

ORIGINAL ARTICLE

Spectrum of Asthma in Children Visiting the Outpatient Clinic of the Subdivision of Allergy and Immunology

by

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*(From the Department of Child Health, Medical School University of Indonesia)***Abstract**

A retrospective study on clinical and laboratory findings was conducted in 104 children with asthma visiting the Outpatient Clinic, Subdivision of Allergy and Immunology, Department of Child Health, Dr. Cipto Mangunkusumo General Hospital, Medical School, University of Indonesia, Jakarta.

This study revealed that the proportion of asthma in males was greater than in females with the ratio 1,36 : 1. The age ranged from 8 months to 14 years with a mean age of 6,72 years. The majority of the children (70,2%) had the age of onset of asthma under 5 years, and the highest percentage was between 2 - 4 years (45,2%).

The author thinks that this may be due to the upper respiratory tract infections, which are frequently found in this age group of children and may precipitate asthma in certain individuals. There was no significant correlation between the duration of breast feeding and the age of onset of asthma, without considering strict avoidance of formula or solid food. The majority of the children in this study (95,2%) had positive family history of atopy and 79.80% had family history of asthma. This supports the opinion that asthma is inherited. Thirty nine out of 104 children (37,5%) also suffered from other allergic manifestations and was mostly urticaria. It seems that patients with asthma tend to have other allergic diseases. The percentage of increased serum IgE level in pure asthma was 21,87% while increased eosinophil count 36,1%. The majority of the children in this study (92,8%) showed positive prick test. It seems that normal IgE serum level and normal eosinophil count did not rule out the presence of allergic asthma. The percentage of increased level of serum IgE and peripheral eosinophil count increased with the presence of ascariasis and other allergic manifestations. The majority of the patients tested (64 out of 60 patients) showed positive skin prick test against at least one allergen, the three leading percentages were against house dust (75%), animal epithelia (70,1%) and house dust mite (54,7%). It seems that the majority of our children with asthma were allergic and the most involved allergen was aeroallergen (inhalan).

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Introduction

Asthma is one of the diseases which is usually seen in our private practice. It is the commonest disease of all chronic diseases in childhood (Godfrey, 1983). Our study in a certain urban area around central Jakarta revealed that 6,9% of children under 14 years suffered from asthma (Siregar et al., 1990). It is also known that the majority of asthma in children were of allergic origin, had family history of allergic diseases, age of onset under five years, increased level of serum IgE and increased peripheral eosinophils count

(McNicol and Williams, 1973; Carlsen et al., 1984). It is also suggested that breast feeding can prevent, postpone or modify the onset of atopic diseases in infants and children (Chandra, 1979, Saarinen et al., 1979).

In this connection the author tried to obtain clinical and laboratory data that may play a role in our children with asthma which will help us to face or manage children with asthma in order to have a more effective result.

Materials and methods

The study was conducted retrospectively and samples were taken from the medical record of patients with asthma visiting the outpatient clinic, Subdivision of Allergy and Immunology Department of Child Health Dr. Cipto Mangunkusumo General Hospital, Medical School, University of Indonesia, Jakarta during the period of January 1, 1984 until December 31, 1984.

For the diagnostic criteria of asthma, the definition of the American Thoracic Society (1962) was used, namely the presence of hyperreactivity of the trachea and bronchus against various stimuli manifested as obstruction of the respiratory tract which can improve spontaneously or with drugs. Clinically it is observed as recurrent shortness of breath with wheezing and coughing. Patients with other lung diseases such as tuberculosis, bronchiectasis and bronchopneumonia were excluded.

