

Aeroallergen Sensitivity Among Thai Children with Allergic Respiratory Diseases: A Hospital-Based Study

Paskorn Sritipsukho

Allergic rhinitis and asthma are allergic respiratory diseases commonly found with increasing trend worldwide and having a great impact on children's quality of life.¹ In Thailand, increasing prevalences of allergic rhinitis and asthma in children have been reported.^{2,3} Of all the chronic conditions that may occur concurrently in children, coexistence of allergic rhinitis and asthma is the most frequent.⁴ Although allergic rhinitis and asthma often occur together and are linked by epidemiologic, histologic, physiologic and immunopathological characteristics, the reason for this common comorbidity is still a matter of debate.⁵⁻⁷ Atopy, based on specific serum IgE or skin-prick-test positivity to allergens, is the strongest identifiable factor for development of allergic rhinitis and asthma. In Thailand, the patterns of aeroallergen sensitization for asthmatic and allergic rhinitis patients have been reported separately.⁸⁻¹⁰ Thus, this cross-sectional study was performed in order to describe and compare sensitization patterns to common

SUMMARY One hundred and twenty patients, aged 3-15 years, attending the Allergy Clinic, Thammasat University Hospital, with allergic rhinitis, asthma or both conditions were studied. Standardized skin prick tests were performed with 15 common aeroallergens. The subjects were 85 boys and 35 girls with the mean age of 8.1 years (SD = 3.4 years). There were 63 cases (53%), 22 cases (18%) and 35 cases (29%) diagnosed with allergic rhinitis only, asthma only and both conditions, respectively. The prevalence of asthma among the allergic rhinitis patients was 36 percent whereas the prevalence of allergic rhinitis among the asthmatic patients was 61 percent. The sensitization patterns for major aeroallergens among the three groups were similar with the most common sensitized allergens as *D. pteronyssinus*, followed by *D. farinae*, American cockroach, Kopok and German cockroach, respectively. Among the atopic patients, a greater number of allergen reactivity was significantly associated with the increased risk of having their coexistence of allergic rhinitis and asthma ($p = 0.0046$; score test for trend of odds ratio).

aeroallergens among Thai pediatric patients with allergic rhinitis and asthma.

MATERIALS AND METHODS

Subjects

One hundred and twenty patients attending the allergy clinic, Thammasat University Hospital and diagnosed with allergic rhinitis and/or asthma between March 1999 and February 2000 were randomly recruited into the study. Allergic

rhinitis patients were re-evaluated for asthma and, conversely, asthmatic patients were re-evaluated for allergic rhinitis. Diagnoses were made by a well-trained pediatrician in allergy with the following diagnostic criteria.

Diagnostic criteria

The diagnostic criteria for patients with allergic rhinitis were

From the Pediatric Department, Faculty of Medicine, Thammasat University Rangsit Center, Patumthani 12121, Thailand.

those with a history and clinical presentation of allergic rhinitis as well as skin-prick-test positivity to common aeroallergens (≥ 3 mm wheal) and patients with asthma were those with a history and clinical presentation of more than 2 asthmatic attacks or reversible airway obstruction, defined by at least 20 percent reversibility from peak expiratory flow (PEF) measurement on post bronchodilator testing, concomitant with family history of atopy or associated atopic diseases.

Procedures

According to the diagnostic criteria, all subjects were categorized into three groups; allergic rhinitis only, asthma only, and both conditions. Demographic and home environmental characteristics of the subjects were recorded. The subjects were asked to withhold antihistamines or other medications that would interfere with the skin-prick-test result for 7 days prior to undergoing the test. Standardized skin prick tests were performed on the subjects' upper backs by pricking through a drop of allergen extracts (at least 4 cm for distance between each drop). Glycerinated histamine 10 mg/ml and saline were used as positive and negative controls, respectively. The allergen extracts included *Dermatophagoides pteronyssinus* (Dp) 10,000 AU/ml, *Dermatophagoides farinae* (Df) 10,000 AU/ml, American cockroach 1:10 w/v, German cockroach 1:10 w/v, Kapok 1:10 w/v, Bermuda grass 1:10 w/v, Johnson grass 1:10 w/v, Careless weed 1:10 w/v, Acacia 1:10 w/v, *Cladosporium clarosporoides* 1:10 w/v, *Alternaria tenuis* 1:10 w/v, *Aspergillus* mix 1:10 w/v, *Penicillium* mix 1:10 w/v, cat dander 1:10 w/v and dog dander

1:10 w/v, all of which were manufactured by Center Laboratories, Port Washington, USA. The test results were based on wheal sizes (mean of the 2 longest orthogonal dimensions), evaluated after 10 minutes for histamine and 15 minutes for allergens. Positive test of skin reactivity was defined by a wheal of 3 mm or greater. Written consents were obtained by all participants to enter the study.

