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CHILDHOOD ASTHMA IN FINLAND

A Survey of 559 Patients

By

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During the last 10 to 15 years there has been an increasing awareness of the problem of childhood allergies. The investigational basis for this common interest has been the observation that untreated cases of asthma in childhood by no means cure spontaneously but have a clearly worse long-term prognosis than specifically treated patients (1, 24, 32, 41). A statement that asthma is "outgrown at any certain age" is not correct (41). Allergies are far the most common chronic diseases in childhood (6, 42). There is also some evidence that occurrence of allergies and asthma are increasing in childhood (37, 42).

Childhood asthma, however, presents perhaps the most ideal target for preventive measures a pediatrician can think about. This is due to the fact that childhood asthma is almost always an allergic disease (1, 50) which can be effectively treated with modern specific therapy. This requires accurate allergological examination which is not available in all parts of Finland. In Finland allergology is not acknowledged as a speciality, and only one of the largest hospitals has official positions of allergologists. Unofficially, experts of allergology are distributed among a few centers but often allergological activities in a hospital depend on how good the chief physician understands this topic. This causes great variations in the diagnostic and therapeutical facilities in different regions, overflow of patients, often from long distances, to centers

equipped with allergological expertise, and finally an uncertain situation in this field of medicine. Consequently, when allergology is not a specialty and not regionally organized in Finland, general practitioners' skills in this field are very modest. It is known that most general practitioners, when dealing with allergy, offer palliative medication only. From the allergological point this is not treatment at all.

Manpower and organization will be necessary to put into effect all allergological knowledge which is available nowadays. There is, however, a need to clarify the quality and the magnitude of the problems of childhood asthma. This study deals with these problems by means of material collected from all parts of Finland.

AIMS OF THE STUDY

According to the viewpoints presented in the introduction, this study of childhood asthma was generally aimed to investigate the following subjects:

1. General evolution of asthma in childhood.
2. Factors related to the disease: mainly those with allergological, social and regional importance.
3. Availability of clinical, investigational, and therapeutical facilities.

PATIENT MATERIAL AND METHODS

The patient material for the study was collected primarily in 1971 as a part of a larger sociological investigation dealing with 47 chronic diseases (49). The primary screening of the patients was done by 373 health nurses who were selected at random in whole Finland. The pediatric population (0 to 14 years) in these districts was 25.5 per cent of the whole Finnish pediatric population. The health nurses served as health advisors and for screening of developmental errors and other diseases of children. They had a health file for every child in their district; therefore they were an excellent source of information.

In the initial material there were 269 health nurses reporting 575 cases of asthma, of which 7 cases turned out to be non-asthmatic, and 104 nurses reporting no cases of asthma in their districts.

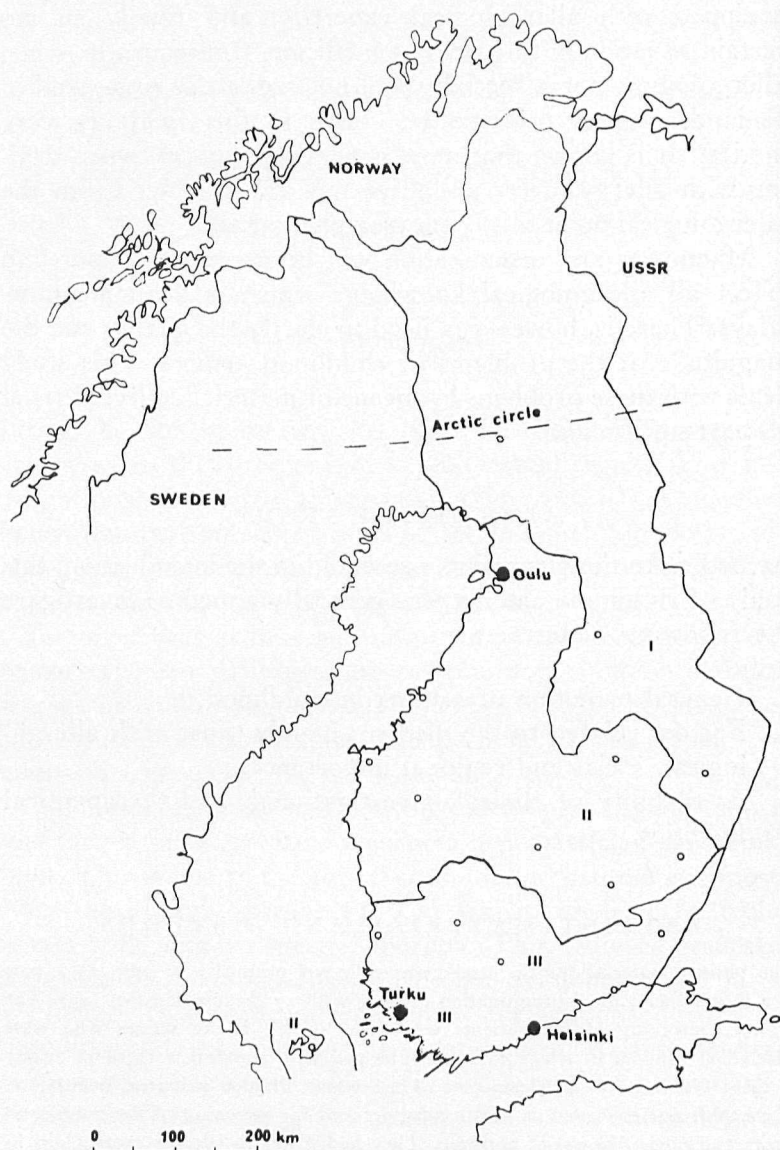


Fig. 1.

The study regions. The economic developmental areas are indicated by Roman numbers. ● University central hospitals, ○ central hospitals in 1971. For explanation on available medical services, see Table 1.

TABLE 1
Some Information about the Economic Developmental Regions.

	Regions			Whole country
	I	II	III	
Whole population (1970)	602428	1409670	2586238	4597336
0-14 years old population	169727	361709	588144	1119550
Variations in the number of doctors per 100 000 inhabitants in the counties belonging to the different regions (1971)	55-66	60-101	77-216	55-216
Number of pediatricians per 100 000 inhabitants (1972)	2.5	2.9	9.5	6.6
Central Hospitals and other pediatric hospitals (1968)	4	9	10	23
Pediatric beds in hospitals (1968)	201	459	1320	1940
0-14 years old children per bed	844	788	445	577

After this primary inquiry 156 nurses were given a second questionnaire asking whether they could find more asthmatic children in their districts. This was done because it was assumed that they could easily have overlooked some cases of asthma when they had to retrieve all their card files with respect to many chronic diseases. 97 out of 156 nurses answered this inquiry in time so that the new cases they reported were included when the occurrence of asthma in the study districts was calculated. The data acquired from these 97 nurses constitute *material 1* (Table 2). The nurses who answered later and those who did not report the number of the children initially contributed *material 2*.

A statistical analysis was made to find the presumptive differences in materials 1 and 2. Although it would be assumed that extra questioning in material 1 would have brought into light the less severe or less extensively treated cases of asthma, this was not the case. There were only minor variations between materials 1 and 2, which were then investigated together.

The interviews were conducted using a detailed questionnaire. This consisted of data on the following subjects: the course of asthma, factors observed to influence asthma directly, therapy and environment of the child. Only those children were accepted to be interviewed who had asthma diagnosed by a physician. Also asymptomatic cases were searched for.

The severity of asthma during 1967 to 1971 was asked in terms of frequency of asthmatic days per year in order to get also mild attacks. This was done because the Finnish people easily understand the word "attack" as a rather severe situation and cases with mild wheezings were thus omitted. Asthma

TABLE 2
The Structure of the Material.

