including a question on a doctor's diagnosis of AD was sent to the sample families and the average follow-up time since birth was 6.8 years (6.5–9.5 years).

The 1998 study consisted of a random sample of 10,000 children born in Denmark from 1984 to 1994, drawn from the Danish Medical Birth Register (9) for several purposes: first to study associations between AD and possible risk factors and indicators and second to serve as a control group in a study of association between AD and insulin-dependent diabetes mellitus (10). In the summer of 1998 a questionnaire was sent to 9744 sample families after excluding 256 families who no longer lived in Denmark.

The study was approved by the Ethical Committee of the County of Aarhus, Denmark and the Danish Data Protection Agency.

Questionnaire

In the 1993 study a one-page questionnaire was sent to the 1060 families. The questionnaire included questions on history of AD, age of onset of disease, other atopic diseases and family history of atopy.

In the 1998 study a 12-page questionnaire was sent to the 9744 families. This questionnaire included questions related to AD using a modified version of the UK Working Party's questionnaire for AD (7). This questionnaire included the same questions used in the 1993 study concerning AD

diagnosed by a doctor (Appendix). Further, questions concerning the use of doctors, hospital admission and treatments of AD were included, and the severity of AD was scored according to the Marselisborg Hospital severity score (1 to 7 points) (7, 10). In the Marselisborg Hospital severity score chronicity and relapse were expressed by the number and duration of eczema episodes in relation to time since AD onset, and it further included present extent of AD, periods of at least 1 week of disturbed sleep at night and onset during the first year of life (7). The Marselisborg Hospital severity score was graded into mild, moderate and severe (Table I).

Statistical methods

As a result of the sampling procedure, the 1993 study cohort was not representative of the entire cohort of singletons born in Aarhus as regards gestational age and sex distributions. Therefore, the estimate of cumulative incidence was adjusted by direct standardization to the gestational age and sex distribution in the entire 1993 cohort. The cumulative incidence was estimated from age-specific incidence rates by Kaplan-Meier's method for comparison.

RESULTS

In the 1993 study the cumulative incidence of AD at age 7 was 18.9% (Fig. 1). The response rate was 93%. In the 1998 study the cumulative incidence at age 7 was 19.6% (Fig. 1), and the response rate was 79%.

In the 1998 study 81% of children with AD had mild to moderate disease, but 13% were categorized as having severe disease (Table I). A doctor had seen 90% of all AD cases at least once concerning this skin condition but 5% had never attended a doctor with this skin condition. It was found that 36% had mainly been treated by a dermatologist and 14% by a paediatrician. Further, 10% of all children with AD had attended an alternative therapist concerning their skin condition. Among all 1385 AD children only 28 (2%) had ever been hospitalized because of AD.

Low and high potency topical corticosteroids were reported as a frequently used treatment among 50% of the AD children (Table II). The use of low potency topical corticosteroids alone was reported among 25% of the children with AD. Low potency topical corticosteroids such as hydrocortisone 1% can be bought without

Table I. From the 1998 study: the Marselisborg Hospital (MH) severity score among 1385* children with atopic dermatitis (AD) defined according to the UK Working Party's algorithm for AD

The MH severity score	Frequency n (%)
Mild (1–3 points)	660 (47.6)
Moderate (4 or 5 points)	458 (33.1)
Severe (6 or 7 points)	177 (12.8)

*Data were missing for 90 children with AD (6.5%).

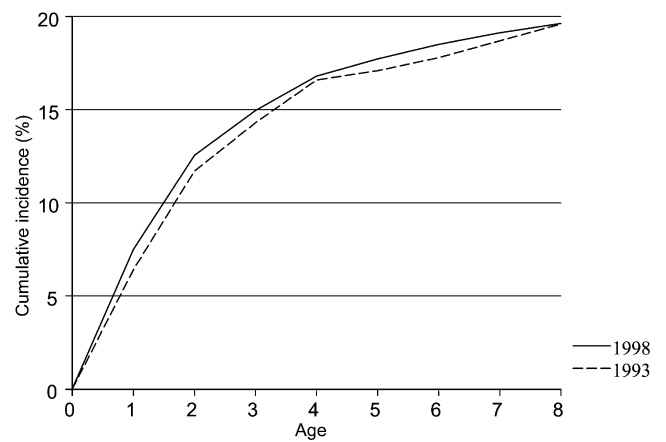


Fig. 1. A comparison of the cumulative incidence rate of atopic dermatitis (AD) defined as a doctor's diagnosis of AD in the 1993 (---) and 1998 (—) studies.

prescription in Denmark and was given as an example in the questionnaire. Emollients were used as part of the treatment among 76% of all AD children but 16% did not use emollients or oil-in-water (Table II). Antibiotics had been used at least once among 9% of children with AD, whereas very few had been treated with tar, topical potassium permanganate 0.03% baths or UV phototherapy.

DISCUSSION

We observed no difference in the age-adjusted cumulative incidence of AD over a 5-year observation period in Denmark. Most children with AD had mild to moderate AD and very few children had been hospitalized. Most

Table II. From the 1998 study: treatments reported as frequently used among 1385* children aged 3–15 years with atopic dermatitis

Frequently used regimens	Frequency n (%)
Emollients	1046 (75.5)
Oil-in-water (only)	62 (4.5)
No emollients or oil-in-water	217 (15.7)
Low and high potency topical corticosteroids	698 (50.4)
Low potency topical corticosteroids (only)†	342 (24.7)
No topical corticosteroids	285 (20.6)
UV phototherapy	4 (0.3)
Tar	54 (3.9)
Topical potassium permanganate baths	11 (0.8)
Antibiotics	128 (9.2)

*Data were missing for 60 children (4.3%).

