

From the School Medical Officers' Organization of the Copenhagen Municipality, Denmark.

BRONCHIAL ASTHMA AMONG SCHOOL CHILDREN IN COPENHAGEN¹

By

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Bronchial asthma during childhood is both a frequent and serious disease, and especially for children who attend school it gives rise to many problems in connection with health, health insurance and school education. The purpose of the present paper is to elucidate some aspects of this complex of problems. The aim has been especially to examine the frequency of bronchial asthma in school children, and further to find out to what degree the disease influences the children's school life with regard to non-attendance, acquisition of knowledge, trouble with the daily school work etc.

The health authorities have considered the idea of establishing special school welfare work in the form of a special school for children suffering from asthma just as they have done in Stockholm. The present study also aimed at elucidating the question of any possible need for a school for such handicapped children in Copenhagen.

The examination is based upon a material for the school year 1949-50, collected in the course of visits to all schools in the Copenhagen municipality, comprising 79 municipal schools and state schools and 16 private schools with a total number of 79,944 pupils; these are distributed on the elementary school, the non-examination middle school, examination middle school, top forms ("Real"- and "Præliminær"-forms for

¹ Read before the Danish Society for Allergy Research, March 15, 1957.

young people leaving school at the age of 16 or 17), senior school forms (preparing for General Certificate examination), and special schools for handicapped children. The information was collected from the school medical officers' health entry cards; these are based upon the child's past history, entered when he, or she, first appeared at school and taken from a questionnaire to the parents, generally supplemented by an interview between the school medical officer and the parents. Further, the entry card gives information about the annual health control at the school, supplemented by entries about the child's diseases and admissions to hospital during the past year. Such a material affords excellent possibilities of estimating various facts in connection with diseases in children of school age.

In the present investigation an attempt was made to supplement the information given on the health entry cards by sending questionnaires to the homes; and to estimate the standard, the frequency of non-attendance etc., the non-attendance records and mark-books of children with asthma were examined, whilst at the same time the child's form-master supplied further information.

I may briefly mention some previous investigations on the incidence of bronchial asthma in school children. In 1954 *Kraepelin* examined conditions in all elementary schools of Sweden for the school years 1948-49 and 1949-50; among 235,649 and 247,000 children respectively he found an incidence of bronchial asthma of 0.73 per cent. Among 60,063 school children in Stockholm aged from 7 to 14 years the same author found an incidence of 1.37 per cent, varying from 1.61 per cent in the first to 0.87 per cent in the eight school year. For the years 1944-45 and 1951-52 he found in children aged from 14 to 20 years in the higher schools in the whole of Sweden incidences of 0.39 per cent and 0.52 per cent respectively. In 1955 *Peltonen & Kasanen* found an incidence of 0.6 per cent of bronchial asthma among 4,832 school children in Finland; about $\frac{4}{5}$ of the children were from rural districts and about $\frac{1}{5}$ from Åbo. In 1955 *Eriksson-Lihr* de-

monstrated an incidence of bronchial asthma of 0.7 per cent (0.4 per cent of boys and 0.3 per cent of girls) in 27,999 school children in Helsingfors.

TABLE I
*Incidence of Bronchial Asthma in School Children in Copenhagen
in the Year 1949-50*

	Total	Asthma	%
Boys	40,009	408	1.02
Girls	39,935	235	0.58
	79,944	643	0.80

In the Copenhagen series of the school year 1949-50, comprising 79,944 pupils, 643 children in all with bronchial asthma, namely 408 boys and 235 girls, were found. This gives an incidence of bronchial asthma of 0.80 per cent (0.51 per cent of boys and 0.29 per cent of girls). The incidence was 1.02 per cent in boys and 0.58 per cent in girls. This finding corresponds rather closely to the above-mentioned figures found in the Finnish investigations and the Swedish for the whole of Sweden.

The ratio between boys and girls, 63.5 per cent and 36.5 per cent, is in complete accord with *Flensburg's* series of 1945, in which he found 63.8 per cent of boys and 36.2 per cent of girls among 298 children with bronchial asthma.