The data taken were the results of history, physical and laboratory examinations. The

laboratory data included leukocyte count, peripheral eosinophil count, serum IgE level, parasite eggs (*Ascaris lumbricoides*) in the stool and the results of skin prick test. The leukocyte count was done manually using Counter Chamber. The eosinophil count was taken from the percentage of eosinophils in 100 leukocytes in the peripheral blood smear times total leukocytes/mm³. Eosinophil count above 250/mm³ was considered increased (Ellis, 1987). The stool was examined microscopically in 1-2% lugol solution for ascaris eggs. Serum IgE levels were analysed either with radio immuno sorbent test (RIST) or single radial immunodiffusion test (Mancini). The normal range in children is up to 100 ng/ml (RIST) and 900 ng/ml with Mancini (Wood and Oliver, 1972).

Skin tests were carried out by the prick method on the forearm using 14 common allergens plus a positive control (histamin diphosphate 0,1%) and a negative control (normal saline) obtained from Bencard

prick testing solutions (Beecham Group Ltd).

The allergens were house dust, house dust mite (*Dermatophagoides pteronyssinus*), animal epithelia (sheep, horse, rabbit, cat, and dog), human dander, kapok, rye grass, maize grass, chocolate, shrimp and crab. Skin reactions were recorded 15 minutes after the prick and were considered positive if there was an erythema with

wheel greater than 2 millimeter with or without pseudopod while the control was negative (Pepys, 1968). When reactions occurred to the control, they were subtracted from the size of the allergen reactions. All data were statistically analysed to determine the mean values, the significance of differences and the presence of correlation with Fisher exact test and regression analyses.

Results

From January 1, 1984 until December 31, 1984 there were 104 patients with asthma visiting the out patient clinic sub division of Allergy and Immunology, Department of Child Health, Dr. Cipto Mangunkusumo General Hospital, Jakarta.

Age and Sex

The age ranged from 8 months to 14 years old with the mean age of 6,72 years. Table 1 shows that the proportion in males was greater than females with a ratio of 1,36 : 1. This difference was observed in 0-5 year and 11-14 year-old groups.

Table 1 : Age and sex distribution of patients with asthma

Age (Years)	Male		Female		Total
	N	%	N	%	
0 - 5	29	61,7	18	38,3	47
6 - 10	23	51,1	22	49,8	45
11 - 14	8	66,6	4	33,3	12
Total	60	57,7	44	42,3	104

Age of onset of asthma

Table 2 shows that the majority of the children (70,2%) had the age of onset under 5 years, very rare under 7 months of

age (5,8%) or 10-14 years old (4,8%), most were between 2-4 years (45,2%). The youngest age of onset was 2 months old and the oldest 11 years and 2 months.

Table 2 : Onset of asthma

Age of onset (years)	N	%
< 7/12	6	5,8
7/12 - 1	20	19,2
2 - 4	47	45,2
5 - 9	26	25,0
10 - 14	5	4,8
Total	104	100,00

Duration of breast feeding

Ninety eight out of 104 patients (94,2%) got breast feeding and the

majority of them (70,4%) got breast feeding less than 12 months (Table 3).

Table 3 : Duration of breast feeding in patients with asthma

Duration of breast feeding (months)	N	%
< 7	38	36,5
7 - 12	31	29,8
13 - 18	15	14,4
19 - 24	11	10,6
> 25	3	2,9
Without breast feeding	6	5,8
Total	104	100,0

Family history of atopy

Table 4 shows that most of the children

(95,2%) had history of atopy in their family.

Table 4 : Family history of atopy in asthmatic children

Family history of atopy*	N	%
Presence	99	95,2
Absence	5	4,8
Total	104	100,0

* Patient's siblings, parents and their siblings, grand father and grand mother and their siblings.

Family history of asthma

(79,8%.) had history of asthma in one or more of their family.

Table 5 shows that most of the children

Table 5 : Family history of asthma in asthmatic children

Family history of asthma*	N	%
Present	83	79,8
Absent	21	20,2
Total	104	100,0

* Patient's siblings, parents and their siblings, grand father and grand mother and their siblings.

Presence of other allergic diseases

Table 6 shows that 39 out of 104 patients (37,5%) also suffered from other allergic diseases than asthma. Other allergic disease

mostly observed was urticaria (46,2%), followed by allergic rhinitis (35,9%) and atopic dermatitis (17,9%).