Statistical analysis

Statistical analysis was done using the Epi-info version 6 statistical package. Descriptive statistics were used for the characteristics and sensitization patterns among the patients. Chi-square tests and Fisher's exact tests were used to compare the proportions of the patients' characteristics including home environmental factors among the three groups. Among the atopic patients, odds ratio with 95% confidence interval and score test for trend of odds ratio were calculated in order to examine the graded effect of the number of aeroallergen reactivity on the risk of having their coexistence of allergic rhinitis and asthma.

RESULTS

A total of 120 children diagnosed with allergic rhinitis, asthma or both conditions were studied, 85 boys and 35 girls. The age ranged between 23 months to 15 years with the mean age of 8.1 years (SD = 3.4 years). There were 98 cases (82%) of allergic rhinitis and 57 cases (48%) of asthma. Thirty-five subjects (29%) had both allergic rhinitis and asthma. Concerning environmental allergen sources, there were 51 cases (43%),

47 cases (39%), 26 cases (22%), 18 cases (15%) and only 5 cases (4%) having passive smoking exposure, air conditioners, pets (dogs or cats), plants and carpets at home, respectively.

The prevalence of asthma among the allergic rhinitis patients was 36 percent whereas the prevalence of allergic rhinitis among the asthmatic patients was 61 percent. Table 1 shows the characteristics of patients among the three groups, according to the diagnostic criteria. The ratios between boys and girls were 2.9:1, 1.8:1 and 2.2:1 among the patients having allergic rhinitis only, asthma only and both conditions respectively. Among the patient characteristics, age was the only factor significantly associated with the diagnostic category ($p = 0.005$). The prevalence of allergic rhinitis only among the patients increased with age. The majority of patients in the group of allergic rhinitis only aged 10-15 years whereas most of patients in the other two groups aged 5-10 years.

Forty-eight cases of asthmatic patients (84%) were atopy, defined by having at least one positive skin-prick-test whereas all of the allergic rhinitis patients were atopy according to the diagnostic criteria. Among the three groups, the sensitization patterns for the major aeroallergens were similar with the most prevalent sensitized allergen as *D. pteronyssinus*, followed by *D. farinae*, American cockroach, Kapok and German cockroach, respectively (Table 2). The prevalences of polysensitization were 97 percent, 50 percent and 97 percent in allergic rhinitis only, asthma only and both conditions, respectively.

Table 1 Characteristics of patients with allergic rhinitis and/or asthma

Characteristics	Number of subjects			p-value*
	Allergic rhinitis only (n = 63)	Asthma only (n = 22)	Coexistence (n = 35)	
Gender				
Males	47 (75%)	14 (64%)	24 (69%)	0.585
Females	16 (25%)	8 (36%)	11 (31%)	
Age				
3-5 years	10 (16%)	9 (41%)	9 (26%)	0.005
5-10 years	24 (38%)	10 (45%)	20 (57%)	
10-15 years	29 (46%)	3 (14%)	6 (17%)	
Parental income (Baht/month)				
< 10,000 (~US \$250)	8 (13%)	5 (23%)	7 (20%)	0.677
10,000-50,000	29 (46%)	11 (50%)	15 (43%)	
> 50,000	26 (41%)	6 (27%)	13 (37%)	
Home environment				
Passive smoking exposure	27 (43%)	6 (27%)	18 (51%)	0.199
Having air conditioners	30 (48%)	5 (23%)	12 (34%)	0.094
Owning pets (dogs or cats)	13 (21%)	3 (14%)	10 (29%)	0.395**
Having plants	11 (17%)	1 (5%)	6 (17%)	0.336**
Having carpets	3 (5%)	1 (5%)	1 (3%)	0.100**

*Using Chi-square test; **Using Fisher's exact test.