The age-incidence in Fig. 2 shows that most cases occur at ages from 9 to 12 years both in boys and girls; the maximum in boys is at the age of 11, in girls at the age of 12 years. It may be mentioned that the number of cases of bronchial asthma at the ages of 6 years and 15 to 18 years affords no guidance in estimating the occurrence of bronchial asthma in Copenhagen children at these ages, as the number of school children at these ages is comparative small.

The problems of children suffering from bronchial asthma are highly dependent on the severity of the disease; an attempt has therefore been made to distinguish between mild, moderate and severe cases. This classification is based in every one

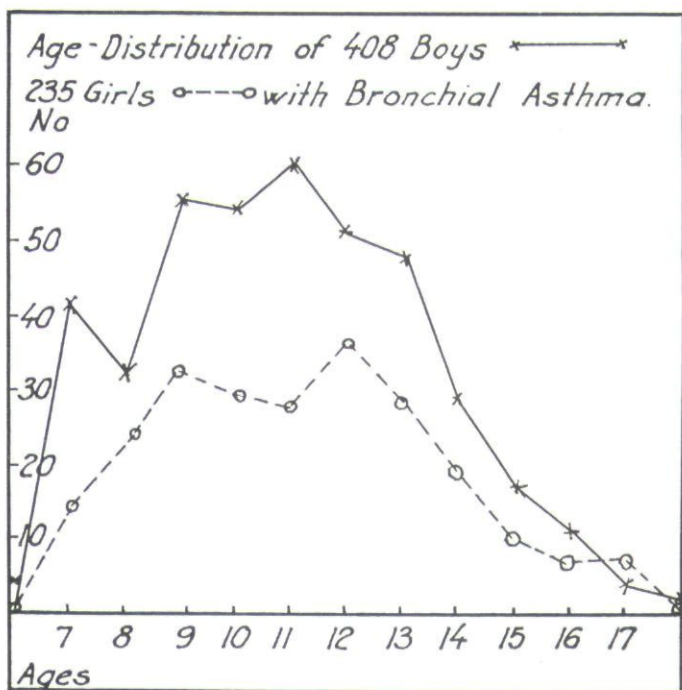


Fig. 2.

case on a complete assessment of the information obtained about the child with regard to duration of the disease, stays in sanatoria and hospitals, periods of illness and non-attendance to school, deformity of the thorax, faulty carriage, and emphysema. The limits are, of course, vague, and dependent on the examiner's assessment. In a number of children the decision as to which group the child belongs to must be based on a mere estimate and this is open to criticism; however, under practical conditions such a classification seems to be advantageous, and in the great majority of children there was no doubt in which group the child belonged.

It appears from Fig. 3 that there were almost twice as many boys as girls among the mild and moderate cases, whereas the number of severe cases was almost the same in either sex.

Fig. 4 shows that the percentage distribution on the three

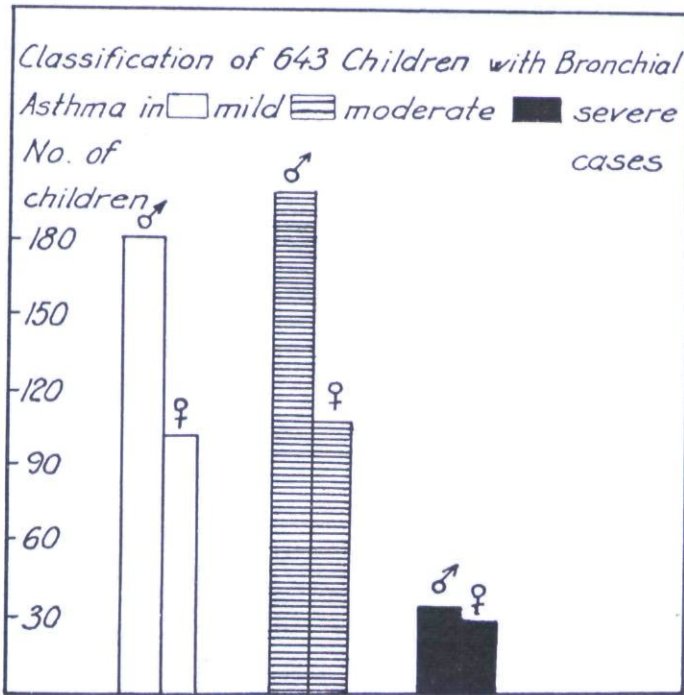


Fig. 3.

groups of boys and girls was almost the same for mild and moderate cases, whereas there was some preponderance of severe cases among girls.

