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PEDIATRICS

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COMPARATIVE ANALYSIS OF THE ROLE OF DOMESTIC ALLERGENS IN ATOPIC RHINITIS IN CHILDREN

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Abstract: The study implied examination of 304 children aged 4 - 18 years, the patients with allergic rhinitis during the period of stable remission by the method of prick-test. The incidence of allergic rhinitis was found to be progressively increasing with age. Allergic rhinitis in children is predominantly caused by Dermatofagoides farina mites, resulting in allergic reactions in most patients, especially in adolescence.

KeyWords: allergic rhinitis, children, domestic allergens.

INTRODUCTION

One of the leading causes of allergic rhinitis (AR) in children is sensitizing to different domestic allergens [1-6]. The majority of authors [6-8] note that allergenic aggressiveness of the house dust depends primarily on the number and kinds of mites inhabiting it, which belong, generally, to Dermatophagoides genus of Pyroglyphidae family, among them Allergenum e pulvere domesticum e Dermatophagoides pteronyssinus, Allergenum e pulvere domesticum e Dermatophagoides farinae, Allergenum e pulvere domesticum ex Acarus siro. Besides, domestic allergens include Allergenum e pulvere bibliothecae, Allergenum e pluma pulvini, and Allergenum e Daphnia magna.

2 PURPOSES, SUBJECTS AND METHODS:

2.1 Purpose

The study design involved a comparative assessment of domestic aeroallergens in etiologic spectrum of allergic rhinitis in children according to the age and sex by prick-test in the period of stable remission of the disease.

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2.2 Subjects & Methods

The objective of the study implied a comparative assessment of domestic aeroallergens in etiology of allergic rhinitis in children. The study implicated examination of 304 children aged from 4 to 18 with atopic rhinitis. The research was carried out in the Regional children's allergy center based in Kharkov Regional Children's Clinical Hospital No.1.

Skin testing with allergens is a comprehensible and informative method of allergy testing. The tests were performed to confirm the role of allergens in the disease development, which was suggested by hypersensitivity history. This highly sensitive method determines specific sensitization by injecting percutaneous allergen and evaluation of the extent and nature of edema or inflammatory reaction. Testing can be carried out using scratch test, injection test, prick test and the intradermal test techniques. We performed allergy prick test to discover first-type reactions.

Indications for skin testing with allergens included past history, clinical and laboratory findings.

Standard serial allergens containing 10,000 PNU in 1 ml made of pollen, house dust, wool, food etc. were used for skin testing (producer LRS Immunolog, 21036, Vinnica, P.O.B. 4283, Zbyzhka street, 5). Skin testing technique is based on the allergen interaction with Langerhans cells

and macrophages. Such interaction, in case of sensitization, results in a release of allergic mediators and the development of local allergic reaction. Technique of the skin test with allergens

Prick testing has no age restrictions. Allergens, test control fluid (negative control) and 0.01% histamine solution (positive control) are applied aseptically. Skin tests are performed on the inner surface of the forearm at the distance 30 ± 10 mm from one another.

One drop (0.10 ml) of a standard water-salt allergen extract for diagnosis, the control test fluid and 0.01 % histamine solution was applied on the skin disinfected with 70˚ ethanol using a sterile plastic dropper. We pricked the skin through a drop of allergen fluid and 0.01% histamine solution against the stopper of the lancet.

The skin test results were assessed in 15 to 20 minutes (immediate reaction). The reaction was evaluated according to the pattern demonstrated in Table 1.

Table 1.

Skin test assessment pattern

Allergic reaction types	Prick testing	
	Papule size, mm	Conventional signs
Negative	0	-
Slightly positive	1-2	+
Positive	3-5	++
Strong positive	8-12	+++
Hyperergic	13 and more	++++

Skin reaction to histamine should be positive, in case of negative reaction allergen test should not be performed. Skin reaction to test control fluid should be negative, in case of positive reaction the allergen tests should be ignored [8]. Test results were analyzed by the extent of skin reaction to the specific allergen to determine the most probable allergens in case of the development or exacerbation of atopic dermatitis in children. The range of allergic reactions from (++) to (+ + + +) was considered causally significant in the etiologic spectrum of the disease.

Conflict of interests

There is no conflict of interests.

3 RESULTS AND DISCUSSION

The study implied a comparative assessment of indoor aeroallergens in etiologic spectrum of allergic rhinitis in children according to the age and sex by prick-test in the period of stable remission of the disease. We examined 304 children aged from 4 to 18 with atopic rhinitis. Table 2 demonstrates sex- and age-dependent distribution of the children. According to sex and age, the distribution is as follows

Table 2.

Distribution of patients according to sex and age

Parameter	Age (years)					
	4-8		9-12		13-18	
	M	F	M	F	M	F
	n=48		n=42		n=204	
abs.	n=30	n=18	n=20	n=42	n=82	n=112
p% ±sp%	9.9 ±1.7	5.9 ±1.3	6.6 ±1.4	13.8 ±1.99	27.0 ±2.5	36.8 ±2.7
P	P >0.05		P >0.05		P >0.05	
p% ±sp%	15.8±2.1		13.8±1.9		67.1±2.7	
p	P (4-8)/(9-12) >0.05; P (4-8)/(13-18) <0.05; P(9-12)/(13-18) >0.05					

Notes: M – males; F – females

According to the findings presented in Table 2, the number of children suffering from AR, is increasing progressively with age, especially in puberty; these results are statistically significant (P<0.05).

