

Prevalence of atopic disease among Danish school children

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As a result of a 1990 survey by questionnaire, the symptoms of atopy among all 4,952 school children aged 5 to 16 years in the municipal district of Viborg, Denmark, were registered. Random checks, made among children who were recorded as having symptoms, and others who were recorded as having none, accorded well with the information supplied by the parents about symptoms and the clinical diagnosis of a specialist; 10.5% of all school children had rhinitis, 7% had atopic eczema, 3.2% had urticaria and 4.5% had asthma; ¼ of all those questioned had shown symptoms within the last year, and a further 13% of all the children were reported as having had atopic symptoms that had disappeared more than a year previously. Of the children showing symptoms within the last year before the survey, ⅓ had gone to a doctor. Of the children with present symptoms, largely asthma, ¼ had been referred to a hospital allergy clinic. For ⅓ of the children with present symptoms, these had led to no contact with a doctor. Of the cases with present symptoms, 6.5% had had contact with natural healers or chiropractors. Rhinitis and asthma were most frequent among boys, while atopic eczema was most frequent among girls. For both sexes, the frequency of rhinitis increased during their years at school, while the frequency of skin symptoms fell.

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This survey details the prevalence of atopic disease among the entire community of school children in a Danish municipality. Several surveys of atopic symptoms suggest a marked rise within the last 30 to 40 years, particularly as regards hay fever and eczema, but possibly also in regards to asthma. Heredity and environment have a decisive influence on the prevalence of atopic symptoms, as do geographic, climatic and cultural conditions (1, 2). The prevalence of asthma does not seem to vary according to social status within a well-defined cultural area (3). Numerous surveys deal with the prevalence of single symptoms within the sphere of atopic disease, in particular asthma. A few surveys have, however, studied the general prevalence of asthma, allergic rhinitis, atopic eczema urticaria and other symptoms of hypersensitivity among children altogether (4–6). The present survey is based upon a study by questionnaire of the prevalence of all atopic symptoms among school children between the ages of five and sixteen in a single year. The object has been to shed light on the prevalence of all those symptoms that the gen-

eral population regard as allergy or allergy-related hypersensitivity. The degree of accordance between the completed questionnaires and a medical opinion is shown by means of a clinical examination of random samples undertaken by a pediatrician.

Material and methods

Viborg has a population of 40,000, a town with some light industry in an agricultural area. The local hospital has a specialized pediatric department. In the autumn of 1990 a questionnaire was sent to the parents of all 4,952 school children in the Viborg municipal district, from nursery-school classes to 10th grade. For practical reasons it was decided in advance not to include pupils in special classes for foreign pupils, for handicapped children, for children and adolescents with behavior disturbances, and for adolescents in youth schools. In a single instance in a small school it was not possible to establish the necessary cooperation with regard to the survey, and the few question-

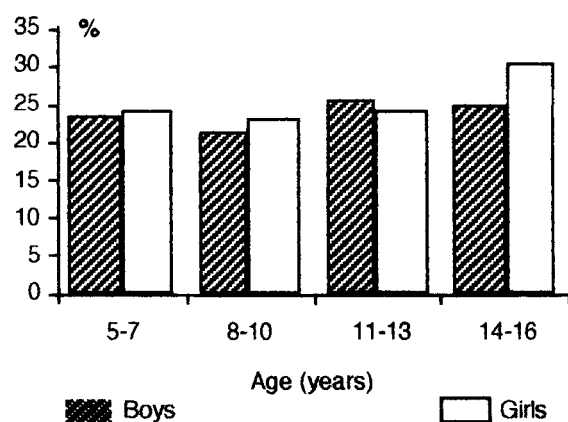


Fig. 1. All atopic symptoms within the last year. Percent of all boys and girls in each age group.

naires from that school were not included in the study. The criteria for excluding these schools have no systematic connection with the occurrence of atopic symptoms. The questionnaires were distributed and collected by the children themselves in cooperation with their form-teachers, the school administration, and the school health service.