	The number of asthmatic children obtained (x = the 2nd questioning)	The 0 to 14 years population in the study districts	Per mille of asthmatic children	Accepted answers from the parents
Material 1. from 97 health nurses	227+149 (x = 376)	78861	2.9+1.9 (x = 4.8)	272 (72 %)
Material 2. from 276 health nurses	348	206442	1.7	287 (83 %)
Total	724	285306	2.5	559 (77 %)

TABLE 3
Percentage Frequencies of Allergic Diseases in the Close Relatives.

	None indicated	In the child's family	The parents of mother and father	Sisters of mother and father	No answer	Total %
Asthma	37	21	25	17	0	100
Hay fever	39	17	4	10	30	100
Other allergic rhinitis	36	19	5	7	33	100
Dermatitis	27	39	11	21	2	100
Urticaria	39	12	2	2	45	100
Other allergies	34	23	6	8	29	100

frequency in 1972 was asked for on the basis of weekly or monthly attacks during four seasons.

The collected data were punched on cards. Each patient was represented by 315 items. Data processing was done using UNIVAC 1108 and IBM 1130 computers in the Institute of Applied Mathematics, Turku University.

Because one of the main aims of this study was to clarify the characteristics of childhood asthma and the therapeutical facilities, the material was divided according to the economic developmental regions of Finland. This is shown in Fig. 1 and Table 1 which also present the main medical features of these regions.

NATURAL HISTORY OF ASTHMA AND CLOSELY RELATED FACTORS

The occurrence of different allergies in close relatives is given in Table 3. These values were practically the same in all parts of the country. When allergic diseases indicated in Table 3 were taken altogether, it was found that 84 per cent of the children had allergic background (68 per cent within the family and 16 per cent among grandparents, uncles or aunts). Asthma in close relatives was reported in 63 per cent of the cases.

The presence of allergic conditions in the child's family and in close relatives was not correlated to the severity of asthma.

36.3 per cent of the asthmatic children were 1st children in the family. This is less than the 1st childrens' prevalence born in 1956-70 (39.7 per cent). The share of the 2nd and 3rd children was 29.0 per cent and 16.6 per cent which is more than in whole population (27.9 and 14.6 per cent). The ratio boys/girls was 1.8:1. This ratio was similar for all parts of the country.

4.3 per cent of these children were reported to have some chronic illness other than allergies. Slow development was

TABLE 4
Percentage Distribution of the Ages of Onset of Asthma and Related Symptoms.

Age of onset	Asthma		Atopic eczema	Recurrent cough and sneezing	Wheezy breath	Allergic rhinitis
	Boys	Girls				
0-1	33.1	19.7	80.2	43.5	32.2	25.4
2-3	43.4	35.7	10.3	35.4	43.5	41.3
4-5	13.4	19.1	3.3	10.6	12.9	18.1
6-8	7.4	19.7	5.5	8.2	9.8	12.7
9-11	2.0	4.6	0.7	2.1	1.6	2.5
12-14	0.7	1.2	0.0	0.2	0.0	0.0
Total %	100	100	100	100	100	100
N	299	173	271	427	451	205

reported in 4.6 per cent of cases. These aspects were not inquired into with more detail.

Occurrence of Symptoms Related to Allergy and Age of Onset

In this material atopic eczema was reported to have occurred at some age in 290 (52.3 per cent), allergic rhinitis in 228 (41.8 per cent) and urticaria in 49 patients (8.8 per cent), respectively. Recurrent cough and sneezing was reported in 427 (76.9 per cent) and wheezy breath in 451 patients (81.3 per cent), respectively.

TABLE 5

Correlation between Late Breast Feeding and Late Beginning of Alimentary Proteins (Cow's Milk, Egg, Fish, Orange, Cereals and Honey) and the Onset of Symptoms Related to Asthma.

	Eczema	Onset of		
		Recurrent cough and sneezing	Wheezy breath	Asthma
Late breast feeding	No effect	Onset later d.fr. = 25 $\chi^2 = 40.47$ $p < 0.025$	Onset later d.fr. = 20 $\chi^2 = 45.87$ $p < 0.0005$	Onset later d.fr. = 25 $\chi^2 = 59.09$ $p < 0.0005$
Late feeding with all foreign proteins	No effect	No effect	No effect	Onset later d.fr. = 15 $\chi^2 = 34.35$ $p < 0.001$

The ages of onset of symptoms of asthma, atopic eczema, recurrent cough and sneezing, wheezy breath, and allergic rhinitis were recorded (Table 4). The first asthma symptoms occurred before the age of 6 years in 85.4 per cent. The boys had the onset of asthma relatively more frequently in the age

of 0-3 years than the girls (d. fr. = 5, $X^2 = 27.72$, $p < 0.0005$). There occurred slight insignificant variations concerning the ages of onset in different developmental regions.

Time lag from the onset of recurrent cough and sneezing, wheezy breath and allergic rhinitis to the beginning of asthma were variable: Recurrent cough and sneezing and wheezy breath preceded or had their beginning in the same year as asthma in 94.1 and 94.7 per cent, respectively. Allergic rhinitis began later than asthma in 32.1 per cent of cases.

The age at onset of the symptoms seemed to be earlier in children from families with large living area per capita. This was valid for asthma, recurrent cough and sneezing, wheezy breath and rhinitis, but not for eczema. The social classification did not influence the age of onset, although it was closely correlated with the living area per capita.

The significance of late breast feeding and late introduction into the diet of cow's milk, egg, fish, orange, cereals and honey was studied. The age of finishing breast feeding, or beginning other foods was recorded to the month. Late breast feeding had a postponing effect on the onset of respiratory symptoms (Table 5). Late feeding with every foreign protein had a postponing effect on the onset of asthma, but no effect on the onset of eczema, recurrent cough and sneezing, and wheezy breath. When individual foreign proteins (listed in the table legend) were investigated, the results suggested the same fact; their late introduction to the diet made a later onset of the symptoms probable. These findings were not significant, however.

The ages at onset of the respiratory symptoms listed in Table 4 were studied as to their correlation with later asthma. To summarize, early onset of all these symptoms suggested a more severe course of asthma than for patients with later onset of these symptoms. However, in no detail was this correlation significant. Among those patients whose eczema was still active, there was an excess of severe asthma cases when tested for long-time asthma severity ($p < 0.025$).

Severity of Asthma

1. This subject was inquired into for the year 1972 and *the severity of asthma was graded*:
 - 0 = No asthma or a few occasional wheezings.
 - I = 5 to 10 attacks per year.
 - II = Approximately monthly attacks.
 - III = Nearly weekly attacks.
2. Asthma during the time from 1969 to 1971 was registered. Patients with two or more years of asthma were given *a long-time asthma grading*:
 - 0 = Most years less than 10 asthmatic days.
 - 1 = Most years 10 to 70 asthmatic days.
 - 2 = Most years more than 70 asthmatic days.

These will be later referred to as severity of asthma (Grades 0, I, II and III) and severity of long-time asthma (Grades 0, 1 and 2).

The severity of asthma (Table 6) showed no significant age dependency as tested with Chi square method. It must be mentioned that in the age groups 9 to 14 years Grades II and III (monthly and weekly asthmatic attacks, respectively) are as frequent as in younger age groups. Neither did the long-time asthma (Table 7) show any age dependency in Chi square test. The patients in age groups 9 to 14 had severe forms of long-time asthma as often as those in younger age groups. Severity of asthma and long-time asthma were not correlated with sex.

The amount of asthma in 1972 was inquired into also seasonally: December–February, March–May, June–August and September–November. During 1972 there were no seasonal differences in the amount of asthma. The reported frequencies were: No asthma 35, monthly asthma or less 48, and weekly asthma 17 per cent, respectively.

Tables 8 and 9 show the change of asthma severity and of long-time asthma severity to the next year (1972). It will be seen that mild asthmatics have a greater chance of being mild

TABLE 6

Percentage Distribution of the Severity of Asthma at Different Ages.