Table 6 : Other allergic manifestations in asthmatic children

Other allergic manifestations	N	%
Urticaria	18	17,3
Allergic rhinitis	14	13,4
Atopic dermatitis	7	6,7
No other allergic diseases	65	62,5
Total	104	100,0

Serum IgE level

Table 7 shows the percentage of patients with increased level of serum IgE with or without other allergic manifestations. It shows that the percentage of increased serum IgE level in pure asthma was 21,86%. It shows also that the percentage of patients with increased level of serum IgE was higher in patients with ascariasis compared to patients with pure asthma (45,5% vs 21,9%). though statistically

not significant ($p > 0,05$). The same happened in patients with other allergic diseases (39,1% vs 21,9%), but this was also statistically not significant ($p > 0,05$). However the percentage of patients with asthma and ascariasis and other allergic diseases who had an increased level of serum IgE was much higher than patients with pure asthma (71,4% vs 21,9%). This difference was statistically significant ($p < 0,05$).

Table 7 : Serum IgE level in asthmatic children with or without other allergic manifestations or ascariasis

Serum IgE level	Pure asthma		Asthma + ascariasis		Asthma + other allergic diseases		Asthma + other allergic diseases + ascariasis	
	N	%	N	%	N	%	N	%
Increased	7	21,9	10	45,4	9	39,1	10	71,4 *
Normal	25	78,1	12	54,5	14	60,9	4	28,6
Total	32	100,0	22	100,0	23	100,0	14	100,0

* $p < 0,05$ compared with children with pure asthma.

Eosinophil count

Table 8 shows the percentage of patients with pure asthma, asthma and other allergic diseases, asthma and ascariasis who had increased eosinophil count. It shows that the percentage of high eosinophil count in pure asthma was 36,1%. It shows also that the percentage of patients with increased eosinophil count was higher in asthma with ascariasis compared to patients with pure asthma (60,9% vs 36,1%); but this difference was

statistically not significant ($p > 0,05$). So was the difference of the percentage of patients with increased eosinophil count in patients with other allergic diseases and patients with pure asthma (50% vs 36,1%). This difference was also statistically not significant ($p > 0,05$). However, the percentage of patients with asthma and other allergic diseases and ascariasis who had increased eosinophil count was significantly higher than patients with pure asthma ($p < 0,05$).

Table 8 : *Eosinophil count in asthmatic children with or without other allergic manifestations or ascariasis*

Eosinophil count	Pure asthma		Asthma + ascariasis		Asthma + other allergic diseases		Asthma + other allergic diseases + ascariasis	
	N	%	N	%	N	%	N	%
Increased	13	36,1	14	60,9*	12	50	13	92,8
Normal	23	63,8	9	39,1	12	50	1	7,1
Total	36	100,0	23	100,0	24	100,0	14	100,0

* $p < 0,05$ compared with children with pure asthma.

Breast feeding and age of onset of asthma

There was no significant correlation between duration of breast feeding and onset of asthma (Fig. 1; $r = 0,066$ and $p = 0,488$).

Allergy skin testing

Prick tests were done in 69 out of 104 patients. Table 9 shows that 64 patients

showed positive prick tests against at least one allergen and only 5 patients showed negative prick tests.