The questionnaire was designed to register all atopic symptoms. The non-specific word "hypersensitivity" was used, since in common parlance it covers both allergy-related and pseudo-allergic symptoms. Respondents were asked to divide their answers into two categories: "Now", i.e. within the last year, and "Earlier". The parents were asked to specify whether the atopic symptoms were noted only by the parents themselves, or by the family doctor, by a specialist, at a hospital clinic, by a natural healer, chiropractor or others. They were also asked whether the family suspected any specific causes that might have brought on the atopic symptoms, what such causes might be, and whether the cause had been ascertained by a specialist. Emphasis was laid on an elaboration of ascertained or suspected causes in the child's diet

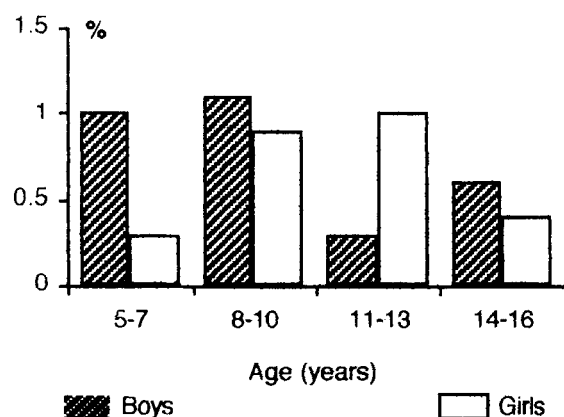


Fig. 2. Quincke edema within the last year. Percent of all boys and girls in each age group.

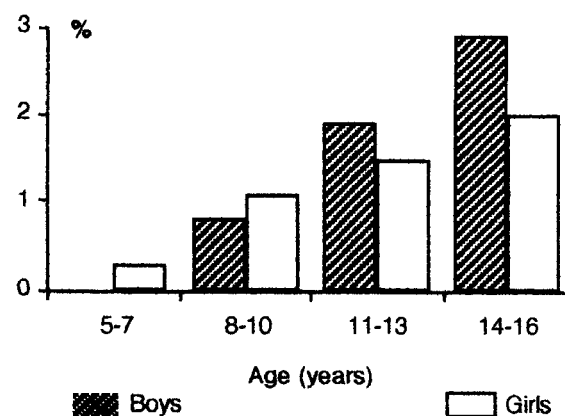


Fig. 3. Itching mouth and throat within the last year. Percent of all boys and girls in each age group.

or additives in the diet, since the survey was primarily initiated for the purpose of examining the significance of food additives to atopic symptoms (7).

A group of 140 children with present atopic symptoms, selected by stratified sampling, together with 98 children who, according to their completed questionnaires, had never had such symptoms, was examined by a pediatrician (GF) to obtain a clinical diagnosis and for exposure to food additives under controlled conditions. This representative sample allowed a comparison of the information given by the parents with the clinical diagnosis. A spot test was also made of 49 children who had not answered the questionnaire in one of the schools. This was to register the prevalence of symptoms in children who had not returned the questionnaire.

Statistics – The prevalence of atopic symptoms in girls and boys were compared using chi squared test (SAS/STAT™ release 6.03). The increase or decrease of symptoms with age was analysed using the trend in proportions test.

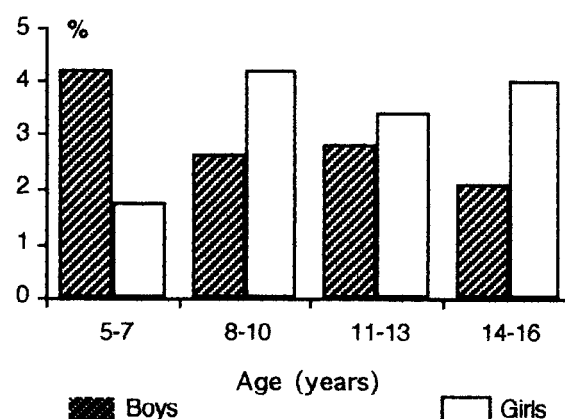


Fig. 4. Urticaria within the last year. Percent of all boys and girls in each age group.

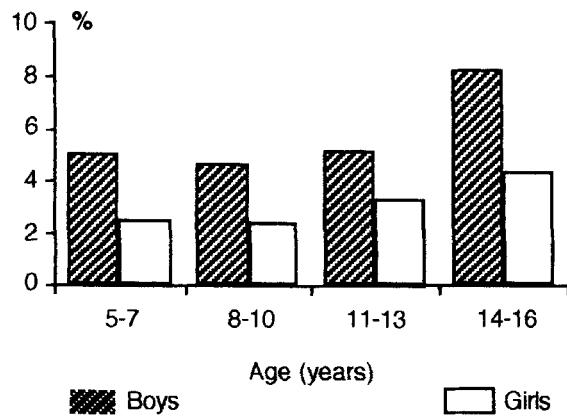


Fig. 5. Asthma bronchiale within the last year. Percent of all boys and girls in each age group.