The distribution of the children between public and private schools appears from table V. 9 per cent of the children with bronchial asthma went to private schools; this gives a somewhat higher incidence of asthma among the children in the private schools, as the latter were only frequented by almost 6 per cent of the total number of school children in the Copenhagen municipality in the school year 1949-50. Six children who were taught at home wholly or in part throughout the school year owing to asthma had all been entered at municipal or state schools.

Next follow some tables VI-XII showing the frequency of

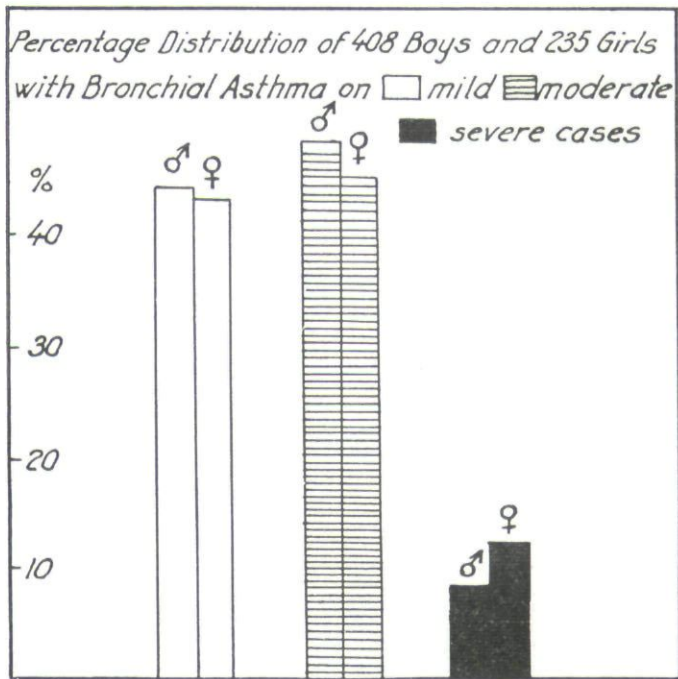


Fig. 4.

non-attendance of the children compared with their standard at school. Here, too, a distinction is made between boys and girls and between mild, moderate and severe cases. It applies to a number of the children that the records of non-attendance have been so insufficient that they had to be left out of the series. The statements of non-attendance include stays in hospitals, sanatoria, Christmas-Seal institutions, homes for asthmatics, and summer camps for delicate children. Stays in these institutions as well as holidays are not included in non-attendance; the actual periods of disease for these children are therefore in many cases much longer than shown by the tables. The average non-attendance for all school children in the school year 1949-50 was 7 days. It may be mentioned that the non-attendance shown in the tables in the case of children with bronchial asthma comprises all forms of non-attendance owing

TABLE V
*Distribution of children with Bronchial Asthma on Public
 and Private Schools in Copenhagen*

	Municipal and state schools		Private schools	
Boys	375	58 %	33	5 %
Girls	210	33 %	25	4 %
Total	585	91 %	58	9 %

to disease other than asthma. However, in the case of the children with asthma the non-attendance in the majority of cases was due to the asthma.

In the case of children with mild and moderate bronchial asthma their standard at school in relation to non-attendance was almost the same for boys and girls as estimated by their teachers. In the case of severe asthma the girls apparently did better at school than the boys. The low standards increased evenly with the severity of the asthma, but it is very remarkable that a low standard was found in only 17 per cent of the boys and 16 per cent of the girls in spite of the repeated, prolonged non-attendance. It is just as remarkable that the majority of the children with severe bronchial asthma managed excellently at school in spite of the repeated, prolonged non-attendance; one-fourth of the children were thus above the general average of their forms. This is presumably due to several causes; both parents, elder brothers or sisters, and teachers look more after these sick children; the latter have more time for studies during the periods of disease than other children, and, finally, the allergic constitution may possibly be associated with a higher average intelligence than the normal. This is also suggested by a study by *Grant* (1957), who found a higher incidence of bronchial asthma among undergraduates than in the general population. It appears from the annual report for 1948-49 of the Copenhagen School Medical Officers that the incidence of bronchial asthma was 0.25 per cent among pupils in classes for backward children, whereas it was 0.50 per cent in the other classes and forms. This might sug-