Age groups (years)	N	Grades of asthma severity				Total %
		0	I	II	III	
0-1	11	27.3	36.3	27.3	9.1	100
2-3	48	29.2	33.3	27.1	10.4	100
4-5	86	29.1	36.0	30.2	4.7	100
6-8	190	31.6	33.6	27.4	7.4	100
9-11	131	32.9	26.7	32.8	7.6	100
12-14	71	39.5	22.5	19.7	18.3	100
Whole material	537	32.8	30.6	27.5	9.1	100

TABLE 7

Percentage Distribution of the Severity of Long-time Asthma at Different Ages.

Age groups (years)	N	Long-time asthma			Total %
		0	I	2	
0-1	5	20.0	60.0	20.0	100
2-3	38	13.6	65.4	21.0	100
4-5	73	26.0	63.0	11.0	100
6-8	175	28.6	58.8	12.6	100
9-11	118	22.9	67.8	9.3	100
12-14	65	27.7	52.3	20.0	100
Whole material	474	25.3	61.3	13.4	100

TABLE 8

Change of Severity of Asthma from 1971 to 1972(d.fr. = 6, $\chi^2 = 176.7$, $p < 0.0005$).

Number of asthmatic days in 1971	N	Asthma severity in 1972				Total %
		0	I	II	III	
< 10	211	48.8	33.2	17.5	0.5	100
10-70	208	11.5	37.0	41.9	9.6	100
> 70	70	10.0	15.7	32.9	41.4	100
All	489	27.4	32.3	30.1	10.2	100

TABLE 9
Change of Severity of Long-Time Asthma to 1972
 (d.fr. = 6, $\chi^2 = 143.1$, $p < 0.0005$)

Severity of long-time asthma	N	Asthma severity in 1972				Total %
		0	I	II	III	
0	125	49.6	38.4	12.0	0.0	100
1	303	26.4	31.4	36.0	6.2	100
2	66	12.1	18.2	25.8	43.9	100
All	494	30.4	31.4	28.5	9.7	100

cases in the next year than the severe ones. The duration of asthma more than one year did not worsen the chance of improving the next year. This is seen by comparing the Tables 8 and 9: The changes of comparable asthma severities were the same in both tables. The change of asthma severity to better or worse was not significantly age-dependent. Between the ages 6 to 11 years there were slightly more improved cases than before and after these ages.

There was one death (0.18 per cent) out of these 559 patients during 1972.

Precipitating Factors

Parents' own observations on the precipitating allergens gave the following results: Pollen was reported to have caused asthma in 59, animal dander in 61, house dust in 36, textile dust in 9, outdoor dusts in 16 and foods in 50 per cent of all patients.

Several physical, chemical, exertional and psychological factors were also reported to have an influence on asthma. With only a few exceptions these factors were reported relatively more often with the severest grades of asthma and long-time asthma (p mostly < 0.0005). Asthma appearing often during a cold was reported in 67, without a cold in 38, asthma mostly in the night in 57, during day-time in 27,

asthma often in the school in 12, and on the way to the school in 13 per cent of cases. Asthma was reported to be made worse by tobacco smoke in 65, walking in 12, running in 63, being in sauna in 20, being irritable in 41, being angry in 32, crying in 40 per cent of cases.

There were no social nor regional differences regarding the precipitating factors of asthma.

Therapy with Reference to Severity of Asthma

The number of days in hospital during 1972 was significantly correlated with the severity of asthma and with the severity of long-time asthma (Tables 10 and 11). It is remarkable, however, that 61.4 per cent of those reporting Grade II asthma (Table 10) and 42.0 per cent of those reporting Grade III had not been in hospital at all. The same fact is observed when patients with long-time asthma (two or more years) (Table 11) are studied; 48.5 per cent Grade II patients had not been in hospital during 1972. Stays in hospital were less frequent in the older age groups (Table 12), although the severity of asthma (Table 6) and of long-time asthma (Table 7) was rather similar in the younger and older age groups—if not more severe in ages 12 to 14 years.

TABLE 10

The Correlation between Severity of Asthma and the Stays in Hospital in 1972
(d.fr. = 9, $\chi^2 = 84.75$, $p < 0.0005$).

Days in hospital in 1972	N	Severity of asthma			
		0	I	II	III
None	379	85.4	61.9	61.4	42.0
< 10 days	99	11.4	23.4	28.3	20.0
11-30 days	52	2.7	12.9	11.8	14.0
> 30 days	29	0.5	1.8	8.5	24.0
Total %		100	100	100	100
N	559	185	171	153	50

TABLE 11

The Correlation between Severity of Long-time Asthma and the Stays in Hospital in 1972

(d.fr. = 6, $\chi^2 = 26.56$, $p < 0.0005$).

Days in hospital in 1972	N	Long-time asthma grading		
		0	1	2
None	328	78.4	65.3	48.6
< 10 days	92	14.4	19.5	22.7
11-23 days	49	7.2	9.9	15.2
> 30 days	25	0.0	5.3	13.5
Total %		100	100	100
N	494	125	303	66

The number of visits to a doctor was also clearly dependent on the severity of asthma and of long-time asthma (Tables 13 and 14). 9.4 and 8 per cent of patients with Grade II and III asthma severity had not been seen by a doctor. The corresponding percentage of patients with long-time asthma Grade 2 was 7.8 per cent. The visits to a doctor decreased in school aged children (Table 15).

TABLE 12

Days in Hospital because of Asthma in Different Age Groups.

(d.fr. = 10, $\chi^2 = 32.74$, $p < 0.0005$).

Age groups (years)	N	Days in hospital in 1972				Total %
		None	< 10 days	11-30 days	> 30 days	
0-1	11	27.3	9.1	27.3	36.3	100
2-3	48	58.4	10.4	12.5	18.7	100
4-5	86	68.6	20.9	5.8	4.7	100
6-8	190	70.0	16.3	11.1	2.6	100
9-11	131	67.2	24.4	5.3	3.1	100
12-14	71	77.5	11.3	7.0	4.2	100

TABLE 13

Correlation between Severity of Asthma and the Visits to a Doctor in 1972.
 (d.fr. = 12, $\chi^2 = 170.1$, $p < 0.0005$).

Visits to doctor in 1972	N	Severity of asthma			
		0	I	II	III
None	117	50.6	11.0	9.4	8.0
1-5 times	268	42.5	60.2	55.7	38.0
6-10 times	74	5.6	20.2	15.4	18.0
> 10 times	63	1.3	8.6	19.5	36.0
Total %		100	100	100	100
N	522	160	163	149	50

TABLE 14

Correlation between Long-Time Asthma and the Visits to a Doctor in 1972
 (d.fr. = 8, $\chi^2 = 39.72$, $p < 0.0005$).

Visit to doctor in 1972	N	Long-time asthma		
		0	I	2
None	102	37.7	18.7	7.8
1-5 times	243	49.2	53.6	51.6
6-10 times	65	9.6	14.9	17.2
> 10 times	56	3.5	12.8	23.4
Total %		100	100	100
N	466	114	228	64

Site of Therapy

The parents were asked which kind of medical services were involved in the therapy of the child before 1972, during 1972, and who planned the long-term therapy.

The site of therapy was grouped as follows:

1. *Central hospital level:* Central hospital, University central hospital, The Hospital for Allergic Diseases of Helsinki

University Central Hospital, hospital of lung diseases or a pediatrician.

2. *Local level*: Local governmental medical officer, local hospital or private doctor.
3. *None of the above*.

TABLE 15
Number of Visits to a Doctor in Different Age Groups.
 (d.fr. = 15, $\chi^2 = 42.03$, $p < 0.0005$).

