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Allergic Rhinitis in Pre-School Children Living in Urban Settings of the Altai Region: a Population-Based Cross-Sectional Study

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Background. It is necessary to study the prevalence and risk factors of allergic rhinitis (AR) in pre-school children in order to shape a disease prevention strategy. **Objective.** Our aim was to study the prevalence, clinical and allergological features, and risk factors for AR in pre-school children living in urban settings of the Altai Region. **Methods.** At the screening stage, the study enrolled children aged 3–6 years attending pre-school educational institutions in 5 cities of the Altai Region. AR symptoms were determined using the ISAAC questionnaire. AR symptoms were determined using the ISAAC questionnaire. The AR was diagnosed if ≥ 2 symptoms (rhinorrhea, nasal breathing difficulty, itching in the nasal cavity, repetitive sneezing) lasted ≥ 1 h with a positive prick test and/or a blood level of specific IgE > 0.35 kU/L to at least one allergen (total 11). **Results.** The prevalence of AR in urban children aged 3–6 years ($n = 3,205$) was 10.6%; 48% of them were previously diagnosed with AR. 85% of children had a persistent course of the disease; 69% had mild AR. Most often, there was established sensitization to house dust mites (61.6%), birch pollen (40.9%), and cat fur (19.4%). The risk factors for AR were family history of allergies [odds ratio (OR) 4.2; 95% confidence interval (CI) 3.5–5.9], masculine (OR 2.8, 95% CI 1.9–4.0), smoking parents (OR 1.8, 95% CI 1.2–2.9), nonadherence to a regimen/dosage of vitamin D3 intake in infancy (OR 1.8, 95% CI 1.2–2.8), presence of asthma-like symptoms (OR 10.2, 95% CI 7.2–14.5), and manifestations of atopic dermatitis (OR 6.0, 95% CI 4.2–8.5). **Conclusion.** AR occurs in every tenth pre-school child (mainly of mild severity and persistent course), every second disease among them was diagnosed for the first time. Sensitization occurs to typical for childhood allergens. The risk factors for AR are family history of allergies, masculine, passive smoking, ignoring the recommendations of taking vitamin D3 in infancy, the presence of atopic dermatitis, and asthma-like symptoms.

Key words: children, allergic rhinitis, questionnaire, ISAAC, prevalence, allergens, risk factors.

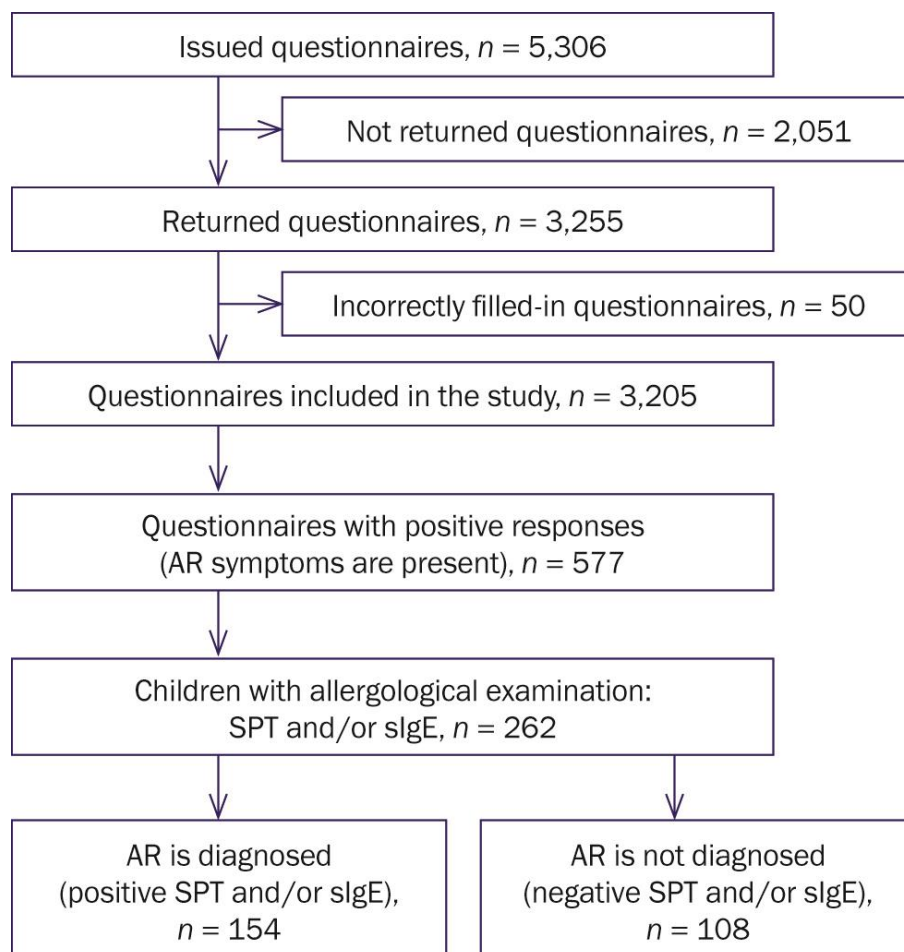
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Fig.1. Map of the Altai Region



Note. The arrows indicate the cities where the study was conducted.

