Clinical characteristics of children with non-allergic rhinitis vs with allergic rhinitis

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Summary

Background: **Allergic rhinitis (AR) and non-allergic rhinitis (NAR) are major causes of chronic rhinitis. Knowledge about children with non-allergic rhinitis is limited.**

Objective: **To study clinical characteristics differentiating NAR and AR among children with chronic rhinitis.**

Methods: **This is a retrospective, descriptive study of 302 children (with ages of 14 years or less) with chronic rhinitis evaluated at the pediatric allergy clinic, Siriraj Hospital between January and December 2006. Based on the results of skin prick test (SPT), they were classified into 2 groups, i.e., AR and NAR. Their medical records were reviewed with respect to clinical data on rhinitis and related symptoms.**

Results: **There were 222 patients with AR and 80 with NAR (73.5% and 26.5%). Median age of onset of the disease among patients with NAR was younger than AR ($p = 0.04$) while the duration of disease among AR cases was longer than in NAR ($p < 0.01$). Severity of rhinitis, based on Allergic Rhinitis and its Impact on Asthma (ARIA), was not different between the two groups. Nasal pruritus, sneezing and eye symptoms were more commonly observed in AR than in NAR ($p <0.01$), whereas snoring and sinusitis were more common in NAR than in AR ($p < 0.01$). The presence of nasal pruritus, sneezing and eye symptoms strongly suggested AR (adjusted OR 2.73, 2.96, 1.49) while snoring was a risk factor for NAR (adjusted OR = 3.11).**

Conclusion: **Presence of nasal pruritus, sneezing and eye symptoms suggests AR. Sinusitis and upper airway obstruction are more common among patients with NAR.** ***(Asian Pac J Allergy Immunol 2010;28:270-4)***

Key words: *Allergic rhinitis, Non-allergic rhininitis, Children, Skin testing*

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Introduction

Based on results of allergy skin prick tests (SPT) and/or measurement of serum-specific IgE antibodies to common aeroallergen, patients with chronic rhinitis can be classified into allergic rhinitis (AR) and non-allergic rhinitis (NAR). However, allergy skin prick tests are not generally available, even in referral centers, in several countries. In Thailand, allergy skin prick tests are performed only in tertiary medical centers and in few private hospitals in Bangkok. Proper differentiation of chronic rhinitis into AR and NAR is essential, since avoidance of offending allergen with/without allergen immunotherapy could lead to alleviation of symptoms of patients with AR, whereas NAR can be a condition with a more prolonged course[1].

Since there is a relative lack of literature on NAR in children, we aim to study clinical symptoms that could potentially differentiate children with NAR from those with AR.

Methods

Subjects

Medical records of children, with ages 14 years or less, with symptoms of chronic rhinitis referred to the Pediatric Allergy Clinic, Siriraj Hospital, between January to December 2006 were reviewed. The study was reviewed and approved by the Institutional Review Board of the Faculty of Medicine Siriraj Hospital, Mahidol University.

Table 1. Basic demographic data of patients with AR and NAR

	AR (n = 222)	NAR (n = 80)
Age		
0-4	115 (51%)	47 (58.7%)
5-9	83 (37%)	27 (33.7%)
10-14	19 (8%)	4 (7.5%)
Sex		
Male	145 (65.3%)	54 (67.5%)
Female	77 (33.6%)	26 (32.5%)
Age of onset (years)*		
Median	5	3
Interquartile range	3-8	1-3
Duration of symptoms (year)'		
Mean (± SD)	5.3 ± 3.4	3.4 ± 2.7

* $p < 0.05$, ** $p < 0.01$

Symptoms of rhinitis include rhinorrhea, nasal obstruction, nasal itching and sneezing. Persistent allergic rhinitis is defined as symptoms of rhinitis lasting longer than 4 days/week and more than 4 weeks based on Allergic Rhinitis And its Impact on Asthma (ARIA) guideline[2]. The duration of symptoms in chronic rhinitis is, however, is not well defined[3]. In this study, patients who suffered with rhinitis symptoms for more than 6 months were included.

Skin prick tests (SPT) was performed on all patients. SPTs was carried out using stainless-steeled lancets or straight non-porated surgical needles (size # 27). The SPT panel for children age 5 years or less include 7 common aeroallergens for Thailand, i.e., house-dust mite (*Dermatophagoides pteronyssinus, Dermatophagoides farinae*), American cockroach, grass pollen (Bermuda, Johnson), cat and dog dander (ALK, Port Washington, New York). For older children additional allergen extracts, including German cockroach, Acacia, careless weed and molds (*Alternaria, Cladosporium, Penicillium mix, Aspergillus mix, Fusarium mix* and Corn smut) were also employed. Histamine solution (10 mg/ml) and glycerinated saline were used as positive and negative controls. SPTs were considered positive if there was a wheal of 3 mm in diameter or larger. Subjects were defined as 'allergic' in the presence of a positive SPT reaction to any aeroallergen. Clinical data included age, sex, presence or absence of rhinitis symptoms (rhinorrhea, snoring, postnasal drip, nasal congestion, nasal itching and sneezing), severity of rhinitis according to ARIA classification were collected from patients' charts. Presence of physician-diagnosed co-morbidities