♂ <i>Standard at School in Relation to Non-Attendance in 143 out of 179 Mild Cases of Bronchial Asthma.</i>							
<i>Total</i>							
<i>Standard</i>	37	62	29	6	3	6	143
<i>Fine</i>	::	:::	..				8%
<i>Above average</i>	:::	:::	:::	:::			21%
<i>Average</i>	::::	::::	::::	.	..	:::	63%
<i>Below average</i>		::	::				5%
<i>Very low</i>		.	..		.		3%
<i>Non-at- tendance in days</i>	<7	7-30	30-60	60-90	90-120	>120	

TABLE VI

gest the same. It appeared from this material that 4 of the children with severe bronchial asthma and a poor standard at school were living under very bad conditions at home, and that this was highly contributory to the low standard. The estimate of asthmatic children's standard at school by the teachers should not be considered absolute, both because there exists no definite "mean standard", and because the majority of teachers when directly asked presumably will take a mild and optimistic view regard to the standard of pupils who are often ill and have periods of prolonged non-attendance. It is, however, considered justifiable to draw conclusions from this investigation with regard to the tendency in the standard of children with bronchial asthma.

Tables XIII and XIV give the views of the teachers with

♂ <i>Standard at School in Relation to Non-Attendance in 173 out of 198 Moderate Cases of Bronchial Asthma.</i>							
<i>Standard</i>	<i>Total</i>						<i>173</i>
	<i>19</i>	<i>76</i>	<i>44</i>	<i>15</i>	<i>9</i>	<i>10</i>	
<i>Fine</i>	..	...		..	..		8%
<i>Above average</i>	...	...	...	..	...	..	24%
<i>Average</i>	...	...	...	...	.	...	48%
<i>Below average</i>	.	...	...	.	.	.	15%
<i>Very low</i>		..	...	..	..		5%
<i>Non-at- tendance in days</i>	<7 7-30 30-60 60-90 90-120 >120						

TABLE VII

regard to the trouble experienced by the children owing to their asthma in everyday school life. It appears that only few children feel actually troubled by their asthma at school, but I am inclined to believe that the view of the teachers is much too optimistic, and that they have only included such children as have been appreciably troubled by the disease. 18 per cent of the boys and 28 per cent of the girls should thus feel troubled at school, but these figures are lower than those indicating exemption from physical exercise, and this suggests a too optimistic view in this respect. The children's trouble includes different difficulties at school, for instance that they always stay in the class-room during playtime or in bad weather, come later in the morning during periods of disease and in damp weather etc. Some children have difficulties in managing the stairs at school owing to dyspnoea and are inhibited during

♂ <i>Standard at School in Relation to Non-Attendance in 26 out of 31 Severe cases of Bronchial Asthma.</i>							
<i>Total</i>							
<i>Standard</i>	<i>1</i>	<i>3</i>	<i>5</i>	<i>4</i>	<i>7</i>	<i>6</i>	<i>26</i>
<i>Fine</i>			.	.			8%
<i>Above average</i>			.	.	..	.	19%
<i>Average</i>	.	..	.	.	..	..	35%
<i>Below average</i>		.	.	.	..	.	23%
<i>Very low</i>			.		.	..	15%
<i>Non-at- tendance in days</i>	<i><7</i>	<i>7-30</i>	<i>30-60</i>	<i>60-90</i>	<i>90-120</i>	<i>120-150</i>	

TABLE VIII

play with their school-fellows. Some also feel troubled by the dust in the woodwork room.