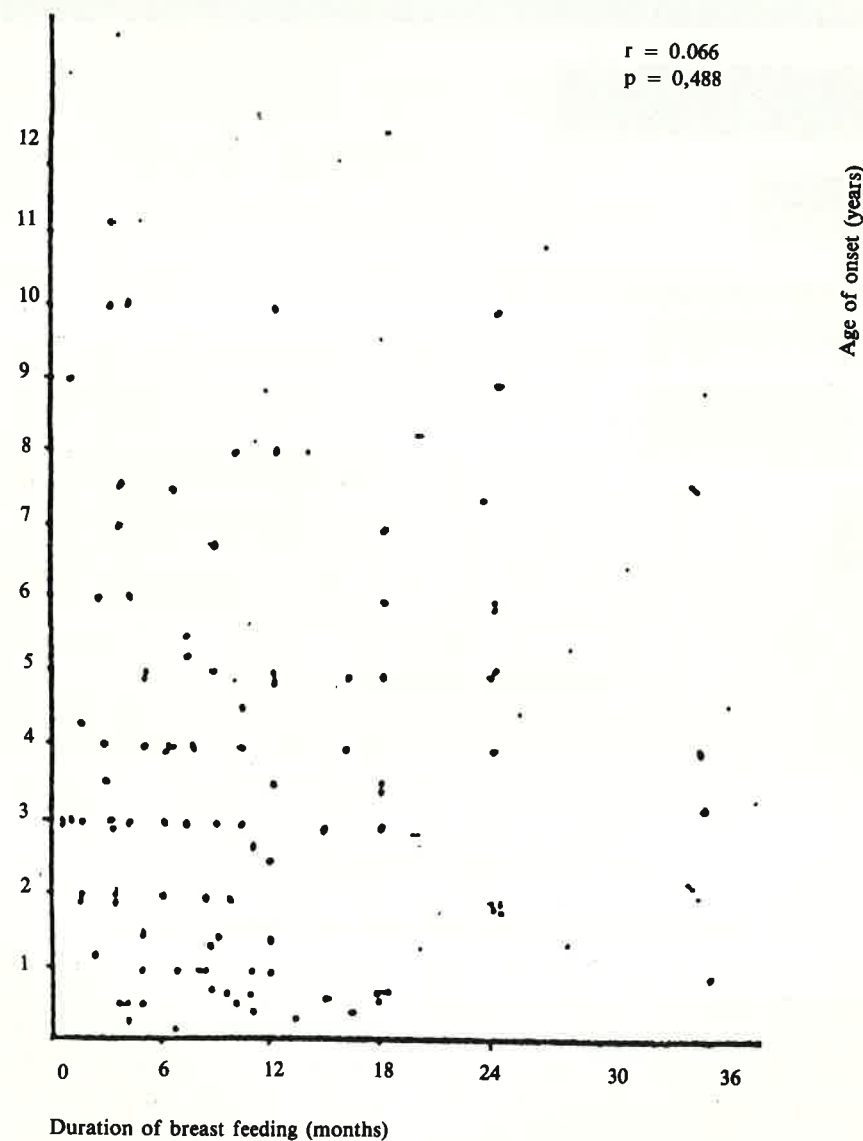


Figure 1 : *Correlation between duration of breast feeding and age of onset of asthma*