Age groups (years)	N	Visits to doctor in 1972				Total %
		None	1-5 times	6-10 times	> 10 times	
0-1	11	9.1	27.3	9.1	54.5	100
2-3	44	9.1	50.0	22.7	18.2	100
4-5	82	22.0	50.0	14.6	13.4	100
6-8	174	19.5	52.9	13.2	14.4	100
9-11	126	23.0	57.1	15.1	4.8	100
12-14	66	36.4	45.4	10.6	7.6	100

This grouping represents a rough grading of pediatric allergological competence, taking into consideration possibilities for allergy diagnostics and allergological therapies.

Severity of asthma influenced strongly the site of planning of long-term therapy (Table 16). It is seen that most severe cases (Grades II and III) had obtained instructions for long-term therapy at the central hospital level and mildest cases (severity Grade O) rather frequently remained completely without long-term instructions. The age did not influence the site of planning of long-term therapy.

Severe cases were treated in 1972 more often at the central hospital level (Table 16). There were, however, some of the most severe patients reporting no contact with a physician. In 1972 the age factor played an important role: 91 per cent were treated at the central hospital level of the 0-1 years old children ($N = 11$) and this percentage value

TABLE 16
Site of Planning of Long-Term Therapy and Site of Therapy in 1972 with Reference to Severity of Asthma and of Long-Time Asthma.

Site of planning of long-term therapy	Severity of asthma			All	N	Long-time asthma				All	N
	0	I	II	III		0	I	2			
Central hospital level	52.4	59.6	67.3	76.0	60.8	340	47.2	64.7	78.7	62.1	307
Local level	25.4	27.5	19.0	20.0	23.8	100	25.6	25.1	16.7	24.1	119
None	22.2	12.9	13.7	4.0	15.4	86	27.2	10.2	4.6	13.8	68
Total %	100	100	100	100	100		100	100	100	100	
N	185	171	153	50	-	559	125	303	66	-	494

d.fr. = 4
 $\chi^2 = 32.72$
 $p < 0.0005$

Site of therapy in 1972	Severity of asthma			All	N	Long-time asthma				All	N
	0	I	II	III		0	I	2			
Central hospital level	36.8	61.4	69.9	82.0	57.4	321	42.4	58.7	83.3	57.9	286
Local level	15.7	26.9	22.9	15.0	21.1	118	27.2	21.8	12.1	21.9	108
None	47.5	11.7	7.2	2.0	21.5	120	30.4	19.5	4.6	20.2	100
Total %	100	100	100	100	100		100	100	100	100	
N	185	171	153	50	-	559	125	303	66	-	494

d.fr. = 4
 $\chi^2 = 31.59$
 $p < 0.0005$

portant factors concerning the life of the family. Therefore the living area per capita, family size, mother's working status and the age of the parents were taken as factors representing the life situation of the study children.

Social class I families were living in larger apartments than families in other social classes. Social class III was characterized by the largest families. Families with a large number of children had generally the smallest living areas per capita ($p < 0.0005$). Social class III was also characterized by higher frequencies of young (< 25 years) and old (> 45 years) mothers and fathers than other classes ($p < 0.0005$).

Social class did not have any correlation to the mother's working status. The age of mother and father did not have any correlation to the size of apartment per capita.

Severity of asthma

Social class I children had asthma severity Grades I and II less and Grade 0 more than other social classes. These changes from the mean distribution were not significant, however.

TABLE 20
Severity of Long-Time Asthma According to the Social Classes.
(d.fr. = 4, $\chi^2 = 10.94$, $p < 0.05$).

Social class	N	Long-time asthma severity			Total %
		0	1	2	
I	31	38.7	48.4	12.9	100
II	360	29.4	59.8	10.8	100
III	138	18.1	64.5	17.4	100

The same tendency was significant, however, when long-time asthma was investigated. Social class I had relatively more Grade 0 cases and social class III Grade 2 cases than other social classes (Table 20). Families living in large apart-

steroids were not correlated to the severity of asthma, but those with severe long-time asthma had obtained them more often than mild cases ($p < 0.001$).

Certain matters seem important here: Rules for environmental control were given only to 81.1 per cent of patients. Environmental control had helped observably in 76.1 per cent of cases. A diet was applied in 20.3 per cent, although 49.5 per cent of parents had their own observations on food allergies. This may be due to the fact that school aged children seldom need a restricted diet, although it may have been necessary earlier. But it is also possible that the high frequency of food allergy is due to uncritical observations by the parents.

Furthermore, the frequencies of ACTH (5.2 per cent) and steroids over one month (7.2 per cent) indicate a quite liberal attitude towards these drugs. Physiotherapy, on the contrary, was used in only 33.7 per cent, which seems a rather low frequency. Specific hyposensitization was used in 20.7 per cent of cases, whereas unspecific vaccines were used in as much as 62.4 per cent of cases.

Environment

All environmental factors recorded were investigated as to their effect on asthma in 1972 and long-time asthma. Tables 18 and 19 give those environmental characteristics which had an effect on severity of asthma or on severity of long-time asthma. In general only a few environmental factors were observed to have correlation with the severity of asthma in the whole material.

General environment (countryside, densely populated community, town) did not have large influence on the progress of asthma. There was a slight excess of the most severe asthmatics in densely populated communities as investigated with respect to long-time asthma ($p < 0.05$).

Smoking factories and unpleasant smelling establishments in the vicinity made asthma slightly worse than supposed by the mean distribution of asthma severity. These factors did

not have effect on long-time asthma. There was a small excess of severe cases of asthma in stone buildings as compared to children living in wooden houses.

TABLE 18
Correlation between Environmental Factors and Severity of Asthma.
(d.fr. = 3)

	Asthma severity				Total %	N	χ^2
	O	I	II	III			
Distribution into severity groupings of all patients	33.1	30.6	27.4	8.9	100		
<i>In the vicinity</i>							
- stinking establishments	28.2	25.9	29.4	16.5	100	85	7.94
- smoking factories	32.1	27.7	24.1	16.1	100	112	8.93
<i>Home environment</i>							
- feather pillow in the child's bed	52.3	26.2	16.9	4.6	100	65	13.15
- flowering flowers in the bedroom of the child	46.5	23.3	11.6	18.6	100	43	12.43
- flowering flowers elsewhere at home	42.4	30.0	19.4	8.2	100	170	12.15
- animals contacts in stairwell	27.8	28.2	32.1	11.9	100	227	10.93

TABLE 19
Correlation between Environmental Factors and Long-Time Asthma Severity.

	Long-time asthma			Total %	N	χ^2	$p <$
	O	I	2				
Distribution into severity groups of all patients	25.3	61.3	13.4	100			
- feather pillow in the child's bed	40.7	52.5	6.8	100	59	9.28	.010
- wool in carpets and rugs	30.1	59.7	10.2	100	246	8.32	0.025
- animal contacts in stairwell	18.7	65.0	16.3	100	203	8.83	0.025

In the home environment of many children there were allergenic details which could easily have been removed. Children having a feather pillow was reported in 11.7 per cent of cases. These children were mostly distributed in the mild asthma groups indicating a more liberal environmental control in families with a mildly asthmatic child. This same phenomenon was observed for wool objects. There was an excess of flowering flowers in the bedrooms of children with mild asthma and also of those with severe asthma. This probably indicates both more liberal environmental control in mild cases and, on the other hand, the worsening effect of flowers on asthma in cases where parents do not realize its harmful effect.

Animal contact in the stairwell or in the vicinity had the effect of making asthma and long-time asthma more severe. On the other hand animals and furs at home or in often visited places did not have any effect on asthma. Neither did combinations of several environmental factors making up animal, dusty, allergenic furnishings, moldy, and irritant environments have correlation with the severity of asthma. Allergenic furnishings were reported most frequently from families with mildly asthmatic children (insignificant). Such environmental details as an old house, an oil heater, a moldy smell, cigaret smoke, animals at home and similar things in frequently visited places were not observed to have any effect on asthma and long-time asthma.

