

Prevalence of atopic disorders among adolescents in Turku, Finland

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A study of the prevalence of atopic disorders among 15–16-year-old teenagers was carried out in a coastal urban town in south-western Finland. Altogether, 1712 children were found in that age group, all previously examined by a pediatrician. Each child who had present or previous allergic diseases was invited for a detailed study, a total of 434 (25%) pupils. Of these patients 416 (95.8%) participated in clinical examination and skin testing. The prevalence of atopic diseases was 21% in the studied group; atopic eczema was found in 9.7%, allergic rhinitis in 14%, and asthma in 2.5%. Of subjects who had rhinitis, 38% also had atopic eczema, while rhinitis – as the only symptom – was found in 8.8%. Figures obtained from this survey suggest that the prevalence rates of atopic diseases are about the same as found 10 years ago in Finland and they correspond also with other recent reports.

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Atopic diseases are common in childhood, and prevalence rates between 15 and 25% have been reported earlier (12, 18, 27, 32). A study carried out among adolescents and conscripts in south-eastern Finland in 1978 showed that single positive skin prick test reactions were found in nearly half of the population, indicating predisposition to IgE-mediated allergy (10). Recently, Foucard published a study carried out among medical students and found past or current symptoms of allergic diseases in 46% (7).

The symptoms of allergic diseases are known to be provoked or worsened by environmental factors, although the disease has a genetic predisposition (21, 25). Thus, atopic children/adolescents have certain limitations at school, at work and in other individual interests.

Food allergy or food intolerance often appears in infancy and adverse food reactions have been reported to occur in approximately 10% of children. Definite prevalence rates have, however, been difficult to estimate (5, 13, 15). Most adverse food reactions tend to disappear with age (29). It seems evident that a proportion of children with atopic eczema will benefit from elimination diets (2), even in some adult patients certain foods seem to be of importance (3).

It has been assumed that the incidence of allergic diseases is on the increase (22, 26). Asthma, which has been studied most extensively, is reported to

occur in 2.5–9% of school children (4, 14, 17, 24). The variation in the figures may be attributed to a multitude of factors, such as differences in population, inclusion criteria, previous underdiagnosis, climatic and varying environmental factors, growing awareness of allergic diseases, or it may reflect a real increase in the prevalence figures (4, 31).

It has also been postulated that common environmental factors may contribute in the development of allergic diseases. In recent studies atmospheric pollution and to a certain extent smoking habits have been associated with a higher prevalence of asthma (1, 23).

Because of repeated postulates suggesting increasing prevalence rates of allergic diseases among school children, we wanted to study the prevalence of allergic disorders, giving special attention to atopic eczema, among 15–16-year-old adolescents in one urban area.

Material and methods

During the 1989–1990 school year all ninth grade pupils, aged 15–16 were studied in the urban area of Turku. Turku has approximately 170 000 inhabitants. The city is located on the south-western coast of Finland. The school system is obligatory in Finland and therefore all children in that age group could be traced. As the children are also covered by a public health care system carried out by pediatri-

cians in the Turku area, the health record of each child from birth to the ninth grade is under specialist control. Each child with a history of present or previous atopic disease, or suspicion of one, was included in the study. The diagnosis of atopic eczema was set according to the criteria of Hanifin & Rajku (11).

In the given age group there were a total of 1712 students. According to previous records 434 (25%) had had symptoms suggesting an atopic disease. All these patients were invited to further studies and 416 (95.8%) participated, comprising 225 boys (54%) and 191 girls (46%). A questionnaire about allergic disorders was distributed to each proband to be filled in at home together with their parents. Information was obtained about present or previous symptoms of atopic eczema, allergic rhinitis or asthma, age at onset of symptoms, provoking factors, seasonal variation, medication used, possible infectious diseases preceding the onset of symptoms, present infectious diseases, pets at home, family history of allergic diseases, smoking habits in the family and adverse reactions to foods, and elimination diets.

All the children were then invited to participate in a clinical examination and skin prick testing. The location and extent of atopic eczema, the topical treatment they had used and possible UV-light therapies and vitamin/trace element treatments were registered.

The severity of the lesions was recorded and, according to the extent, the eczema was scored from 1 to 10; 1 = 1%, 2 = 2–3%, 3 = 4–5%, 4 = 6–10%, 5 = 25%, 6 = 35%, 7 = 50%, 8 = 65%, 9 = 80% and 10 = 100% of the whole body area.