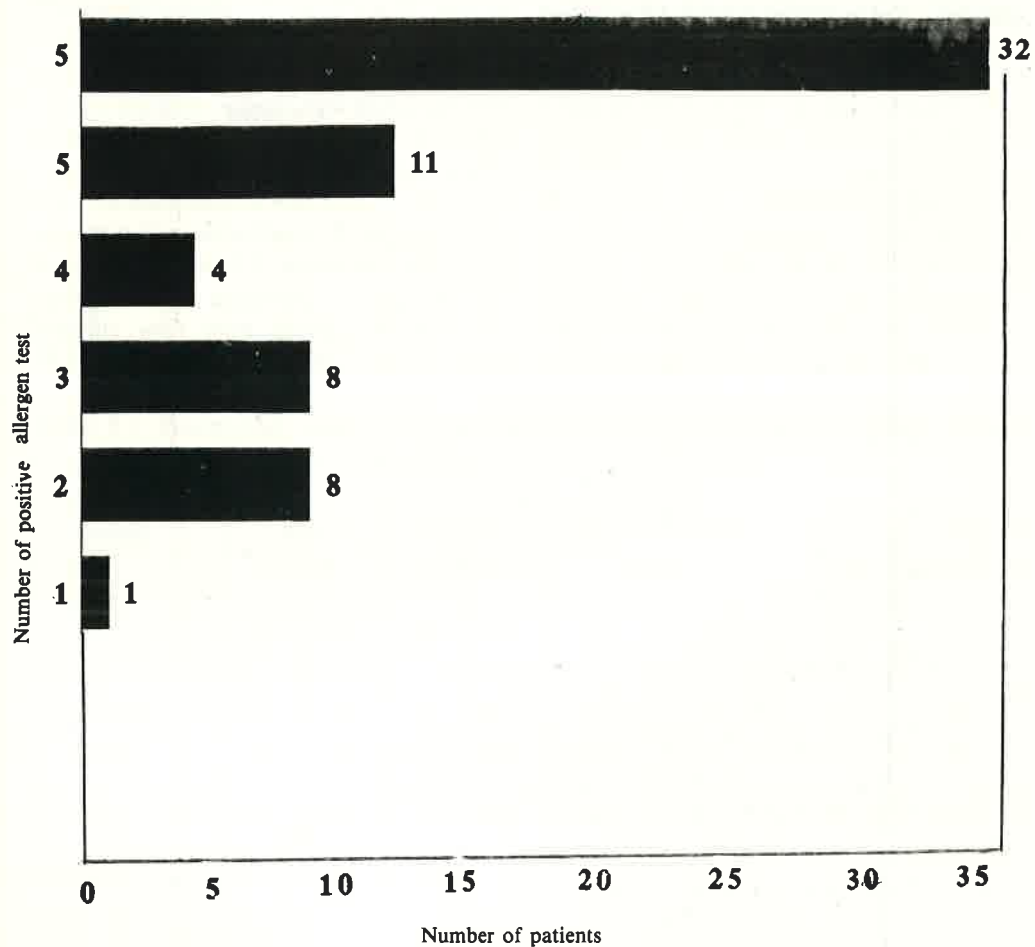


Figure 2 : Number of positive allergen tests in asthmatic children

Figure 2 shows the number of patients with positive prick tests and the amount of positive allergen tests. It revealed that only 1 patient showed one positive allergen test. The rest showed at least 2 positive allergen tests. Thirty two children (50%) showed more than 5 positive allergen tests, 11

children (17,2%) with 5 positive allergen tests, 4 children (6,2%) with 4 positive allergen tests, 8 children (12,5%) with 3 positive allergen tests and 8 children (12,5%) with 2 positive allergen tests.