The participation of children with bronchial asthma in psysical exercise and sports is shown in Tables XV and XVI. The participation of the girls in phycical exercise is somewhat lower than that of the boys; the girls are presumably more readily excused from attendance than the boys. As may be expected, the frequency of exemption increases with the severity of the asthma, and in the severe cases as many as half the boys and almost two-thirds of the girls are wholly or partly excused from attendance. In my opinion it is unfortunate that the frequency of exemption is so high. The children should of course, be excused from attendance in physical exercise during periods of disease, but only as short as possible; and with a view to the child's physical- and psychic development

♀ <i>Standard at School in Relation to Non-Attendance in 91 out of 101 Mild Cases of Bronchial Asthma.</i>							
<i>Total</i>							
<i>Standard</i>	25	48	15	3			91
<i>Fine</i>	...	..	.				7%
<i>Above average</i>				.			23%
<i>Average</i>							58%
<i>Below average</i>	..	...	...	..			11%
<i>Very low</i>		.					1%
<i>Non-at-</i> <i>tendance</i> <i>in days</i> < 7 7-30 30-60 60-90 90-120 >120							

TABLE IX

the aim should be normal attendance under supervision. Cooperation between the school medical officer and the physical training master in this field would be valuable.

Tables XVII and XVIII show the incidence of faulty carriage, deformity of the thorax, and emphysema. These complications are almost equally frequent in boys and girls. In severe cases of asthma they occur in about half the boys and in a somewhat lower number of girls. In my opinion these figures are distressingly high, as many of these children no doubt will have to lead the pitiful life of the chronic asthmatic when they grow up. The figures must be considered minimum figures in all groups, as a special investigation with a view to these serious complications in bronchial asthma would undoubtedly have shown higher figures. In a series of 450 children, *Flens-*

♀ <i>Standard at School in Relation to Non-Attendance in 92 out of 106 Moderate Cases of Bronchial Asthma.</i>							
<i>Total</i>							
<i>Standard</i>	14	40	25	6	3	4	92
<i>Fine</i>	.		.	.	.	.	10%
<i>Above average</i>			...	..			26%
<i>Average</i>				.	.	..	46%
<i>Below average</i>	..		..	.	.	.	15%
<i>Very low</i>		.	.	.			3%
<i>Non-at- tendance in days</i> < 7 7-30 30-60 60-90 90-120 >120							

TABLE X

borg found that 30 per cent had deformity of the thorax and 20 per cent had emphysema, i.e. somewhat higher figures than in the present series from the schools, in which no doubt there have been several mild cases. With regard to the prognosis of the disease and the child's future life, all conceivable therapeutic measures should be used to reduce the incidence of these complications.

Tables XIX and XX show the extent to which the children have been referred to specialist treatment (asthma clinics, paediatric departments and practising allergologists). About one-fourth of the children have not been referred to specialist treatment; this applies especially to children with mild cases of asthma, though also two girls with severe asthma have never been referred to specialist treatment. In this respect the

♀ <i>Standard at School in Relation to Non-Attendance in 25 out of 28 Severe Cases of Bronchial Asthma.</i>							
<i>Standard</i>	<i>Total</i>						
	3	5	1	5	4	7	25
<i>Fine</i>		..		.		.	16%
<i>Above average</i>		.			.		8%
<i>Average</i>	...	.	.	..	..	::	52%
<i>Below average</i>				..	.		12%
<i>Very low</i>		.				..	12%
<i>Non-at- tendance in days</i>	<7 7-30 30-60 60-90 90-120 >120						

TABLE XI

school medical officer is especially qualified to recommend examination and treatment, and to control that the treatment is carried through.

The whole of this investigation shows that treatment is much wanted by a large group of children of school age with bronchial asthma. The requirement for examination and treatment may possibly have been met in this city by the existing institutions, but the possibilities in the rest of the country are too few. Conditions in Copenhagen might possibly be improved by special care for such handicapped children, at there is a group of children with bronchial asthma who would undoubtedly be essentially relieved if, simultaneously with school attendance and treatment, they changed environment for a short or prolonged period. This could be realized either by a

TABLE XII

Survey of Non-Attendance in 550 School Children with Bronchial Asthma

	Non-attendance in days						
	< 7	7-30	30-60	60-90	90-120	120-150	> 150
Boys	57	141	78	25	19	14	8
342	17%	41%	23%	7%	6%	4%	2%
Girls	42	93	41	14	7	6	5
208	20%	44%	20%	7%	3%	3%	3%

TABLE XIII

Estimate by Teachers of Trouble Experienced by children with Bronchial Asthma at School.