INFLUENCE OF SOCIAL LIVING CONDITIONS

The occupation of the child's father was coded according to the social classification by Rauhala (43): class I included non-manual educated (5.7 per cent), class II manual educated (68.9 per cent) and class III unskilled manual people 25.4 per cent). Social classes I and III are underrepresented in this material as compared with the distribution in the general population (I: 10.8, II: 58.7 and III 30.5 per cent) (43). This classification may not always be related to other im-

portant factors concerning the life of the family. Therefore the living area per capita, family size, mother's working status and the age of the parents were taken as factors representing the life situation of the study children.

Social class I families were living in larger apartments than families in other social classes. Social class III was characterized by the largest families. Families with a large number of children had generally the smallest living areas per capita ($p < 0.0005$). Social class III was also characterized by higher frequencies of young (< 25 years) and old (> 45 years) mothers and fathers than other classes ($p < 0.0005$).

Social class did not have any correlation to the mother's working status. The age of mother and father did not have any correlation to the size of apartment per capita.

Severity of asthma

Social class I children had asthma severity Grades I and II less and Grade O more than other social classes. These changes from the mean distribution were not significant, however.

TABLE 20
Severity of Long-Time Asthma According to the Social Classes.
(d.f. = 4, $\chi^2 = 10.94$, $p < 0.05$).

Social class	N	Long-time asthma severity			Total %
		0	1	2	
I	31	38.7	48.4	12.9	100
II	360	29.4	59.8	10.8	100
III	138	18.1	64.5	17.4	100

The same tendency was significant, however, when long-time asthma was investigated. Social class I had relatively more Grade 0 cases and social class III Grade 2 cases than other social classes (Table 20). Families living in large apart-

ments tended to have asthmatic children with less severity. This finding is in agreement with the effect of social class on asthma severity, but was statistically not significant.

Allergens and other factors initiating or worsening asthmatic attacks were not influenced significantly by social conditions.

Age of onset

The age of onset of recurrent cough and sneezing was slightly earlier in social classes I and II than in social class III—otherwise the social class did not influence the onset of the symptoms. Analogously families with large area per capita reported earlier onset of recurrent cough and sneezing, wheezy breath, asthma and allergic rhinitis than those with small apartments per capita. All these tendencies were statistically insignificant.

Environment

Only a few environmental factors were observed to have some effect on the severity of asthma (Tables 18 and 19). Combinations of several environmental factors making up animal, dusty, allergenic furnishings, moldy and irritant environments were investigated for their occurrence in the three social classes and apartments of different sizes per capita.

Social class and living area did not have any effect on the frequency of animal environment, allergenic furnishings and irritant environment. They also had no effect on how many "faulty" details were reported to exist in vicinity of the child.

Environments characterized by more than 6 dusty details were found most often in social classes II and III (d.fr. = 4, $X^2 = 13.62$, $p < 0.01$) and in apartments with less than 10 m² per capita (d.fr. = 8, $X^2 = 16.37$, $p < 0.05$). Moldy environments were observed most often in social classes II and III (d.fr. = 4, $X^2 = 37.22$, $p < 0.0005$) whereas living area did not have an effect on this.

Sex incidence

The social class and also the living area per capita had a slight parallel correlation with the sex ratio of the asthmatic children. The ratio boys/girls was generally 1.8:1, but this ratio was 2.5:1 in social class I and 1.4:1 in social class III, respectively. In the smallest apartments ($< 5 \text{ m}^2$ per capita) the ratio boys/girls was 0.8:1 and the ratio increased gradually to 4:1 in largest apartments ($> 30 \text{ m}^2$ per capita). This interesting phenomenon was not statistically significant.

Therapeutical aspects

The site of therapy before and during 1972 and the site of the planning of long-term therapy, [central hospital level, local level or nowhere (see page 16)], were not influenced by social classification. Stays in hospital and visits to a doctor in 1972 were not influenced by the social classification and the living area per capita.

Therapeutical measures as dealt with before in Table 17 were not influenced significantly by the social classification or living area per capita.

Number of children

Increasing number of children in the family was not observed to be associated significantly with a higher frequency of severe grades of asthma. There was an insignificant tendency of large families to have more severe cases of long-time asthma. However, children who were fifth or later in order had a tendency of having more often severe grades of long-time asthma than children first to fourth in order ($p < 0.025$).

Age of the parents

Young (< 25 years) and old (> 45 years) mothers had an insignificant tendency of having more frequently severe cases of asthma. The father's age did not show any correlation with asthma severity.

Mother's work

44.4 per cent of mothers were working outside their homes. The severity of asthma had a slight correlation with the mother's work: In the two most severe groups (II and III) 39.2 per cent of mothers worked while in the two mildest groups (O and I) this number was 46.9 per cent (d.fr. = 6, $X^2 = 14.03$, $p < 0.05$).

INFLUENCE OF REGIONAL FACTORS

Social class, living area and family size

The general distribution of this material into social classes was: I class 5.7, II: 68.9 and III 25.4 per cent, respectively. There was a tendency of the more developed regions II and III to have relatively more educated people (d.fr. = 4, $X^2 = 10.06$, $p < 0.05$). Living area per capita in the whole country was distributed as follows: $< 5 \text{ m}^2$ 2.0, $6-10 \text{ m}^2$ 15.6, $11-20 \text{ m}^2$ 58.5, $21-30 \text{ m}^2$ 17.9, and $> 30 \text{ m}^2$ 6.0 per cent of families. There was a clear tendency of the region III to have the larger apartments (88.4 per cent $> 10 \text{ m}^2$) more often than regions I and II (78.3 and 75.4 per cent $> 10 \text{ m}^2$) (d.fr. = 8, $X^2 = 28.17$, $p < 0.0005$).

Five or more children in the family occurred most often in regions I and II (35.9 and 25.2 per cent) whereas 7.7 per cent of families in region III were of this size (d.fr. = 6, $X^2 = 50.86$, $p < 0.0005$). Mothers were working in 44.4 per cent of families in the whole country. There were no regional differences.

Severity of asthma

There were no regional differences at all concerning the severity of asthma. Long-time asthma was also not influenced by the study region.

There were some significant differences regarding the frequencies of factors influencing asthma (allergens, physical

and chemical irritants etc.) but these differences were too small to be important from the clinical point of view.

Therapeutical aspects

The results concerning the site of therapy in the whole country are presented in Table 21. There were certain regional features outside the table which deserve explanation: In the region II central hospital level services were obtained least before 1972 ($p < 0.025$). This tendency was not statistically significant for therapy in 1972. Region II reported also the highest frequency of patients having no planning of long-term therapy (22.6 per cent) ($p < 0.01$).

TABLE 21

*Site of Therapy and Site of Planning the Long-term Therapy in Whole Country.
The Statistical Parameters Refer to the Regional Differences.*

Site of therapy	Therapy before 1972	Therapy during 1972	Planning of long-term therapy
1. Central hospital	83.4	57.4	60.9
2. Local level	15.3	21.3	23.8
3. None	1.3	21.3	15.3
Total %	100	100	100
N	555	555	555
d.fr.	4	4	4
χ^2	13.12	6.89	13.70
p	< 0.0250	> 0.05	< 0.010

As individual sites of therapy in 1972 were searched, some regional differences were found: In the regions I and II the local governmental medical services were used more than in region III. Vice versa, private doctors were used more in the region III than in regions I and II. This is most probably due to a more urban population in region III where the out-

hospital medical services depend more on private doctors in towns and densely populated communities.

The Hospital for Allergic Diseases in Helsinki had been used during 1972 least by children in the region I (9.6 per cent). The corresponding value was 19.6 per cent in region III. This fact is due to the long distance from the region I to Helsinki. About one fourth of children in all regions were reported to have received instructions for long-term therapy from the Hospital for Allergic Diseases. Skin tests had been performed in 71 per cent of cases. This figure was nearly the same for all regions. Long-term follow-up was reported in 45.9 per cent of patients. In this aspect there were no regional differences.