Table 2 Patterns of aeroallergen sensitivity among the patients

Aeroallergens	Sensitivity prevalence			
	All subjects (n = 120)	Allergic rhinitis only (n = 63)	Asthma only (n = 22)	Coexistence (n = 35)
<i>D. pteronyssinus</i>	95 (79%)	54 (86%)	10 (45%)	31 (89%)
<i>D. farinae</i>	83 (69%)	46 (73%)	9 (41%)	28 (80%)
American cockroach	36 (30%)	16 (25%)	5 (23%)	15 (43%)
Kapok	29 (24%)	13 (21%)	4 (18%)	12 (34%)
German cockroach	24 (20%)	13 (21%)	4 (18%)	7 (20%)
Bermuda grass	19 (16%)	10 (16%)	3 (14%)	6 (17%)
Johnson grass	18 (15%)	10 (16%)	3 (14%)	5 (14%)
Cat dander	15 (13%)	9 (14%)	2 (9%)	4 (11%)
<i>Acacia</i>	13 (11%)	9 (14%)	0	4 (11%)
<i>Alternaria</i>	11 (9%)	6 (10%)	1 (5%)	4 (11%)
Careless weed	11 (9%)	6 (10%)	2 (9%)	3 (9%)
Dog dander	9 (8%)	2 (3%)	1 (5%)	6 (17%)
<i>Penicillium</i>	9 (8%)	8 (13%)	0	1 (3%)
<i>Aspergillus</i>	9 (8%)	3 (5%)	0	6 (17%)
<i>Cladosporium</i>	8 (7%)	1 (2%)	0	7 (20%)

Table 3 shows the distribution of number of allergen hypersensitivity among the patients. Among the atopic patients, the median number of allergen hypersensitivity in allergic rhinitis only, asthma only and both conditions were 3 (range: 1-8, n = 63), 2 (range: 1-6, n = 13) and 4 (range: 1-8, n = 35), respectively. A greater number of allergen hypersensitivity was significantly associated with the increased risk of having their coexistence ($p = 0.0046$; score test for trend of odds ratio).

DISCUSSION

In this hospital-based study, allergic rhinitis and asthma affected boys more than girls. This agrees with observations in other studies that males were more frequently affected by allergic rhinitis and asthma than were females in childhood period.^{2,3,8,11} The prevalence of allergic rhinitis without asthma among our patients increased with age but the asthmatic patients, with or without allergic rhinitis, was most prevalent in the age group of 5-10 years. These findings may be explained by two reasons. Firstly,

during childhood period, allergic rhinitis is usually diagnosed later than asthma.^{12,13} Secondly, more than half of asthmatic children has remission before reaching adulthood.¹⁴ In this study, the prevalence of allergic rhinitis among the asthmatic patients was 61 percent, consistent with those in other studies ranging between 50 and 70 percent.^{15,16} The prevalence of asthma among the allergic rhinitis patients was 36 percent, which is higher than those in other studies ranging between 10 and 32 percent.^{15,17,18} However, these results are difficult to compare because of differences in the study setting and definitions of rhinitis and asthma used. Nevertheless, these figures were by far more than the prevalences of allergic rhinitis (33-44 percent) and asthma (10-18 percent) among children from general population in this country.^{2,3} According to the diagnostic category, the sensitization patterns for the major aeroallergens were similar among the three groups. These results support linkage of allergic rhinitis and asthma.

The major sensitized aero-

allergens were indoor allergens including house dust mites, cockroaches and Kopok.^{8,9,10,16} *D. pteronyssinus* and American cockroach were the most common species of hypersensitivities to mites and cockroaches respectively. This is consistent with those reported in this country and adjacent regions.^{8,9,16} Low prevalences of keeping pets at home and low prevalences of hypersensitivity to animal dander among the patients in this study were observed when comparing to those from Westernized countries.^{19,20} This may be due to different life style and environment.

Among the atopic patients, a greater number of allergen hypersensitivity was significantly associated with the increased risk of having their coexistence of allergic rhinitis and asthma ($p = 0.0046$; score test for trend of odds ratio). A graded effect has been observed as the risk of atopic disease in the child increased with the number of positive skin-prick-test-reactions.^{21,22}

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Table 3 Distribution of the number of allergen reactivity among the patients

Number of allergen hypersensitivity (of 15 aeroallergens)	Frequency			Odds ratio* (95% CI)
	Allergic rhinitis only (n = 63)	Asthma only (n = 22)	Coexistence (n = 35)	
0	0	9 (41%)	0	-
1	2 (3%)	2(9%)	1 (3%)	1**
2	27 (43%)	6 (27%)	7 (20%)	0.6 (0-7.1)
3	12 (19%)	2 (9%)	7(20%)	1.5 (0.1-18.2)
4	11 (17%)	2 (9%)	7 (20%)	1.6 (0.1-19.7)
5-8	11 (17%)	1 (5%)	5 (14%)	3.3 (0.3-38.9)

*an association between number of aeroallergen hypersensitivity and the coexistence of allergic rhinitis and asthma (n = 111), $p = 0.0046$ by score test for trend in odds ratio; **the reference group.

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