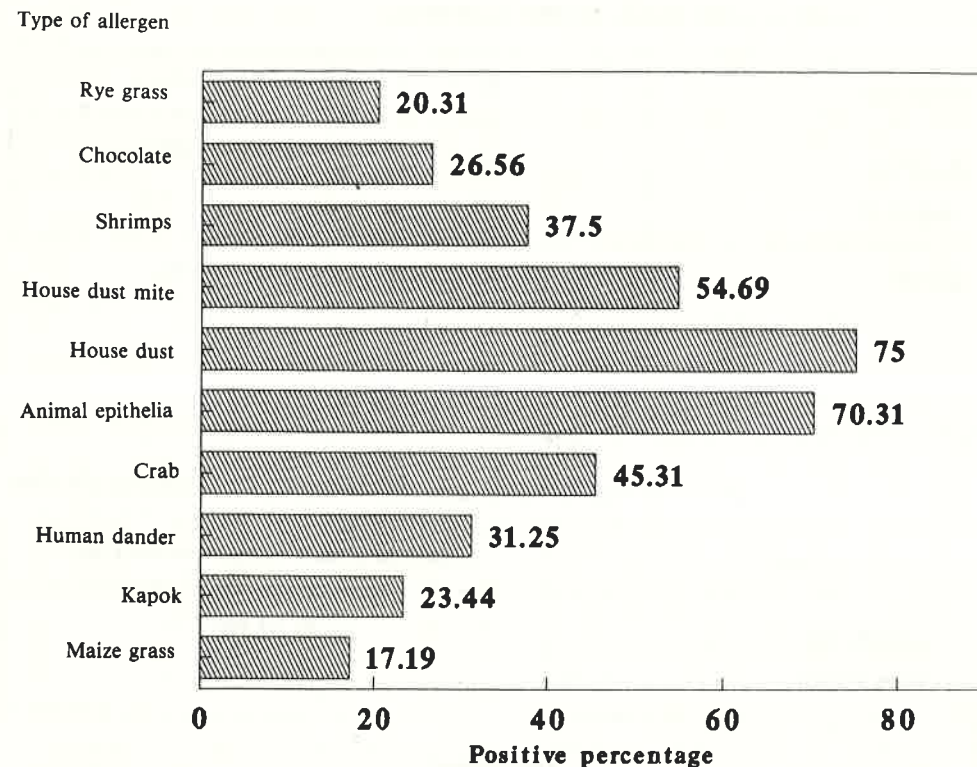


Figure 3 : Positive prick tests against various type of allergen

Figure 3 shows the percentage of patients who were positive against certain allergens. It revealed that the majority of the tested patients (75%) showed positive prick tests

against house dust, 70,13% against animal epithelia and 54,69% against house dust mite.

Table 9 : *Result of prick test in asthmatic children*

Prick test	N	%
Positive	64	92,8
Negative	5	7,2
Total	69	100,0

Table 10 shows that the majority of patients showed positive prick tests against

Table 10 : *Positive prick test against aero and food allergen in asthmatic children*

Type of allergen	Number of patients with positive prick test
Aeroallergen	61 (95,3%)
Food allergen	52 (81,3%)

Discussion

This study showed that the proportion of asthma in males was greater than in females (1,36 : 1). This is in agreement with the findings of other investigators (Smith, 1961; Balfour-Lynn, 1985). The cause of this sex variation is still unknown, although humoral factors have been implicated. The majority of the children in this study (70,2%) had the age of onset under 5 years, mostly were between 2-4 years (45,2 %), and rare were under 7 months (5,8%). This is also in agreement with the result of our previous study (Matondang, 1981) and other investigators (Blair, 1977; Godfrey, 1983). This may be due to the viral respiratory infections which are often

seen in children under 5 years and which may precipitate asthma in certain children.

Table 3 shows that almost all patients (94,2 %) had had breast feeding. Exclusive breastfeeding up to 6 month (Saarinen et al., 1979) and even up to 4 weeks (Chandra, 1979) can prevent or postpone the onset of asthma in a child whose mother is an atopic individual. However in this study there was no significant correlation between duration of breast feeding and age of onset of asthma (Figure 1). This different finding may be due to that in this study the presence of formula or solid food besides breast feeding were not considered.

The majority of the children (Table 4) in this study (95,2%) had a positive family history of atopy (including asthma, allergic rhinitis, atopic dermatitis and urticaria); and 79,8% had a family history of asthma (Table 5). This is also in agreement with the findings of Sibbald et al., (1980) and Zimmerman et al. (1988). Although this study was not done with control group, the high percentage of family history of atopy or asthma supports the opinion that asthma is inherited. Other allergic manifestations are frequently associated with childhood asthma (Sibbald et al., 1980; Zimmerman et al., 1988). In this study (Table 6) 39 out of 104 children (37,5%) also suffered from other allergic diseases, mostly urticaria. Atopic dermatitis was found in 7 children (6,7%). According to Kuzemko (1980) asthma with persisted dermatitis tends to become chronic. It is good to follow up these children and see whether yes or not they become chronic.