Fig. 2. Study diagram



Note. AR — allergic rhinitis, SPT — skin prick tests, sIgE — specific immunoglobulins E.

Table 1. Characteristics of children with AR symptoms, who participated and did not participate in the clinical stage of the study (diagnosis verification)

Parameters	AR diagnosis verification		<i>p</i>
	Yes <i>n</i> =262	No <i>n</i> =315	
Age, years	4.8±1.2	4.9±0.9	0.889
Sex (boys), abs. (%)	170 (64.8)	190 (60.3)	0.259
Burdened history of allergies, abs. (%)	103 (39.3)	135 (42.8)	0.389
Allergic diseases in a mother, abs. (%)	58 (22.1)	78 (24.7)	0.459
Allergic diseases in a father, abs. (%)	54 (20.6)	59 (18.7)	0.057
Premature, abs. (%)	24 (9.1)	30 (9.5)	0.881
Breastfeeding < 6 months, abs. (%)	88 (33.6)	99 (31.4)	0.141
Smoking:			
• Mother during pregnancy, abs. (%)	9 (3.4)	12 (3.8)	0.811
• Parents in the first year of life, abs. (%)	28 (10.7)	34 (10.8)	0.967
• Parents at the present time, abs. (%)	34 (12.9)	41 (13.0)	0.988
Access to pets in the 1st year of life, abs. (%)	112 (42.7)	145 (46.0)	0.429
Failure in taking vitamin D ₃ , abs. (%)	50 (19.1)	70 (22.2)	0.355
Asthma-like symptoms, abs. (%)*	78 (29.7)	97 (30.7)	0.790
Symptoms of atopic dermatitis, abs. (%)*	75 (28.6)	79 (25.0)	0.337

Note. * — the presence of asthma-like manifestations and symptoms of atopic dermatitis was assessed at the screening stage using the ISAAC questionnaire (Asthma-Like Symptoms and Atopic Dermatitis modules for children aged 7-8 years) [14].

Table 2. Risk factors for verified allergic rhinitis in children aged 3-6 years

Risk factor	Children with AR (<i>n</i> =154)	Children without AR (<i>n</i> =2736)	OR (95% CI)	<i>p</i>
Masculine	112 (72.7)	1,337 (48.8)	2.8 (1.9–4.0)	0.001
Burdened family history of allergies	85 (55.2)	615 (22.4)	4.2 (3.0–5.9)	0.001
Allergic diseases in a father	41 (26.6)	280 (10.2)	3.1 (2.1–4.6)	0.001
Allergic diseases in a mother	53 (34.4)	453 (16.5)	2.6 (1.8–3.7)	0.001
Premature birth	18 (13.6)	281 (10.2)	1.1 (0.6–1.9)	0.574
Breastfeeding <6 months	48 (31.2)	775 (28.3)	1.1 (0.8–1.6)	0.446
Access to pets in the 1st year of life	78 (50.6)	1,358 (49.6)	1.0 (0.7–1.4)	0.806
Smoking mother during pregnancy	5 (3.8)	55 (2.0)	1.6 (0.6–4.1)	0.295
Smoking parents in the first year of life	22 (14.2)	270 (9.8)	1.5 (0.9–2.4)	0.076
Smoking parents at the present time	28 (18.2)	287 (10.4)	1.8 (1.2–2.9)	0.002
Failure in taking vitamin D ₃	29 (18.8)	298 (10.8)	1.8 (1.2–2.8)	0.002
Asthma-like symptoms	67 (43.5)	191 (6.9)	10.2 (7.2–14.5)	0.001
Symptoms of atopic dermatitis	59 (38.3)	255 (9.3)	6.0 (4.2–8.5)	0.001

Note. The analysis of risk factors did not include the data on children with AR symptoms (*n* =315) whose parents refused to participate in the clinical part of the study (AR confirmation using a prick test and/or determining specific IgE). AR — allergic rhinitis.

Table 3. The results of previously published studies on the prevalence of allergic rhinitis in pre-school children

Source	Country	Age, years	Study method	Prevalence, %
[21]	China	3–6	ISAAC questionnaire + CMD ¹	10.8
[22]	China	3–5	Questionnaire ²	14.9
[23]	Japan	3–6	ISAAC questionnaire	50.7
[24]	Japan	3–5	ISAAC questionnaire	17.8
[6]	China	3–5	ISAAC questionnaire	42.5
[5]	China	3–6	Questionnaire	7.3
[7]	Korea	3–6	Questionnaire	20.8
[8]	Italy	3–5	Questionnaire	5.5
[9]	USA	3–5	Questionnaire	13.7
[10]	Turkey	3–6	ISAAC questionnaire	13.4
[11]	Australia	2–6	Questionnaire	8.3
[12]	Korea	3–7	ISAAC questionnaire	17.3

Note. CMD — confirmed medical diagnosis. ¹ — the diagnosis of allergic rhinitis is based on the ARIA criteria (2008) [16], ² — based on the results of parents questioning.

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Not specified.

CONFLICT OF INTERESTS

Not declared.