†The responder was informed that it could be bought without prescription and topical hydrocortisone cream 1% was given as an example.

children attended a doctor at least once, and one-third of all children had mainly been treated by a dermatologist. Also paediatricians and alternative therapists frequently treated the condition. Emollient was the most common reported treatment and topical corticosteroids the second most frequently reported treatment.

Earlier studies reported an increased AD prevalence from the 1940s until the 1970s (1–3, 11). A real increase has been suggested in either the AD incidence, which is the number of new cases in a defined period, or an increased duration of AD, which also would result in an increased AD prevalence (4). However, alternative explanations such as increased recognition of the disease among doctors and parents, misclassification of the disease and recall problems in retrospective studies may have contributed to the observed magnitude of the 'epidemic' of AD. To study changes in incidence and duration of the disease, longitudinal observational studies of cohorts representative of the population in a geographically well-defined area are necessary, and investigational instruments of chronicity and severity are needed (7). The magnitude of the cumulative AD incidence presented in this study is in line with a study performed in Odense, Denmark, in 1995–1996, where Mörtz *et al.* (12) found a cumulative incidence of AD of 21.3% among children at the age of 12 and a Swedish study by Broberg *et al.* who found a cumulative incidence of AD among 5–6-year-olds of 20.7% in 1997–1998 (13). However, in countries with larger populations of immigrants and refugees there is some evidence that the incidence of AD has also been increasing during the 1990s. In a study from Australia the Chinese immigrants had a significantly higher incidence of AD compared with both Vietnamese and Caucasian infants (14).

Denmark has a population of immigrants and refugees of approximately 5% and our observations suggest that a saturation level may have been reached in the homogeneous population of Denmark, i.e. that the proportion of individuals that are genetically susceptible to AD is around 20% in Denmark. In countries with large immigrant and refugee populations the incidence of AD may be much higher because of genetic differences between populations and the incidence may increase in periods of high immigration caused by the environmental contribution to the expression of AD (14).

Furthermore, it is important to stress that the stable incidence in our study was observed over a relatively short observation period of 5 years, which of course limits the power of the observation.

The use of a doctor's diagnosis of AD might have introduced a skewness towards recognition of the more severe cases of AD. However, in the 1998 follow-up study it was possible to separately compare a doctor's diagnosis of AD with an algorithm of symptoms of AD,

and the cumulative incidence from 0 to 14 years of age was quite similar, although the doctor's diagnosis of AD was a little more frequent in all age groups. This observation suggests that the observed cumulative incidence is not severely underestimated in the present study.

The present studies were not designed to compare duration of the disease, which is partly due to lack of investigational instruments for the purpose.

In the 1998 study a severity score was developed to analyse the course of AD (7, 10). The Marselisborg Hospital severity score does not include use of doctors or treatments because health behaviour may be associated with confounding factors such as socio-economic class and educational level of the parents (15–17). The severity grading presented in this study gives a picture of the course of AD among a random sample of children with AD in Denmark. The score shows that most children with AD in a population have a mild to moderate disease, but further follow-up is needed to describe the clinical course of AD along with prognostic predictors of the disease. The complexity of constructing a severity score system that is valid for epidemiological studies was described by Emerson *et al.* (18), who focused on the theoretical and practical problems of defining the severity of AD using variables like disease intensity, extent, and course, including the Children's Life Quality Index. The importance of critical attitudes towards severity scores is inevitable, but the important question to raise when defining and validating a severity score is: What is the purpose of measuring the severity of AD?

In the 1998 study low and high potency topical corticosteroids were the second most frequently used treatment. Only very few children were hospitalized and a little more than one-third of AD children had been treated by dermatologists. This should remind us that we base our common knowledge of AD among children in a selective group. The management of AD among children in Denmark reported here is in marked contrast to the management of the disease reported in an American study, where most AD children were reportedly seen by dermatologists (19). However, it should be kept in mind that the reports of management were done by the doctors themselves and do not reflect the management of AD among the population of children in USA.

Emollients were the most frequently used treatment, but a group of AD children did not use this treatment frequently. Most AD children had seen a doctor concerning their skin disease, but lack of reported emollient use may be due to lack of knowledge of the recommendations of emollient use for AD both between and during relapse of the disease.

In conclusion, no difference in age-adjusted cumulative incidence of AD was observed from 1993 to 1998,

which may reflect that a saturation level of AD has been reached in a homogenous Danish population. Most AD children had mild to moderate AD disease according to our grading. Most children had been seen by a doctor at least once concerning the skin condition, but very few children with AD had been hospitalized. The most frequently reported treatments were emollients and topical corticosteroids. It should be kept in mind that we base most of our common knowledge of AD on children selected for management in dermatological clinics and departments.

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APPENDIX. The identical questions used in the 1993 and 1998 questionnaires

A. Have you ever been informed by a doctor that your child has atopic eczema? Yes ☐ No ☐

B. How old was your child when this skin disease began? _____ Years _____ Months

C. Have you ever been informed by a doctor that your child has asthma? Yes ☐ No ☐

D. Have you ever been informed by a doctor that your child has hay fever? Yes ☐ No ☐

E. Please indicate year of birth for your child, his/her siblings and parents, and put an X for the diseases which the child, his/her siblings and parents have had:

Siblings no./parents	1	2	3	4	5	6	mother	father
Year of birth								
Atopic eczema								
Asthma								
Hay fever								