Table 2. Clinical symptoms of patients with AR and NAR

	AR (%)	NAR (%)	P value
Rhinorrhea	205 (92.3)	70 (87.5)	0.193
Nasal congestion	170 (76.5)	63 (78.7)	0.691
Nasal itching	130 (58.5)	24 (30)	< 0.01 *
Sneezing	155 (69.8)	33 (41.2)	< 0.01 *
Eye Symptoms	85 (38.2)	17 (21.2)	< 0.01
Snoring	48 (21.6)	37 (46.2)	< 0.01 *

such as asthma, conjunctivitis, history of food allergy, atopic eczema, sinusitis, possible obstructive sleep apnea/hypopnea syndrome (OSAHS), along with environmental data (presence of household pets and smoking) were recorded. A term 'possible OSAHS' was used in lieu of obstructive sleep apnea (OSA) due to lack of documentation by polysomnography in patients with symptoms of OSA, mainly snoring[5].

Statistical analysis

Data were analyzed with SPSS 16 program (SPSS Inc, Chicago, Illinois). Comparison of age between groups was by Mann-Whitney U test. The association of nasal and related symptoms with AR vs NAR was assessed by Chi-square tests. The crude and adjusted odds ratios for being diagnosed as allergic rhinitis with the presence of certain nasal symptoms were calculated. The 95% confidence interval (CI) was given for each ratio. Statistical significance is denoted by p value of less than 0.05.

Results

During the 12-month period, there were 302 patients evaluated for symptoms of chronic rhinitis in the pediatric allergy clinic at Siriraj Hospital. Among these patients, 222 (73.5 %) patients were classified as AR and 80 (26.4%) were NAR. The median age of onset for patients with AR was older than NAR (median ages of 5 and 3 years with interquartile ranges of 3-8 and 1-3 years for AR and NAR respectively, Table 1). The duration of symptoms (± SD) for AR was longer than that of NAR (5.3 ± 3.4 vs 3.4 ± 2.7 years $p < 0.01$). There was a male predominance in both groups (male 222, female 80). The female: male ratio was not different between the 2 groups (1.88 versus 2.07, $p > 0.05$).

Nasal symptoms in the two groups are shown and compared in Table 2. Rhinorrhea and nasal congestion were the most frequent complaints in both groups. Nasal pruritus, sneezing and eye symptoms were significantly more frequent in the AR as opposed to the NAR group ($p < 0.01$),

Table 3. Classification of AR and NAR according to the Allergic Rhinitis and its Impact on Asthma (ARIA) guidelines

	ARIA Mild intermittent (%)	ARIA mild persistent (%)	ARIA Mod/ severe (%)	Total (n)
AR	32 (14.6)	158 (72.1)	29 (13.2)	219
NAR	19 (23.7)	55 (68.7)	6 (7.5)	80

whereas snoring was more prevalent in the NAR than the AR group ($p < 0.01$). When symptom severity was classified according to the ARIA classification (Table 3), more patients in the AR group suffered a higher degree of rhinitis symptoms than the NAR group (13.2% vs 7.5%); however, the difference was not statistically significant ($p > 0.05$).

Table 4 tabulated OR's and adjusted OR's for various symptoms with the diagnosis of AR. Sneezing was the most important indicator of allergic rhinitis (adjusted OR 2.90, CI 1.6-5.24) followed by nasal itching (adjusted OR 2.73, CI 1.50-4.96). A history of snoring was associated with NAR (adjusted OR of 3.11, CI 1.81-5.37). The presence of co-morbidities such as asthma and eczema was not significantly different between the two groups (Table 5). Of note, approximately ½ of these patients had a concomitant diagnosis of asthma. The presence of sinusitis and OSAHS was more common in the NAR group ($p < 0.01$ and 0.083).

Environmental data collected in this retrospective review were the presence of household pets and smoking. The presence of pets in the home was documented more often in the AR than in the NAR group (30.6% VS. 28.7%) whereas, smoking was more common in the NAR than the AR group (27.4% VS 37.5%). However, these differences were not statistically significant ($p > 0.05$). Seasonal variation of symptoms were not significantly different between the NAR and AR groups (37.5% VS 31%).

The allergens causing the highest percentage of sensitization among atopic patients were house dust mites (89.1%), cockroach (50.9%), cat (13.9%), dog (9.4%) and careless weed (7.6%), respectively

Discussion

There has been a worldwide increase in prevalence of allergic diseases during the last 20-30 years. In the United States, the incidence of

Table 4. Odds ratios for diagnosis of allergic rhinitis with selected symptoms

Risk factors	Odds ratio (95% CI)	Adjusted odd ratio (95% CI)
Nasal itching	3.30 (1.84-5.92)	2.73* (1.5-4.96)
Sneezing	3.29 (1.88-5.89)	2.90* (1.6-5.24)
Snoring	0.32 (0.18-0.57)	0.372* (0.204-0.677)
Eye symptoms	2.3 (1.22-4.39)	1.49 (0.77-2.87)

* $p < 0.01$

AR was 10-30% in adults and was 40% in children. The International Study of Asthma and Allergy in childhood (ISAAC) conducted in Bangkok Thailand in 1998, identified cumulative prevalence of rhinitis among children aged 6-7 and 13-14 years to be 44.2% and 38.7%, respectively[6]. Such finding indicates that persistent rhinitis in children is a condition with a high burden to the community.