Skin prick testing was performed on 357 children with a panel of 10 common allergen extracts (Allergologisk Laboratorium, Hørsholm, Denmark): birch (3 hep), timothy grass (3 hep), meadow foxtail (3 hep), mugwort (3 hep), *Cladosporium* (1/20 v/w), cat dander (3 hep), dog dander (3 hep), cow epithelium (1/20 v/w), guinea pig (1/20 v/w) and house dust mite (*D. pteronyssinus*) (3 hep).

Histamine chloride (10 mg/ml) and allergen extract dilutant served as positive and negative controls. A skin test reaction was regarded as positive if the wheal size was at least 3 mm in diameter or $\geq 50\%$ of the histamine reaction. In addition, skin prick testing with diverse foodstuffs was performed on pupils who suspected that they had adverse food reactions. The following foods were selected for testing: codfish (ALK Soluprick 1/20 v/w), coalfish, apple, paprika, carrot, celery, cow's milk, egg, orange, caraway and oregano in their natural forms. Skin prick tests were performed only with foods suspected of causing adverse reactions. All the data were recorded on a database computer file and analysed.

Results

Eczema

According to the questionnaire a history of atopic eczema during the past year was reported by 167 children (9.7%), 140 (8%) had clinical symptoms at the time of the investigation. 305 children (17.8%) had suffered from eczema earlier in childhood. 92 (55%) of eczema patients had in addition seasonal or perennial rhinitis and 13 (7.8%) had asthma. The onset of eczema was most common between 1 and 6 years of age (Fig. 1).

There was a distinct seasonal variation in symptoms, eczema occurring most commonly in winter and least in summer (Fig. 2). With the exception of one patient, the extent of atopic eczema was limited (<25% of the whole body area) (Fig. 3). The eczema was in a quiet state in 84% of children, 15% needed more effective treatment and only one child had severe eczema. Some of these patients who had eczema at the time of the investigation used vitamin/trace element products: 39 (28%) were using one product, 11 (12%) 2 products, 3 (2%) 3 different products and one patient was daily using 8 different products. Five patients had been treated previously with SUP light therapy (selective ultraviolet phototherapy with UV light emission spectrum max. 310–

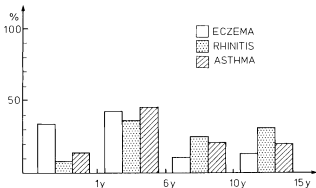


Fig. 1. Onset of symptoms in atopic subjects. The percentage of patients on vertical axis and the age groups on the horizontal axis <1, from 1 to 6, from 6 to 10 and from 10 to 15 years.

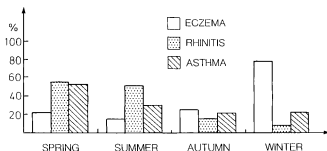


Fig. 2. Occurrence of symptoms during various seasons.

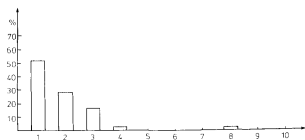


Fig. 3. Extent of skin lesions in subjects with eczema (1 = 1%, 5 = 25%, 10 = 100% of the whole body area).

330 nm) and 3 with UVB (UV light therapy with emission spectrum max. 300–320 nm).

Seventy percent of eczema patients were using some topical steroid creams/ointments when needed; most commonly hydrocortisone. Some had been using hydrocortisone-17-butyrate and only few had betamethasone valerate creams/ointments. Topical emollients were in regular or intermittent use by 80% of atopic eczema patients and 12% regarded the symptoms so mild that no topical treatment was needed.

Among factors that were connected with deterioration of the symptoms were mentioned contact with animals by 35 subjects, pollens by 20, scents by 15, house dust by 9, cigarette smoke by 9 and inflammatory diseases by 6 subjects.

Cutaneous adverse reactions caused by various internal medicines were reported by 9.8%, 41 of all the atopic persons; in 54% the cutaneous lesions were thought to be caused by penicillin, in 33% by sulfa, in 7% by aspirin, in 2% by amoxicillin and in 2% by an anti-inflammatory drug. None of these reactions was proved by provocation.

Allergic rhinitis

Recent symptoms of seasonal or perennial rhinitis were reported by 242 pupils (14%); 257 (15%) had previously suffered from rhinitis. At the time of the investigation 92 pupils with rhinitis had also symptoms of atopic eczema (38%), rhinitis as the only symptom was noted in 150 pupils (8.8%). An inflammatory disease was considered as the origin for allergic rhinitis in 33/416 cases (8%), and 51/416 children (12%) had a history of repeated upper respiratory tract inflammatory diseases. One half (57%) of the pupils with rhinitis used antihistamines or local nasal corticosteroid or cromoglycate when needed. Symptoms of rhinitis were most commonly connected with pollens (in 208 children), often with animals (in 144), with house dust (in 82) and cigarette smoke (in 42 children). Symptoms of rhinitis were most common in spring and least in winter (Fig. 2).