Table 3 shows that the allergens prevailing in the etiological range to allergic rhinitis to house dust include Dermatophagoides farina (Allergenum e pulvere domesticum e Dermatophagoides farina).

Table 4 demonstrates the prevalence of hyperergic reactions to domestic allergens in girls with AR, aged 4-8 years.

Table 5 shows the prevalence of hyperergic reactions to domestic allergens in girls with AR, aged 9-12 years.

Table 4

Allergic reaction to domestic allergens in children with AR,

aged 4 to 8 years

Sex	**Boys (n=111)**				**Girls (n=139)**			
Allergy grade	1+	2+	3+	4+	1+	2+	3+	4+
Allergens	($p\%\pm s_{p\%}$)				($p\%\pm s_{p\%}$)			
A.D. pteronissimus	6.7±4.5	16.7±6.8	3.3±3.3	0	11.1±7.4	5.6±5.6	16.7±8.7	5.6±5.6
A.D. farina	20.0±7.3	20.0±7.3	0	20.0±7.3	61.1±11.5	11.1±7.4	50.0±11.8	0
A.P. bibliothecae	10.0±5.4	16.7±6.8	0	0	11.1±7.4	5.6±5.6	16.7±8.8	5.6±5.6
A.D. Acarus siro	3.3±3.3	13.3±6.1	6.7±4.6	0	5.6±5.6	11.1±7.4	22.2±9.7	0
A.P. pulvini	3.3±3.3	13.3±6.1	3.3±3.3	0	11.1±7.4	5.6±5.6	16.7±8.8	0
A. Daphnia magna	3.3±3.3	16.7±6.8	3.3±3.3	0	5.6±5.6	11.1±7.4	22.2±9.7	0

Table 5

Allergic reaction to domestic allergens in children with AR,

aged 9 to 12 years

Sex	**Boys (n=49)**				**Girls (n=41)**			
Allergy grade	1+	2+	3+	4+	1+	2+	3+	4+
Allergens	($p\%\pm s_{p\%}$)				($p\%\pm s_{p\%}$)			
A.D. pteronissimus	10.0±6.7	10.0±6.7	0	0	9.5±4.5	2.4±2.4	11.9±4.9	4.8±3.2
A.D. farina	65.0±10.6	55.0±11.1	5.0±4.8	20.0±8.9	26.2±6.7	33.3±7.2	14.3±5.4	9.5±4.5
A.P. bibliothecae	15.0±7.9	0	5.0±4.8	0	7.1±3.9	9.5±4.5	9.5±4.5	2.4±2.4
A.D. Acarus siro	10.0±6.7	10.0±6.7	5.0±4.8	0	11.9±4.9	4.8±3.2	9.5±4.5	2.4±2.4
A.P. pulvini	5.0±4.8	5.0±4.8	0	0	7.1±3.9	11.9±4.9	7.1±3.9	2.4±2.4
A. Daphnia magna	5.0±4.8	15.0±7.9	0	0	4.8±3.3	9.5±4.5	9.5±4.5	2.4±2.4

Table 6

Allergic reaction to domestic allergens in children with AR,

aged 13 to 18 year

Sex	**Boys (n=82)**				**Girls (n=112)**			
Allergy grade	1+	2+	3+	4+	1+	2+	3+	4+
Allergens	($p\%\pm s_{p\%}$)				($p\%\pm s_{p\%}$)			
A.D. pteronissimus	20.7±4.4	6.1±2.6	3.7±2.1	1.2±1.2	6.3±2.3	15.2±3.4	6.3±2.3	1.8±1.3
A.D. farina	28.0±4.9	37.8±5.3	3.7±2.1	14.6±3.8	17.9±3.6	24.1±4.0	4.5±1.9	3.6±1.7
A.P. bibliothecae	17.1±4.1	11.0±3.4	2.4±1.6	1.2±1.2	8.9±2.6	12.5±3.1	7.1±2.4	8.9±2.6
A.D. Acarus siro	17.1±4.2	9.8±3.2	3.7±2.1	1.2±1.2	7.1±2.4	12.5±3.1	5.4±2.1	4.5±1.9
A.P. pulvini	22.0±4.5	6.1±2.6	1.2±1.2	1.2±1.2	6.3±2.3	16.1±3.4	3.6±1.7	3.6±1.7
A. Daphnia magna	12.2±3.6	7.3±2.8	7.3±2.8	4.9±2.3	7.1±2.4	9.8±2.8	8.0±2.5	5.4±2.1

As shown in the Tables, the number of children with allergic rhinitis is progressively increasing with age.

The findings of the study suggest that domestic allergens play an important role in the etiological spectrum of AR in children. Dermatophagoides farina which causes hyperergic skin reactions in children of all age groups, especially at puberty should be considered causally significant in the development of atopic rhinitis among the domestic triggers.

Assessment of the test results with the other household allergens showed the prevalence in the group of girls at puberty, aged 9-12. However, the significance of other household allergens in AR exacerbation in children aged 4-8 and boys aged 9-12 should be considered questionable.

However, there was an increased sensitivity to Daphnia magna allergens in children at preschool and early school age, especially boys aged 4-8, suggesting the cause and significance of AR at this age. Daphnia allergens are not causally significant in children at elder age (Tables 3 to 6).

4 CONCLUSIONS

1. The study showed that the causally significant allergens from house dust morbidize atopic rhinitis in children of certain age and sex.

2. The number of children with allergic rhinitis is progressively increasing with age, especially at puberty.

3. Positive reactions to Dermatophagoides farina prevail in children with allergic rhinitis.

4. These findings give a possibility to elaborate specific immunotherapy.

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