For therapeutical measures taken during 1970-72 the reader is referred to Table 17. Those actions with regional differences were: Animals had been removed from home most in regions I and II (56.4 and 64.0 per cent, respectively; $p < 0.0005$). This is natural, because of the more rural population in these regions. Adenoids were removed most in region III (56.3 per cent, $p < 0.01$) indicating perhaps the most dense medical services there. Unspecific vaccines and histamine azoprotein, Lertigon® were used slightly more in region III (42.6 per cent) than elsewhere ($p < 0.05$).

Environment

The type of living community was a town in 29.4, a densely populated community in 18.2 and countryside in 52.5 per cent of cases, respectively. People were reported to live in the countryside as follows: Region I 72.8, II 58.5 and III 41.5 per cent, respectively. The opposite was seen for people from towns. This tendency of region III to have a more frequent urban population than other parts of the country was significant (d.fr. = 4, $X^2 = 35.67$, $p < 0.0005$).

Smoking factories, unpleasant smelling establishments, flowering flowers and animal contacts in the vicinity of the home were those characteristics with worsening effect on

asthma (Tables 18 and 19). Allergenic objects at home (flowers, animals, furnishings) were most often reported from the study regions I and II. This indicates possibly a lower capacity of the medical organization in those regions to inform parents about the details of environmental control although this information was in principle given similarly in all study regions. Objects associated with agriculture were most often reported from study regions I and II this being due the larger proportion of farmers in the population in those regions. These environmental characteristics did not have a worsening effect on asthma, however. Moldy environments were most often reported from the study regions I and II.

DISCUSSION

Studies on asthma involving only questionnaire interview are always open to criticism because of the limitations of the method. Especially the severity of asthma is a central subject which may be evaluated heterogeneously by the parents. In order to minimize the heterogeneity of the answers, the parents were asked about the frequency of asthmatic days rather than the number of attacks, because "attacks" are often understood as dramatic episodes and mild attacks are missed. On the other hand, the questionnaire method is cheap. Its results may be considered to give a line of direction.

The prevalence-rate of asthmatic children has not been determined in Finland during the past years. Peltonen et al. (37) found in schoolchildren a prevalence of asthma of 0.85 per cent. Eriksson-Lihr (16) observed asthma among Helsinki schoolchildren (7-14 years) in 0.4 per cent of the boys and 0.3 per cent in the girls. Alanko (3) observed asthma in 10 to 19 years old rural population in 0.5 per cent and an overall prevalence (10 to 60 years of age) of 1.4 per cent.

The estimates of prevalence-rates for children in other Nordic countries are somewhat higher: Frandsen (20) found a rate of 0.8 per cent among Copenhagen schoolchildren (7-

14 years of age) and Kraepelien (30) reported a prevalence of 1.4 per cent in Stockholm schoolchildren (7-14 years). Dawson et al. (14) found a prevalence-rate of 4.8 per cent for Aberdeen children. Also American surveys show clearly higher prevalence-rates than the Nordic ones (5, 9).

When the earlier results by Peltonen et al. (37) and Eriksson-Lihr (16) are taken as a basis, one can calculate that there are some 8,000 to 10,000 asthmatic children in Finland.

This study was not aimed to investigate the prevalence-rate. Our sample did not reach the earlier estimates on prevalence-rate of childhood asthma in Finland. The prevalence-rate increased from 2.9 to 4.8 per thousand by extra questioning in material 1 (Table 2). The prevalence of material 2 (1.7 per thousand) is the same as obtained by Väänänen (53) in a similar study in 1967 based on a sample obtained from health nurses. Prevalence-rates in individual health nurse districts were from 0 to 22 per thousand. It shows that many known cases of asthma were not detected by the method used. The characteristics of patients in material 1 did not differ from those in material 2 in any important matter as tested with Chi square method. This suggests that the remaining part of asthmatic children in the study regions may be very similar to those included in the study. The results indicate that occurrence of asthma in different parts of Finland is rather uniform.

The *age distribution* of the material (shown e.g. in Table 6) was not in agreement with the ideal model which was constructed on grounds of reported ages of onset of asthma. In age groups 9-11 and 12-14 years there is a shortage of patients of about 25 and 50 per cent, respectively, when compared to the number of children in younger age groups. Thus, judgements about older age groups may have to be taken carefully. The conclusion about the whole material is that for most purposes it may be considered to represent the whole pediatric asthmatic population in Finland.

Allergic background and asthma in close relatives were found in 84 and 63 per cent of cases, respectively. These are

higher values than those reported elsewhere (12, 36, 46, 52), Wilken-Jensen (52) reported slightly better results of therapy in the group with allergies in the family. This was judged to be due to a better understanding of sustained therapy in this group. This is observed to hold true in clinical work in individual cases; in this material there was no significant relationship between the severity of asthma and family history of allergies.

Dawson (14) and Charpin (12) observed that the second and third children in the family had the greatest chance of getting asthma in childhood. These observations were confirmed in the present study. The reason for this phenomenon is completely unexplained.

In the present material there was a *ratio of boys to girls* of 1.8:1. This is practically the same as reported previously by many workers (12, 14, 33, 38, 39, 46). Dawson et al. (14) reported that boys had more severe asthma than girls. This was not observed in the present study, but both sexes had similar distribution according to the severity of asthma and of long-time asthma.

The *age of onset of asthma* (Table 4) was distributed rather similarly as in studies by Peltonen et al. (38), Selander (46), Wilken-Jensen (52), Leveque et al. (33) and Dawson et al. (14): 85 per cent of asthma had started before the age of 6 years. In the studies by Dawson et al. (14) and Charpin et al. (12) early onset of asthma was observed to result in relatively more severe cases of asthma than late onset. This relationship was not found in the present study. The time lag from the beginning of recurrent respiratory symptoms (cough and sneezing, wheezy breath) seems to have been shorter in this material than observed by Peshkin (39) in an American material. This difference has perhaps no clinical significance.

Withholding of foreign, *potentially allergenic foods*, during the first six to nine months of life has been observed to lower the incidence of asthma and allergic perennial rhinitis by Johnstone & Dutton (23). In the present study late breast feeding alone and late beginning with cow's milk, egg, fish,

orange, cereals and honey all together had a significant postponing effect on the onset of asthma (Table 5). Thus, it is worth while to recommend to the parents of potentially allergic children to sustain breast feeding up to six months of age and to withhold allergenic foods during at least the six first months of life. Six months or more of breast feeding was reported only in 13 per cent of cases. The corresponding value in 1962 was 20 per cent (22) and in 1950 approximately 50 per cent (21). This continuously decreasing incidence of late breast feeding may be an important cofactor which increases the incidence of childhood asthma and other allergic diseases. All personal discussions by the author with experienced pediatricians reveal that asthma in children has tremendously increased since the 1940's. Also the results in Finnish school-children by Peltonen et al. (37) suggest this tendency of increasing allergies.

TABLE 22

Comparison of the Asthma Severity Distribution of the Present Material with those of Three Earlier Studies

Asthma severity grading by Kraepelin (1958)		Asthma severity grading in the present study corresponding to that by Kraepelin (1958)	Asthma severity Distribution of the present material	Ryssing and Flensb. (1963)	Dawson et al. (1969)	Anton- sen (1973)
I	0-5 attacks/year	0	32.8	22	58	} 80 20
II	6-10 attacks/year	I	30.6	26	29	
III	> 10 attacks/year	II and III	36.6	42	13	
Age (years)			0-14	?	10-15	0-14

A comparison of the *severity of asthma* between the present study and previous ones may be misleading. There are several scoring systems of asthma severity: That by Kraepelin (31) is based on the number of attacks per year, that by Charpin et al. (12) on the number of asthmatic days per year, and

Falliers et al. (17, 18) use a weekly score. The asthma severity grading used in this study resembles that of Kraepelin et al. (31) as presented in Table 22. The combination of Grades II and III of the present study includes cases which would belong to Grade II in Kraepelin's grading. E.g. Ryssing & Flensburg (45), Dawson et al. (14) and Antonsen (4) (Table 22) have used Kraepelin's severity grading of asthma.