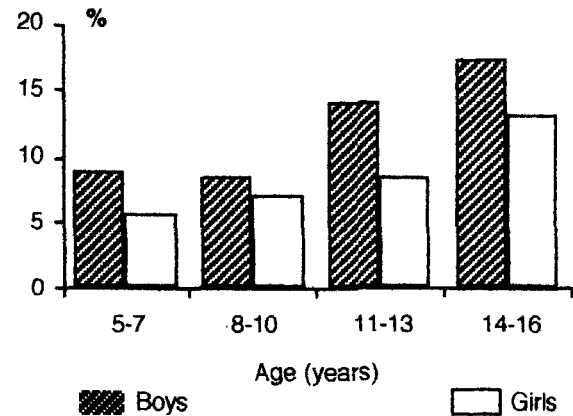


Fig. 7. Rhinitis within the last year. Percent of all boys and girls in each age group.

Results

A total of 4,274 questionnaires were completed (86.4%); 1,052 children (24.6%) registered atopic symptoms within the last year, and a further 555 children (13%) registered atopic symptoms at an earlier period. The following tables and other results are concerned solely with the 1,052 children who registered symptoms within the last year, "now". The one-year prevalence of atopic symptoms was constant in all school-age groups, and equally distributed between the sexes (Fig. 1). The occurrence of individual symptoms varied, however, with age and sex (Figs. 2-7). Airway symptoms, i.e. rhinitis and asthma, occurred most frequently among boys ($p < 0.001$). Atopic eczema was most common among girls ($p < 0.001$).

The frequency of atopic eczema decreased with age for both sexes, but the decrease was only significant for the girls ($p < 0.001$). The frequency of rhinitis increased with age for both sexes ($p < 0.01$), but this was most marked for the boys ($p < 0.001$). The prevalence of asthma showed no more than a minor increase with age, not statistically

significant. Itching in mouth and throat, closely correlated with rhinitis, showed increased frequency with age, but this was only statistically significant for boys ($p < 0.001$). The prevalence of the various symptoms in different age groups and sexes among all 4,274 children is illustrated in Table 1. Rhinitis was found in 10.5%, atopic eczema in 7%, urticaria in 3.2% and asthma in 4.5% of all school children.

Table 2 gives the association between the individual atopic symptoms. One can, for instance, see that 61% of children with asthma also had rhinitis, while 26% of children with rhinitis also had asthma; 52% of children with rhinitis had noted that the symptoms appeared at certain periods of the year; 19% noted that their rhinitis had no connection with the season, and the rest of the children with rhinitis had made no answer to the question about seasonal variation.

Table 3 shows the results of the spot-control test relating the symptoms reported by the parents to the clinical diagnosis made by a pediatrician. This investigation was done in connection with the controlled study for intolerance to food additives (7) mentioned earlier.

A total of 98 children (not described in the table), were selected as healthy controls by random sampling among children who, according to the questionnaire, had never shown any atopic symptom. At the clinical anamnesis and examination, 5 of these 98 "healthy" children were classified as having at least one atopic symptom within the last year or earlier (mild skin symptoms). The 140 children described in Table 3 represents a random sample, stratified according to symptoms, of the 1,052 children with present atopic symptoms according to the questionnaire. In 6 of these children, anamnesis and clinical examination by the pediatrician could not confirm the parent's assumption of atopic disease in the child. Generally,

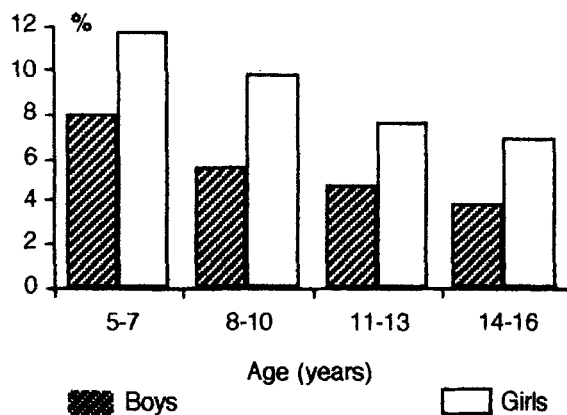


Fig. 6. Atopic eczema within the last year. Percent of all boys and girls in each age group.