Differentiating AR from other causes of rhinitis can be difficult because allergic and nonallergic conditions can present with similar symptoms[3]. It is important to correctly identify children with allergic rhinitis since effective treatments such as antihistamine and immunotherapy are effective and specific for patients with AR. Among general practitioners, it is unclear when to refer patients with persistent rhinitis for allergy testing since no such guideline has yet been produced by the American Family Physicians for such condition. It was concluded in a review that allergy testing was not necessary in all patients but could be useful in ambiguous or complicated cases[4].

In 2000, Bunnag et al performed a questionnaire survey of the characteristics and risk factors among 3,124 Thai subjects with rhinitis (all adults). They found that there was no distinctive feature to differentiate between allergic and non-allergic groups, i.e. age, sex, associated allergy, family history of atopy, smoking including frequency of occurrence of each nasal symptoms[7].

Table 5. Co-morbidities of patients with AR and NAR

	AR (%)	NAR (%)	P value
Asthma	112 (50.4)	41 (51.2)	0.958
Eye Symptoms	85 (38.2)	17 (21.2)	< 0.01 *
History of food allergy	15 (6.7)	0	0.02*
Eczema	21 (9.4)	3 (3.7)	0.102
Sinusitis	35 (15.7)	25 (31.2)	< 0.01*
Possible OSHAS	14 (6.3)	10 (12.5)	0.083

In 2006, Bachert et al reported the prevalence, classification and perception of allergic and non-allergic rhinitis among adults in Belgium. The result of this study of 4,959 self-declared rhinitis cases indicated that AR (diagnosed only by history) was three times more prevalent than NAR[8]. Also, patients with AR suffered a greater number of symptoms (rhinorrhea, obstruction, itching, sneezing, eye symptoms, breathlessness and wheezing) than those with NAR. The results of our study support those of the Bachert study, confirming a higher frequency of AR over NAR. However, our study could be biased by the fact that our patients were exclusively enrolled from a pediatric allergy clinic.

In a similar study, Molgarrd et al studied differences between AR and NAR in 1,186 adolescents and adults by screening questionnaires in Copenhagen, Denmark and found that subjects with AR had more sneezing, itchy eyes and food allergy whereas subjects with NAR suffered more sinusitis[9]. NAR were more common among women than men. NAR was associated with headache and sinusitis than AR. Notably, the Bachert and Molgarrd studies were conducted among the adolescent and adult population. Studies among children are lacking.

Murray and Ferguson, however, in their landmark research reported that even with a standardized questionnaire, identification of atopic sensitization to airborne allergens, can only be made with modest sensitivity[10]. Therefore, the results of surveys on AR vs NAR using only questionnaire will have to be considered with caution.

In our study, allergy skin prick tests were performed in all children with rhinitis to categorize them into AR and NAR. The most common nasal symptoms in the AR group were sneezing and nasal itching (adjusted OR 2.90, 2.73, p <0.01). The results of our study, in contrast to that of Bachert et al, indicated that snoring and sinusitis in children were more common among the NAR than the AR group.

The younger age of onset of NAR could indicate vulnerability of children to suffer from rhinitis at early age (probably due to prolonged viral infection). Longer duration of disease among AR suggests persistence of symptoms with increasing levels of allergen sensitization among older age group.

Co-morbidities in allergic subjects, such as conjunctivitis and a history of food allergy were more common in AR than NAR group (p < 0.01 and p = 0.02, respectively). In our study, asthma and conjunctivitis in NAR group were notably high, i.e., 51.2% and 21.2%. The high incidence of such co-morbidities can be explained high pollution and poor air quality in Bangkok and could also be due to selection of patients from allergy clinic.

In a study by Plaschke et al, there was a strong association between smoking and the onset of asthma among nonatopics and between sensitization due to exposure to pollens and pets and AR[11]. The result of our study suggests a similar association although such relationship was not statistically significant. As our study is a retrospective review, compilation of data may not be as complete as in a prospective study.

The lack of seasonality of rhinitis symptoms in our study population is perhaps due to the fact that most of our patients were sensitized to house dust mite which is present in homes all year round. Such findings are similar to those reported from Singapore[12].

Conclusions

In conclusion, in our retrospective study of chronic rhinitis in children, AR was about three fold more prevalent than NAR. Nasal pruritus and sneezing were more common among AR than NAR, while snoring and sinusitis were more common in NAR than AR. The presence of nasal pruritus and sneezing or the two in combination strongly suggests AR and further allergy work-up among such children may be warranted.

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