A further comparison can be made between the asthma situation in 1971 of the present study and results given by Charpin et al. (12): < 10 days of asthma/year 43.1 per cent (Charpin: 20.1 per cent < 8 days/year), 10–70 days of asthma 42.6 per cent (Charpin: 54 per cent 8–60 days) and > 70 days of asthma 14.3 per cent (Charpin: 25.3 per cent > 60 days or continuous asthma).

As seen in Table 6, there was no consistent age dependency concerning the severity of asthma. One can conclude that there are as many symptomatic cases of asthma after 10 years of age as before that age. Long-time asthma (patients with asthma for 2 years or more) was also not statistically age-dependent, although severe grades occurred least frequently in ages from 4 to 11 years (Table 7). Fig. 2 represents an idealized structure of the asthmatic population in different ages with reference to the age of onset (Table 4) and distribution according to severity grading (Table 6). As the onset and severity grading were almost identical in different parts of the country one may expect the features presented in Fig. 2 to exist in every Finnish material with minor variations.

Worthy of consideration is the large proportion of patients with severe asthma in the age group 12–14 years. A partial answer may be the fewer contacts with medical care (Tables 12, 15) among the school age children than among the younger age groups. It is also common that allergy testing is not repeated in the later stages of the disease when the child is having much trouble.

Specific hyposensitization therapies were ordered in 20.8 per cent of cases. Finnish asthmatic children are estimated to have allergy to fungal spores in 25 per cent and to house dust

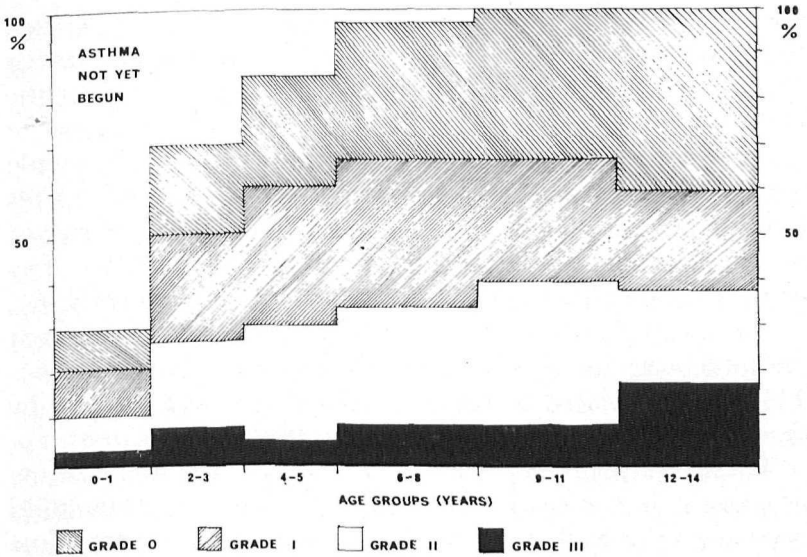


Fig. 2.

The idealized model of childhood asthma situation in Finland. The information is compiled from Table 4 (age of onset) and Table 6 (asthma severity in different ages).

in 35 per cent of cases respectively (28). These allergies alone, when not treated properly, will create the situation of Fig. 2. However, these allergies can effectively be treated by hyposensitization (2, 51).

Ryssing (44) states that asthmatic children becoming symptom-free before the age of 15 years have a better *prognosis* than those with asthma symptoms in this age. Therefore, patients of school age deserve the special interest of allergologists, especially since specialized allergological care is insufficiently utilized by this group of patients. A more detailed study would be necessary to characterize the problems in this age group.

According to available investigations (7, 15, 19, 41, 44, 47) 20 to 60 per cent of asthmatic children continue to have symptoms after a follow-up 10–20 years. Similar observations have been done by Pynnönen (40) on a southwestern Finnish

material of patients approximately 20 years old. She observed that about one third of former childhood asthmatic are having symptoms at that age. Furthermore, asthma patients after the pediatric age are treated by internists. They often tend to consider asthma as an "intrinsic" one. Thus, many young people with allergic asthma are treated only symptomatically. This is a real point in childhood asthma, because only a minority of the children have a severely invalidating disease, but frequency of disability increases after the age of 20 years (36). In Finland the costs of lung diseases are about 10 per cent of the total costs for therapy and salaries of all diseases (26). The costs associated with lung diseases are exceeded only by those of the psychiatric and cardiovascular diseases.

There are many reports showing that the initial asthma situation is important for the prognosis (1, 12). Thus, mild cases are more likely to be mild cases after 5 to 10 years time than severe cases. This could be found when change from 1971 to 1972 was studied (Table 8). Similar findings were obtained for long-time asthma (Table 9). The annual change of asthma severity from 1971 to 1972 was rather similar to that observed by Dawson et al. (14). The change to better or worse asthmatic condition was observed in all age groups. There were slightly more improved cases in the age groups from 6 to 11 years. This corresponds also to the practical clinical impression.

Atopic eczema is found more often in patients with an onset of asthma before the age of 20 years than in those with a later onset (8). Several workers (7, 10, 12, 33) have observed that asthmatic children with present or past atopic eczema have an excess of severe asthma. In the present study 52.3 per cent of patients had atopic eczema. Patients with previous eczema did not differ from those without eczema in asthma severity. Those with present eczema tended to have more often severe asthma (insignificant). The long-time asthma grading was relatively more severe in patients with present eczema ($p < 0.025$).

Patients with *allergic rhinitis* (41.8 per cent) had more

severe asthma and long-time asthma. This finding is in agreement with previous findings (25, 41, 44) that patients with rhinitis have a lesser chance for relief from asthma.

The *death rate* obtained in this material, 0.18 per cent (1 patient) overshoots the situation in the whole of Finland. During the last part of 1960's there were annually approximately 7 deaths due to asthma in the ages from 0 to 19 years (27). This number of asthmatic deaths corresponds to a death rate of roughly 0.05 per cent in the present asthmatic population.

Allergens of asthma as observed by the parents themselves were reported seemingly uncritically, so the reported figures may represent a maximum estimate for respective allergens. A more reliable estimate of the allergens causing asthma in children in Finland is as follows (28): pollen in 30-40 per cent, fungal spores in 25 per cent, house dust in 35 per cent, animal dander 40-50 per cent and foods in 15 per cent of patients.

Unspecific worsening factors were reported more often for children with severe than mild asthma. Such factors as tobacco smoke and smell of cosmetics were reported to cause asthma often enough to justify more information about their role in asthma. Psychological worsening factors were reported to occur in about 50 per cent of patients.

It is a general impression in everyday practice that asthmatic children of school age are not as frequent visitors to out-patient clinics as are children of pre-school age. This fact was clearly verified in this study. There was a strong relationship between the severity of asthma and long-time asthma, and the frequency of *contacts with medical services*. Furthermore, increasing severity of asthma increased the number of contacts to the central hospital level. However, rather many patients with severest grades of asthma had no contact with medical services, or had contact with services at local level only. These patients were most often children of school age. They often have a tendency to minimize their asthmatic symptoms. Charpin et al. (12) noticed this disappearance of

patients from follow-up series with a rate of 60 per cent per year. In general local doctors may not be considered competent in pediatric allergology. The therapy applied at this level is too often symptomatic only, and thus ineffective on a long-term basis.