Table 1. Present atopic symptoms in different age groups, boys and girls, 1438 symptoms in 1052 children. The total number of children is given in the left column. For each symptom, the percent of children in each age group with that specific symptom is stated. Qu = Quincke edema, It = itching in mouth and throat, GI = gastrointestinal symptoms, Ur = urticaria, As = asthma, AE = atopic eczema, Rh = Rhinitis, O = other symptoms.

	all ch. N	Qu %	It %	GI %	Ur %	As %	AE %	Rh %	O %
boys, age									
5-7 years	400	1.0	0.0	2.3	4.2	5.0	8.0	9.0	3.7
8-10	610	1.1	0.8	2.8	2.6	4.6	5.6	8.5	4.7
11-13	635	0.3	1.9	1.6	2.8	5.2	4.7	14.0	5.0
14-16	521	0.6	2.9	0.4	2.1	8.3	3.8	17.3	3.5
girls, age									
5-7 years	384	0.3	0.3	2.9	1.8	2.6	11.7	5.7	4.4
8-10	551	0.9	1.1	0.9	4.2	2.5	9.8	7.1	4.9
11-13	677	1.0	1.5	2.5	3.4	3.4	7.6	8.5	4.3
14-16	496	0.4	2.0	0.8	4.0	4.3	6.9	13.0	5.7
% children for each symptom		0.7	1.4	1.7	3.2	4.5	7.0	10.5	4.6
Symptoms N		31	59	75	135	192	301	450	195
Children N	4,274								

the major atopic symptoms in the spot control showed good correspondence between the questionnaire and the pediatrician's assessment. Some of the "other symptoms", according to parents, were diagnosed as eczema by the pediatrician. This explains the difference between the parent's and the pediatrician's assessment in these two categories. In only 4% of cases did the parents seem to overestimate that their children had atopic disease as a whole. In 5% of the healthy children the parents underestimated that their child had an atopic disease.

Another spot-control test was taken from among the 13.6% of families that had not filled in the questionnaire. In one school, where the questionnaires handed in could be checked against the list of pupils, 49 children had not returned the questionnaires. The parents of these children were contacted by letter and by phone. Two families could not be contacted, despite repeated attempts, and one refused to cooperate on grounds of principle. Of the remaining 46 children, 28% had atopic symptoms within the last year, and 11% had last had atopic symptoms more than one year previ-

ously, i.e. the prevalence of atopy in the drop-out controls agreed with that shown by the survey.

The seriousness of the symptoms was only indirectly referred to in the survey. Of the 1,052 children with actual symptoms 31% had never been to a doctor (or natural healer) with their symptoms, even though visits to a doctor are free of charge in Denmark, and the diagnosis was based solely on the parents' assumptions. 69% had sought medical help of some kind for their atopy. 32% of the children with actual symptoms had more than one such symptom. 26.6% of the children with actual symptoms had been confined to hospital or had been treated by the allergy clinic at the pediatric ward. The children's use of the health system is illustrated in Fig. 8. In the three categories: 1) "no medical attendance", 2) medical help, but no hospital attendance", and 3) "hospitalized", the symptoms of rhinitis, atopic eczema, urticaria and "other symptoms" were quite evenly spread. Asthma, however, showed considerable differences in prevalence in the three categories. Asthma was reported for 2% of the children without medical attendance, for 10% of the children examined by a doctor without hospital re-

Table 2. Association between symptoms in percent. Index symptom in the left column. The associated symptom is stated in the upper row.

		Qu %	It %	GI %	Ur %	As %	AE %	Rh %	O %
(Qu)	Quincke edema		16	16	23	16	26	42	13
(It)	Itching mouth	8		3	12	36	20	80	10
(GI)	Gastrointest. sympt.	7	3		16	16	25	28	13
(Ur)	Urticaria	5	5	9		13	17	27	9
(As)	Asthma	3	11	6	9		10	61	9
(AE)	Atopic eczema	3	4	6	8	16		31	10
(Rh)	Rhinitis	3	10	5	8	26	21		10
(O)	Other symptoms	2	3	5	6	9	15	24	

Table 3. Symptoms according to parents vs. clinical diagnosis in 140 children. Some of the patients have more than one symptom or diagnosis.

	no atopy	Quin cke	Itch. mouth	Gastro- intest.	Urti- caria	Asth- ma	Atopic eczema	Rhin- itis	Other sympt.
Symptoms according to parents	0	2	8	12	29	10	58	53	28
Pediatrician's clinical diagnosis	6	0	0	7	26	6	76	40	8

ferral, and for 49% of those children who had attended a pediatric hospital clinic for their atopic symptoms. In the entire population of 4,274 children the prevalence of asthma was 4.5%. Thus, $\frac{2}{3}$ of all school children with known cases of asthma had undergone allergological examination at the pediatric department.