Henderson et al. (1971) noted that 75% of patients with extrinsic asthma showed increased serum IgE levels. But in this study the percentage of increased serum IgE level in pure asthma was 21,9%. Berg and Johansson (1969) found that asthmatic children who are allergic only to house dust or mold antigens tend to have relatively normal IgE levels. Nagaya (1979) noted that patients with allergic rhinitis who showed normal levels of IgE serum, had higher house dust IgE specific than those of the group with high IgE levels. Figure 3 shows that the most frequent positive allergen test (75%) were house dust, and that 64 out of 69 children (92,8%) showed positive prick tests (Table 9). So the low percentage of increased level of

serum IgE in this study may be due to what Berg and Johansson (1969), and Nagaya (1979) had noted. It seemed that the presence of specific IgE was not necessary increased the total serum IgE. This was also seen by Kuno - Sakai (1986). Other factors which may influence this low percentage of increased serum IgE level, was the technique used which could not detect the smaller increase of IgE level. The lowest IgE level which can be measured by RIST is 100 ng/ml and by radial immunodiffusion 900 ng/ml. The percentage of increased serum IgE levels in this study were divided into 4 groups namely in pure asthma, asthma with ascariasis, asthma with other allergic manifestations and asthma with ascariasis and other allergic manifestations. This was done because each of these diseases can also cause an increased level of serum IgE. It seemed that the percentage of increased level of IgE was higher in children with asthma plus ascariasis plus other allergic manifestations (Table 7) compared to pure asthma (21,9% vs 71,4%). Whether this was due to the accompanied disease or the asthma itself, further evaluation should be done. McNicol and Williams (1973) found that eosinophil count was higher in asthma compared to control group. In this study the percentage of increased eosinophil count in pure asthma was 36,1%. Because in this study there was no control group, we could not know whether or not it was significant. But counting the percentage of eosinophil hypodense is more significant than the total eosinophil (Shult, et al., 1988). The higher percentage of increased eosinophil count in asthma plus ascariasis plus other allergic manifestations (Table 8) may be due to the accompanied disease

rather than the asthma itself. Because these diseases can also cause an increased eosinophil count, further evaluation should be done.

Rackemann and Edwards (1952), Wood and Oliver (1972), and Damanik et al. (1984) respectively found that 82,4%, 92%, and 96,4% children with asthma showed positive skin prick tests. In this study (Table 9) 64 out of 69 children (92,8%) showed positive prick tests. This finding supports the opinion that most of asthma children were allergic (Rackemann and Edwards, 1952; McNicol and Williams, 1973; Carlsen et al., 1984). The majority of the children (98,4%) showed positive prick tests against at least 2 allergens (Figure 2). This is also in agreement with the findings of Damanik et al. (1984) and Zimmerman

Conclusion

The incidence of asthma in males were greater than in females (1,36 : 1).

The majority of the asthmatic children had the age of onset under 5 years (70,2%), this may be due to the respiratory infections which are frequently found in this age group and may precipitate asthma. There was no correlation between duration of breast feeding and age of onset of asthma without considering strict avoidance of formula and solid food.

The majority of the asthmatic children had positive family history of atopy; this supports the opinion that asthma is inherited. Thirty nine (37,5%) out of 104

et al. (1988). The most frequent allergen encountered in this study was house dust (75%), almost the same result as our previous study namely 67% (Matondang, 1977). Other investigators (Damanik et al., 1984; Rahayoe 1986) also noted the same results, respectively 74,5% and 76,5%. In this study animal epithelia ranks second (70,3%), followed by house dust mite (54,7%), Figure 3). It seemed that aeroallergens were found the most (Table 10). This was also seen by Wood and Oliver (1972). Although positive skin tests sometimes does not agree with the history, the author is of the opinion that at some time these positive allergen can precipitate an allergic manifestations in that individual. That's why it is justified to attempt minimizing the exposure of the known allergens.

children also suffered from other allergic diseases. It seemed that patients with allergic asthma tend to have other allergic manifestations. Normal IgE serum level or peripheral eosinophil count did not rule out the presence of allergic asthma.

The majority of the tested asthmatic children (92,8%) showed positive prick tests. This means that most of our children with asthma were allergic. The three leading positive prick tests were against house dust, animal epithelia and house dust mite. This shows that aeroallergens were the most allergen involved.

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