Surprisingly, the frequency and level of medical contacts were not influenced by social class. Also there were unexpectedly small regional differences concerning the frequency and level of medical contacts. If there were regional differences, they were unfavorable for patients living in region I and II (middle and northeastern parts of Finland). However, the reader is reminded of some features of regions I and II which are unfavorable in comparison to the southwestern region III: Longer distances to local doctors and central hospitals and the relatively lower number of pediatricians in these regions (Table 1). The latter fact makes it probable that asthmatic children in regions I and II are more often than in region III seen only briefly when acute stages of asthma occur. In fact lack of long-term instructions for therapy occurred mostly in regions I and II. In spite of these negative presuppositions the over all situation in regions I and II was similar for asthma to that in region III.

Long-term follow-up was arranged in 45.9 per cent of cases. There were only minor regional differences. Although follow-up was reported more in cases with severe asthma than in mild cases, about one third of the severe cases were without long-term follow-up. These children were mostly of school age. This age group most often also had no central hospital level contacts. This means that in many instances (especially in school aged groups) even severe cases do not have such medical contacts which are supposed capable of allergological diagnosis and therapy. Apparently the situation is due to the fact that asthmatic children in all parts of Finland are treated by available pediatric manpower predominantly in acute situations and not according to a controlled, purposeful schedule as applied e.g. in the therapy of diabetic patients. The latter kind of treatment would include planned controls even for

symptom-free asthma patients. *The problem is:* How many pediatric allergologists are needed to diagnose, treat, and follow-up the 10,000 asthmatic children in Finland. An unknown number of children with allergic rhinitis should also be evaluated to cover the whole field.

Therapeutical measures could be studied only superficially in the present material. The quality of environmental controls, specific therapy, etc. can be studied only by the particular medical institutions themselves through laborious controls. It may be stated that almost all therapies were applied relatively more often in severe than mild cases of asthma. Self-evident therapies such as environmental control, physiotherapy, etc., were not always used even in the most severe cases of asthma (Table 17). The use of unspecific injection therapies was rather frequent (62.4 per cent) when compared to that of specific injection therapies (20.8 per cent) (Table 17). This ratio of unspecific and specific injection therapies would indicate a poor belief in specific therapy, presumably due to unsatisfactory testing facilities. No one really knows in how many patients specific hyposensitization should be used. A line of direction would be the mean hyposensitization rate of 63 per cent in a Norwegian material of asthmatic children by Antonsen (4).

It was remarkable how few allergenic *environmental factors* in the homes were associated with an excess of severe asthma or long-time asthma (Table 18). The possibility exists that in the interview as well as to their own doctors, the parents did not reveal some pet(s) or similar sources of allergen. It is more probable, however, that a therapeutical feedback from cause-symptom-observations to removal of the cause is effective at the patient-level. This view was confirmed e.g. by the finding that feather pillows, flowering flowers and wool objects were more often reported to exist in bedrooms of mildly asthmatic children than of severe cases. Otherwise, allergenic objects in the homes of patients were distributed evenly in all grades of asthma severity. However, one may state that feather pillows, flowering flowers etc., are allergens

which are risky factors and would be easy to remove. Here, increased information given to the parents would easily correct the situation.

The dusty and moldy environmental characteristics asked were not associated with an excess of severe asthma. The reason is clear: House dust mites live in clean houses as well as in dusty houses (48) and the occurrence of fungi is not necessarily related to housing characteristics. Fungi are a product of green nature (13, 35) and may colonize structures of new as well as old houses (29).

Those environmental characteristics which were associated with an excess of severe asthma were "unavoidable" in character (Table 18): smoking factories, stinking establishments and animal contacts in stairwells. Also flowers belong to this category, but can of course to some extent be avoided if information is given of their role in asthma.

The observations on the effects of smoking and stinking establishments are by no means surprising. Cassel et al. (11) observed that air pollution can be a contributory factor of the common cold, cough and other symptoms. Asthmatic patients may be considered far more sensitive to pollutants, and severe cases are therefore probably harmed by environments with air polluting industries, etc. Finnish towns have clean air when compared to that in industrialized towns elsewhere. This may explain why children in towns and densely populated communities had almost the same asthma severity as children from the countryside. There may also exist compensating factors which make the role of air pollution in the towns difficult to detect: e.g. allergy to fungal spores is more probable in the patients from the countryside, because the spores occur in larger amounts in the countryside than in towns (13).

Social classes I and III were underrepresented in this interview as compared with the distribution in the general population. There are varying results on the effect of the social class on occurrence of asthma. This is thoroughly reviewed by Mitchell & Dawson (34). The social class had only a minor effect on the severity of asthma and long-time asthma.

Social class III included a slight excess of severe cases. This finding is similar to that by Dawson et al. (14) in Aberdeen asthmatic children.

The frequency and level of medical contacts were not influenced by the social and living conditions. This indicates that the health insurance and social systems used in Finland make medical services available for all social levels which is a very important factor in the therapy of a chronic illness like asthma.

Asthma had a clear effect on the *mother's working* possibilities. At present more than 50 per cent of Finnish women are working outside their homes. In the present material corresponding figures were lower: 46.9 per cent of mothers of a Grade 0-1 asthmatic child and 39.2 per cent of those of a Grade II-III asthmatic child were working outside their homes. These figures indicate that there is also an aspect of national productivity involved in the problem of childhood asthma.

SUMMARY AND CONCLUSIONS

The results of the questionnaire-interview study of 559 asthmatic children (0-14 years) from all parts of Finland are presented. 85 per cent of cases were reported to have had the onset of asthma before 6 years of age. The age at onset of asthma was significantly postponed with late breast-feeding and late onset of other protein foods. Early onset of asthma was not observed to make asthma severe. The ratio boys/girls was 1.8:1. Asthma occurring weekly and monthly was observed in 9.1 and 27.5 per cent of patients, respectively. Asthma occurring five to ten times per year was observed in 30.6 per cent, and 32.8 per cent of patients had no asthma or only occasional wheezing episodes.

Severity of asthma (in 1972) and of long-time asthma (asthma two or more years) was not significantly age dependent; there were slightly more severe cases of asthma at the

age 12 to 14 years than in younger age groups. Severe asthma in one year was more probably severe the following year than initially mild asthma. The duration of severe asthma for two or more years did not increase the probability of the asthma remaining severe the next year.

Atopic eczema and allergic rhinitis occurred in 52.3 and 41.8 per cent of patients respectively. Occurrence of both of them had a tendency of being associated with more severe asthma.

The frequency and the quality of medical contacts increased as the severity of asthma increased. There were, however, far too many severe asthmatics without satisfactory contacts with medical care. These patients were predominantly children of school age.

Allergological and symptomatic therapies were applied more frequently in severe than in mild cases. Many of the severe cases had not satisfactory environmental controls. In some cases this apparently was due to lack of information. Symptomatic therapies with corticosteroids and ACTH were frequent (5.2 and 7.2 per cent). Specific hyposensitization therapy were infrequent (20.8 per cent) when compared to the unspecific ones (62.4 per cent). Surprisingly few allergenic or irritant factors in the environment were observed to have a worsening effect on asthma. Allergenic factors associated with severe asthma were "unavoidable" in character. These observations were assumed in most cases to be due to removal of allergenic objects suspected to cause asthmatic symptoms. Fungal and house dust allergies are the most probable causes of severe asthma.

Social and living conditions had no marked effect on the severity and therapeutical aspects of asthma. Low social status caused a slight excess of severe asthmatics. The mother's working ability lowered by the severe grades of asthma.

Regional (I: northeastern, II: middle, III: southwestern parts of Finland) factors did not influence the severity of asthma. Therapeutical facilities were observed to be slightly worse in northeastern and middle regions than in the south-

western region. There are probably several factors in the qualitative sense making the situation even worse in regions I and II which are not seen in the present statistics.

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