	Mild	Moderate	Severe cases	Total
Boys	179	198	31	408
Slight trouble	17	31	7	55
Considerable trouble	5	3	8	16
Very considerable trouble	0	0	1	1

} 18%

TABLE XIV

Estimate by Teachers of Trouble Experienced by children with Bronchial Asthma at School

	Mild	Moderate	Severe cases	Total
Girls	101	106	28	235
Slight trouble	17	28	11	56
Considerable trouble	1	5	4	10
Very considerable trouble	0	1	0	1

} 28%

TABLE XV

Participation of Children with Bronchial Asthma in Physical Exercise and Sports

	Mild	Moderate	Severe cases	Total
Boys	179	198	31	408
Normal participation	149 (83%)	135 (68%)	14 (45%)	298 (73%)
Partial exemption	17 (10%)	22 (11%)	3 (10%)	42 (10%)
Complete exemption	11 (6%)	40 (20%)	12 (39%)	63 (16%)
No data available	2	1	2	5 (1%)

TABLE XVI

Participation of Children with Bronchial Asthma in Physical Exercise and Sports

	Mild	Moderate	Severe cases	Total
Girls	101	106	28	235
Normal participation	73 (72%)	51 (48%)	11 (39%)	135 (57%)
Partial exemption	16 (16%)	30 (28%)	3 (11%)	49 (21%)
Complete exemption	9 (9%)	24 (23%)	14 (50%)	47 (20%)
No data available	3	1	0	4 (2%)

TABLE XVII

Faulty Carriage in School Children with Bronchial Asthma.

	Mild	Moderate	Severe cases	Total
Boys	179	198	31	408
Faulty carriage	17 (9%)	36 (18%)	16 (52%)	69 (17%)
Girls	101	106	28	235
Faulty carriage	13 (13%)	16 (15%)	9 (32%)	38 (16%)

TABLE XVIII

Deformity of the Thorax and Emphysema in School Children with Bronchial Asthma

	Mild	Moderate	Severe cases	Total
Boys	179	198	31	408
Deformity of thorax; emphysema	16 (9%)	37 (19%)	14 (45%)	67 (16%)
Girls	101	106	28	235
Deformity of thorax; emphysema	6 (6%)	17 (16%)	11 (39%)	34 (14%)

special form of school or by housing the children for a prolonged period in connection with existing special departments where they can be treated, whilst at the same time they attend a neighbouring school and thus keep in contact with their school-fellows. Unfortunately, private teaching in the child's home is permitted; the present series contained 6 children, 2 who received partial and 4 who received complete private tuition. These children can hardly avoid neuroses of varying degree as a complication to their asthma in the overprotected

TABLE XIX

Specialist Treatment in School Children with Bronchial Asthma

	Mild	Moderate	Severe cases	Total
Boys	179	198	31	408
Referred to specialist	99 (55%)	159 (80%)	31 (100%)	289 (71%)
Not referred to specialist	80 (45%)	39 (20%)	0	119 (29%)

TABLE XX

Specialist Treatment in School Children with Bronchial Asthma

	Mild	Moderate	Severe cases	Total
Girls	101	106	28	235
Referred to specialist	56 (55%)	90 (85%)	26 (93%)	172 (73%)
Not referred to specialist	45 (45%)	16 (15%)	2 (7%)	63 (27%)

domestic asthma environment, removed from the contact with children of their own age and from normal school life. In my opinion, private tuition ought to be limited and reduced as much as possible.

SUMMARY

For the school year 1949-50 an incidence of bronchial asthma of 0.80 per cent was found among school children in Copenhagen.

The incidence was highest at ages from 9 to 12 years in both girls and boys; over one-third were girls and almost two-thirds were boys.

9 per cent of the children attended private schools, the others went to municipal or state schools.

The frequency of non-attendance increased gradually with the intensity of the disease; many children had a very considerable frequency of non-attendance, and about one-fifth of the children had been absent from school for more than a quarter of the school year.

With regard to knowledge, the children did very well in spite of prolonged non-attendance; almost one-third were above the average, and less than one-sixth below.

Over one quarter of the boys and almost half the girls were

wholly or partly excused from physical exercise and sports. This is considered very unfortunate.

Chronic sequelae of the asthma in the form of deformity of the thorax, emphysema and faulty carriage were seen in one-sixth of the children.

One quarter of the children had not been referred for specialist treatment of the disease and it is considered that there is insufficient treatment among school children.

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