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The Significance of Risk Factors in The Development of The Combined Form of Bronchial Asthma in Children

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Abstract: The characteristics of bronchial asthma combined with allergic rhinosinusitis have been identified: a more severe course of the disease, bronchial hyperreactivity, and decreased activity of the body's nonspecific defense mechanisms. Risk factors and non-infectious allergens play a significant role in the formation and development of bronchial asthma. Allergic rhinosinusitis determines the severity of the clinical course of bronchial asthma.

Keywords: Bronchial asthma, bronchial hyperreactivity, risk factors.

Introduction: Objective of the study. To investigate the clinical features and determine the significance of risk factors in the development of atopic bronchial asthma combined with allergic rhinosinusitis (ARS) in children.

Methods. A study was conducted involving 100 children aged 7 to 14 years suffering from atopic bronchial asthma, both with and without ARS. A control group consisted of 30 practically healthy children. Clinical-allergological, functional, laboratory, immunological, and statistical research methods were used.

Results. Specific clinical features of atopic bronchial asthma combined with ARS were identified: predominance of cases with more severe clinical course, pronounced meteorological sensitivity, psychological disturbances, hyperreactivity of bronchial receptors to histamine and acetylcholine, suppression of external respiratory function, impaired rhinometry indicators, and decreased phagocytic activity of neutrophils. The significance of risk factors (predisposing and contributing) for the development of bronchial asthma in children was established.

Relevance of the problem. The urgency of the bronchial asthma issue is due to its steady increase in incidence worldwide, often with more severe clinical manifestations and a high risk of fatal outcomes (1,2). Uzbekistan is no exception, where over recent years, the incidence of bronchial asthma among children has increased more than 20-fold (2,3,4). The condition is especially prevalent among children living in environmentally unfavorable regions (1,3,5). Although various aspects of bronchial asthma have been actively researched, many questions remain unresolved. In this regard, the issue of combined forms of bronchial asthma with other allergic diseases presents significant scientific and practical interest. For instance, there are contradictory opinions regarding bronchial asthma associated with allergic rhinosinusitis (ARS). It is believed that primary pathology of the upper respiratory tract plays a significant role in the development and clinical manifestation of bronchial asthma (1,2,4,5).

The objective of the study was to examine the clinical characteristics and determine the risk factors in the development of atopic bronchial asthma associated with ARS in children.

METHODS

The study observed 130 children aged 7–14 years, including 60 suffering from atopic bronchial asthma combined with allergic rhinosinusitis (ARS), 40 with atopic bronchial asthma without ARS, and 30 practically healthy children. The diagnoses of the primary and associated conditions were established based on clinical-allergological, functional, laboratory, and radiological examinations. Forced expiratory power, sensitivity threshold of the bronchial receptor

apparatus to histamine and acetylcholine, nasal respiratory function, eosinophil count in peripheral blood and nasal secretions, and the cause of sensitization were determined using allergic skin tests.

The set of paraclinical studies included the evaluation of serum IgE levels, phagocytic activity of neutrophils, and the psychological state of the children (1,2,4,6,8). Statistical analysis was carried out using the Microsoft Windows application software package. The significance of differences between the compared values was assessed using the Student's t-test. Correlations among the studied parameters were evaluated using the correlation coefficient, with statistical significance set at $p < 0.05$.

RESULTS AND DISCUSSION

Analysis of the results showed that atopic bronchial asthma was more common in boys (65.0–71.7%) than in girls (28.3–35.0%) (Table 1).

In the majority of affected children—38 cases (63.3%)—the onset of bronchial asthma began with symptoms of allergic rhinitis and sinusitis. In 18 children (30.0%), the disease started with simultaneous manifestations of bronchial asthma and ARS symptoms. In only a few children—4 cases (6.7%)—the disease began with bronchial asthma symptoms, and symptoms of allergic inflammation of the nose and its paranasal sinuses appeared some time later.

Characteristics of Children by Clinical Forms of Disease Manifestation, Gender, and Age

Table 1.

№	Name of the Condition	7 – 12 years		13 – 14 years		Total		
		Boys	Girls	Boys	Girls	Boys	Girls	Total
1.	**Bronchial asthma combined with ARS** (n=60)	13 (21,6)	7 (11,7)	30 (50,0)	10 (16,7)	43 (71,7)	17 (28,3)	60 (100)
2.	Bronchial asthma not combined with ARS (n=40)	12 (30,0)	6 (15,0)	14 (35,0)	8 (20,0)	26 (65,0)	14 (35,0)	40 (100)
3.	Practically healthy (n=30)	9 (30,0)	6 (20,0)	10 (33,3)	5 (16,70	19 (63,3)	11 (36,7)	30 (100)
	Total:	34 (26,2)	19 (14,6)	54 (41,5)	23 (17,7)	88 (67,7)	42 (32,3)	130 (100)

Note: here and below, percentages (%) are given in parentheses

The severity of the clinical course of bronchial asthma, both combined and not combined with ARS, varied. In cases of bronchial asthma combined with ARS, moderate (45.0%) and severe (20.0%) clinical courses predominated, whereas in cases not combined with ARS, mild (75.0%) and moderate (25%) forms were more common.