Of the 1,052 children with symptoms, 6.9% had been in contact with natural healers or chiropractors about their symptom. The tendency to turn to natural healers, etc., seemed to increase with the number of different contacts to the health service in general. Thus, 12% of children with contact to hospital had also contacted a natural healer. Very few had used natural healers as their only contact.

Discussion

The prevalence of atopic symptoms in this survey agrees well with other similar recent surveys in Scandinavia (4, 5), apart from a higher prevalence of rhinitis in this survey. There are differences between methods and the diagnostic criteria, and accordingly the results are not directly comparable. In this questionnaire study, the information from the children and parents is supported with

clinical diagnosis by a pediatrician in a spot sample of children with atopic symptoms and healthy controls. Although parents seem to have minor difficulties in categorizing mild skin symptoms, parents and pediatrician seem to agree well in the assessment of major atopic symptoms and of atopic disease or not.

A comparison of the figures for 5–7 years olds in this survey, with a survey made in 1982 of a cohort of 7-year-old children born at Viborg Hospital in 1975 (4) gives the following results (figures for the 1982 survey in brackets): Asthma 3.8% (4.6%). Atopic eczema 9.8% (8.9%), allergic rhinitis 7.4% (2.1%), urticaria 3% (2%), overall prevalence of 5–7 year old children with atopic symptoms/disease 23.9% (13.3%). In the 1982 survey a positive prick test was the necessary criterion for the diagnosis of rhinitis allergica, as distinct from the present survey. Therefore, it is not possible to establish whether there is a real increase in the frequency of rhinitis in relation to the same town and age group in 1982.

A recent Danish survey of asthma among school children, based on information supplied by parents and children, shows an asthma prevalence of 4%. That study shows, however that the prevalence doubles if the questionnaire is supplemented by tests for exercise-induced asthma (8).

This survey confirms that atopic symptoms are very frequent among school children in all age groups. There are great differences in the gravity of the problem from child to child. For $\frac{1}{4}$ of the children with symptoms the problem has been so serious that hospital assistance has been necessary, this was particularly true for children with asthma; $\frac{1}{3}$ of children with symptoms, mainly rhinitis, atopic eczema, urticaria and "other symptoms", had never sought medical help, probably because of the mildness of the symptoms. However, it cannot be excluded that some of these children could benefit from pediatric allergological examination, guidance or treatment.

The public showed a positive interest in this survey, and the percentage response was high. Parents' assessment of symptoms and clinical diagnosis agree well. Questionnaire surveys supplemented by clinical spot tests may be useful when the frequency of atopic symptoms has to be monitored with limited resources. Since the popula-

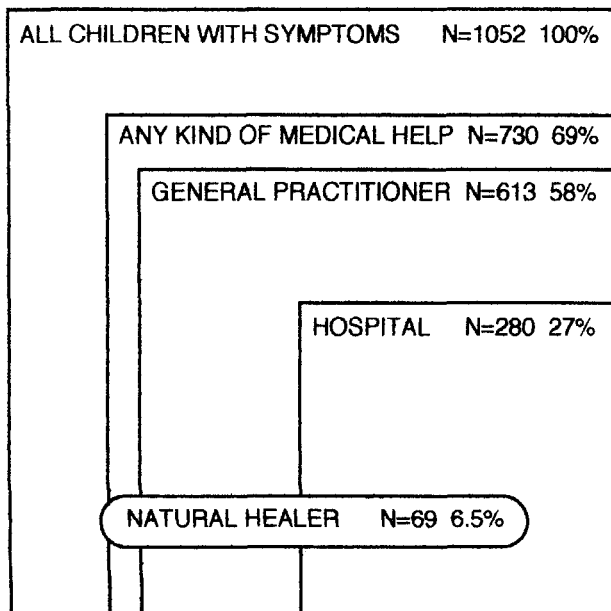


Fig. 8. Use of the health system. 1052 children with present atopic symptoms. 322 children = 31% had never sought medical help for their atopic symptom.

tion of children in public schools in Scandinavia shows the full scale of variation of symptoms, gravity, and use of the health service, surveys of these conditions by school health authorities can be useful when a preventive effort is planned.

Acknowledgements

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