Asthma

Asthma had been diagnosed in 42 pupils (2.5%), and 13 (31%) asthma patients had also symptoms of atopic eczema. All asthma patients had temporarily used either antihistamines or sympathomimetic drugs. Only very few had regular prophylactic corticosteroid or cromoglycate medication. Symptoms of asthma were accentuated by animals in 37 cases, by pollens in 27, by inflammatory diseases in 17, by cigarette smoke in 12 and by house dust in 12 cases. Symptoms of asthma dominated in spring (Fig. 2).

Skin prick test results

At least one positive skin prick test reaction was found in 62% of the pupils tested. Positive reactions to pollens were found in 67% and to animal dander in 56% of rhinitis/asthma patients and in 35% and 39% of eczema patients, respectively. At least one positive skin prick test reaction to an animal dander was seen in 68% of those patients who suspected rhinitis from animal contact, and 76% of those reporting symptoms from pollens had at least one positive reaction to pollens. Respective figures in asthma patients were 81% and 85% and in eczema patients 65% and 60%. Single allergens that caused positive reactions most commonly were meadow foxtail (40.6%), timothy grass (35.5%), cat dander (33.3%) and birch (28%) (Table 1).

Home environment

In 98 families with atopic children (23.5%) and in 7 families with asthma children (16.6%) the parents smoked. Pets were rather common; 147/416 (35%) of atopic pupils had pets. 28.5% (69/242) of children suffering from rhinitis had furred pets and 16 had several furred pets. Six children with asthma had animals; 4 of them had an aquarium, one had a dog and one had mice.

Atopic diseases in the family

Atopic symptoms in the parents were recorded in 253 (61%), 33 (13%) had asthma, 141 (56%) rhi-

Table 1. Number of positive reactions to tested allergens (357 subjects tested)

	No. positive reactions	%		No. positive reactions	%
Meadow foxtail	145	40.6	Mugwort	56	15.6
Timothy grass	127	35.5	Guinea pig	39	11
Cat dander	119	33	Cow dander	26	7
Birch	100	28	House dust mite	16	4
Dog dander	58	16	Cladosporium	7	2

Table 2. Results of skin prick test with food allergens

Food	No. tested	No. positive reactions	Percent of positive reactions
Apple	60	29	48
Coalfish	62	29	46
Carrot	41	16	39
Celery	20	6	30
Paprika	19	5	26
Codfish	56	4	7
Egg	36	2	6
Carroy	16	2	13
Milk	26	1	4
Orange	84	1	1
Oregano	16	1	6

Table 3. Atopic symptoms in children and their parents

Symptoms in childhood	No. children	Symptoms in parents			Total symptoms (%)	Symptom-free (%)
		AE and AR/A	AE (%)	AR/A (%)		
AE and AR/A	188	31 (17%)	36 (19)	53 (28)	120 (64)	68 (36)
AE	117	13 (11%)	34 (29)	21 (18)	68 (58)	49 (42)
AR/A	109	12 (11%)	16 (16.5)	32 (29.5)	62 (57)	47 (43)

AE = atopic eczema; AR = allergic rhinitis; A = asthma.

nit, and 145 (57%) eczema. 326 subjects had siblings, of these 187 (57%) had symptoms of atopic diseases: 21 (12%) asthma, 97 (52%) rhinitis and 141 (75%) eczema. The parents and the siblings could have several different symptoms. The parents of children who had eczema had also eczema as the most common symptom, whereas those whose children had rhinitis/asthma and eczema and rhinitis/asthma the mucous symptom was the most common (Table 3).

Food hypersensitivity

Out of 416 children, 42% reported some kind of food intolerance. According to the answers by questionnaire the clinical symptoms suspected were mainly deterioration of eczema and swelling in the mouth. Citrus fruits were suspected to cause most of these adverse reactions (53%), followed by peas, nuts, carrot, apple and other raw vegetables and fruits (40%), chocolate (39%), tomato (29%), fish (27%), egg (15%), strawberry (11%) and milk (1%).

Rhinitis and asthma symptoms were reported most often after ingestion of fish (8%), of raw vegetables and nuts (5%), citrus fruits (3%) and egg (2%).

Fifteen children complained of gastrointestinal symptoms, most of which were reported to occur after having ingested milk or milk products. Other food stuffs that were said to cause gastrointestinal symptoms were raw vegetables, fruits and nuts (4%), fish (2%) and tomato (1%).

Elimination diets were followed by 18.5% of the children. Those who had experienced adverse reactions from fish and raw vegetables strictly avoided those foods, whereas those who got pruritus or worsening of their eczema by, e.g. chocolate or citrus fruits avoided them only when they had skin lesions.