In children with bronchial asthma combined with ARS of moderate to severe severity, physical activity was limited, speech was impaired, expiratory dyspnea and meteorological sensitivity were clearly expressed, and psychological disturbances were noted. These children demonstrated low academic performance, nervousness, and irritability. The disease exhibited a clear seasonal pattern depending on the sensitization trigger. Pollen-induced bronchial asthma (e.g., wormwood, goosefoot) was frequently exacerbated in spring and summer, whereas asthma of domestic origin (e.g., house dust) worsened in autumn and winter.

Forced expiratory flow rates (1.56 L/sec) were significantly lower ($p<0.05$). The sensitivity of bronchial receptors to histamine and acetylcholine was elevated (hyperreactivity), as evidenced by low threshold concentrations of these substances causing bronchospasm. All patients exhibited allergic rhinitis. Additionally, a significant proportion of patients had allergic sinusitis (45.0%) and nasal polyps (3.3%).

Rhinometric values ranged from 16.8 to 18.4 mm H_2O. The phagocytic activity of neutrophils was reduced: phagocytic number (44.6%), phagocytic index (3.5), and phagocytic capacity were all low. Eosinophils were present in peripheral blood (10–15%), and eosinophils were detected in imprint smears of nasal secretions (16.2%) (see Table 2).

Clinical and Laboratory Features of Bronchial Asthma Combined with Allergic Rhinosinusitis

Table 2.

№	Indicators	Sick children	Practically healthy
1.	Clinical course	Predominance of severe cases	-
2.	Meteolability	Clearly pronounced	Normal
3.	Seasonality	Clearly pronounced	-
4.	Psychological state	Impaired	Normal
5.	Forced expiratory flow (L/s)	1,56±0,45+	3,85±0,56
6.	Threshold sensitivity (µg %) of bronchial receptors to: histamine (µg %)	400+ 1200+	1000 3000
7.	Allergic rhinitis (%)	100+	-
8.	Allergic sinusitis (%)	45,0+	-
9.	Nasal polyps (%)	3,3+	-
10.	Rhinometry (mm H_2O) right side left side	16,8±3,1+ 18,4±3,2+	8,7±0,3 8,7±0,3
11.	Eosinophilia (%)	10 – 15+	4 - 5

12.	Eosinophils in nasal mucosa impression smears (%)	16,2±	2-4
13.	Phagocytic number (%)	44,6±5,1+	75,5±4,5
14.	Phagocytic index	3,5±0,4+	7,4±0,5
15.	Phagocytic strength	156,1±10,3+	558,7±16,2

Note: Numerical differences are not statistically significant (P>0.5).

The presence of risk factors plays a significant role in the development of bronchial asthma. According to our data, predisposing and contributing risk factors had equal importance in the development of atopic bronchial asthma, both associated and not associated with ARS (Table 3). The patients' bodies responded actively to allergenic exposure and produced a sufficiently high level of IgE (615.5–850.5 IU/mL). Bronchial hyperreactivity was observed in all patients, hereditary allergic predisposition was present in 70.0–75.0%, and allergic diathesis was identified in 62.5–55.0% of patients. Among the contributing factors, toxicosis (60.0–68.3%) and pregnancy and childbirth pathologies (15.0–38.3%) in the mothers of the sick children were notable. Artificial or early mixed feeding was significant in 55.0–65.0% of patients, and the combination of the primary disease with allergic dermatitis was observed in 45.0–59.8% of patients.

Risk Factors for the Development of Bronchial Asthma in Children (M±m%)

Table 3.

Risk Factors	Bronchial Asthma	
	Associated with ARS	Not associated with ARS
Predisposing:		
Blood IgE level (IU/mL)	850,5	615,5
Bronchial hyperreactivity	100%	100%
Hereditary predisposition	45 (75,0±5,5)	28 (70,0±9,9)
Allergic diathesis	33 (55,0±6,4)	25 (62,5±9,6)
Contributing:		
Pregnancy toxicosis in mothers	41 (68,3±7,2)	24 (60,0±10,0)
Pregnancy and childbirth pathologies in mothers	16 (26,7±11,0) 23 (38,3±10,1)	6 (15,0±14,5) 13 (32,5±12,9)
Artificial and/or early mixed feeding	39 (65,0±6,1)	22 (55,0±10,6)
Combination with allergic dermatitis	35 (59,8±8,2)	18 (45,0±9,5)

Thus, identifying the specific features of bronchial asthma associated with ARS is of great scientific and practical importance. This is due to the fact that ARS often transform into bronchial asthma, and its incidence depends on the stage of allergic rhinitis development—ranging from 6.2–11.1% in stages 1 and

2, and increasing to 21.7–36.1% in stages 3–4 (1, 2, 3, 6).

CONCLUSIONS

1. The combination of bronchial asthma with ARS creates a qualitatively new situation, characterized by specific clinical features: more severe disease course, marked airway obstruction, bronchial hyperreactivity, and reduced activity of nonspecific defense mechanisms.

2. Early diagnosis and timely treatment of allergic lesions of the nose and its paranasal sinuses are essential for the prevention of bronchial asthma.

3. Risk factors play a significant role in the onset and development of bronchial asthma in children, while ARS determines the progression and severity of the clinical course.

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