Twenty-seven eczema patients had avoided fish and 5 (18.5%) had a current positive skin prick test reaction to fish, as also 10 rhinitis/asthma patients suspected fish and 5 were skin test positive. Of those who had felt worsening of eczema or swelling of the mouth mucous membrane from raw vegetables or fruit, 39 had followed an elimination diet, 26 (66.7%) of them had positive prick-test reactions to vegetables or fruits. Of 5 rhinitis/asthma patients who had eliminated raw vegetables 3 were skin test positive to at least one of the vegetables. Milk was reported to cause deterioration of eczema in 2 and gastrointestinal reactions in 15 cases. One positive prick-test reaction to milk was found in an eczema patient. In 8 cases lactose intolerance (1.9% of 416 subjects) had been diagnosed.

Discussion

The cumulative incidence of atopic diseases in this study was 24%, which was not as high as in previous Swedish studies (46% and 32.6%) (7, 12) and in a Finnish study by Haahtela in 1978 (38%) (10), but was in close agreement with a previous Swedish study by Åberg et al. (25.5%) (32). The cumulative incidence of atopic eczema was 17.8%, which is about the same as was found in Swedish studies (15.3% and 12%) and in a recent study from south Wales (15.9%) (4), but is less than in the previous Finnish study (24.5%), in which also urticaria patients were included. The cumulative incidence of rhinitis was 15%, which is in agreement with the previous figure from Sweden (17.2%) (12) and the recent survey from south Wales in 1988 (14.9%) (4). The cumulative incidence of asthma (3.3%) was in concordance with previous studies from Sweden (3.5%) and Finland (3.7%).

The prevalence of atopic diseases in our study was 21%, eczema in 9.7%, allergic rhinitis in 14% and asthma in 2.5%. The figures are about the same as in a previous Swedish study (32) and a recent study carried out in Sweden among medical students (7).

The figures obtained from this study can be regarded as reliable because each child up to the age of 16 is enrolled through an intensive health care

system surveilled by pediatricians. Patient selection was based on earlier histories of atopy or recent symptoms. Altogether 95.8% of the selected patients participated and in those cases a good agreement between earlier observations and recent symptoms was noted.

The accuracy of the information obtained from the questionnaire can be criticized; however, the parents and also the 15–16-year-old adolescents are today well aware of allergic diseases. As each of the young people was personally interviewed, the information obtained was verified and complete.

Most of the previous studies indicating an increasing trend in atopic diseases have been compared with the figures reported 20, even 40 years earlier, and in those days there might have been underdiagnosis of atopic disorders (20, 24, 28). Today more and more minute symptoms are recorded, increasing the proportion. Thus, the strict criteria for these atopic diseases must be followed.

Keeping indoor pets is popular in Western society, especially in families with children. It appears that today it is difficult to avoid contacts with animals even if one has no own pets (30). In our material 35% of families with atopic diseases had pets which is in agreement with the figure obtained previously in another urban area (16). In 16 families there were several pets, although parents are recommended to exclude pets from their homes if their children have a predisposition to atopic allergy (16). The health hazards of cigarette smoking have also been well documented and widely accepted, and a relationship between parental smoking and allergic disorders in children has been reported (9, 19). In our material, in spite of the information given, parents in 23.5% of families smoked and in families with asthmatic children.

Already a decade ago a relationship between viral respiratory infections and onset of allergic sensitization was suspected (8). Later studies have shown that the events during infections are multiple and they will enhance factors which participate in the development of airway hyperreactivity (6). In our material 8% of pupils reported that the onset of their allergic symptoms occurred after a respiratory infection, and 12% still repeatedly had upper respiratory tract infections.

The pupils who participated in this study were well aware of their allergic symptoms. Half of the pupils had previously been skin prick tested with a panel of common allergens and 82% of them had visited a doctor because of their symptoms. In the majority the symptoms were mild. Eczema patients used mild topical treatments; most managed with hydrocortisone creams or topical emollients. The mucous membrane symptoms were also well controlled.

The importance of diets in this age group did not appear to play a serious role, 18.5% reported that they were on some kind of diet, but a part of these diets were only temporary. For example, some eczema patients only went on a diet when their symptoms were worst. Those who reacted to fish and raw vegetables kept strictly to an avoidance diet. In these cases positive skin tests were frequent.

In conclusion, 21% of the 15–16-year-old adolescents had atopic symptoms. Although the symptoms are common, the prevalence rates are in agreement with figures found 10 years ago. The severity of symptoms in this age group is relatively mild.

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