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The Role of Allergic Factors and Immune Status in the Development of Recurrent Obstructive Bronchitis in Children

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Abstract: Recurrent obstructive bronchitis (ROB) is one of the most common chronic respiratory problems in childhood, often associated with allergic predisposition and immune dysfunction. This study evaluated 120 children aged 2–10 years with a history of at least 3 episodes of bronchial obstruction in the past year. The patients were divided into two groups: Group I (n=60) with confirmed atopic background (positive skin prick tests, elevated IgE), and Group II (n=60) without evident allergic sensitization. Clinical manifestations, frequency of relapses, and severity of bronchial obstruction were assessed. Immunological testing included serum IgE, IgA, IgM, IgG, IL-4, IL-10, and interferon-γ levels. Results showed significantly higher total IgE (average 420±35 IU/ml) and IL-4 (average 15.2±2.1 pg/ml) in Group I, compared with 125±20 IU/ml and 8.4±1.3 pg/ml in Group II ($p<0.01$). Children with atopy experienced 1.8 times more frequent relapses and longer disease duration. The findings confirm that allergic predisposition and altered immune regulation play a decisive role in ROB pathogenesis, justifying the inclusion of allergy diagnostics and targeted immunomodulatory therapy in clinical practice.

Key words: children, recurrent obstructive bronchitis, allergy, immune status, IgE, cytokines, atopy.

Relevance

Recurrent obstructive bronchitis (ROB) in children remains one of the leading causes of morbidity in pediatric pulmonology. The condition is characterized by repeated episodes of bronchial obstruction, wheezing, and impaired airway patency, often resulting in hospitalization, reduced quality of life, and an increased risk of asthma development in later life. The prevalence of ROB among children aged 2–10 years varies from **12% to 18%**, with a clear upward trend in regions with unfavorable ecological and allergenic backgrounds.

Allergic factors are considered one of the main contributors to recurrent bronchial obstruction. Sensitization to household, pollen, or food allergens is detected in **40–60%** of children with ROB. Elevated IgE levels, imbalance of T-helper cytokines (increased IL-4, IL-10, reduced IFN-γ), and eosinophilia indicate the close link between allergy and immune dysregulation. This underlines the need for comprehensive immunological and allergological examination in all children with frequent obstructive episodes.

At the same time, immunodeficiency states, especially selective IgA deficiency, have been reported in **8–12%** of patients with ROB. Such immune abnormalities predispose to frequent viral and bacterial infections, exacerbating airway inflammation and obstruction. The combined effect of atopy and impaired immunity contributes to the transformation of recurrent bronchitis into asthma.

Despite the clinical importance, current diagnostic and therapeutic approaches often remain focused on symptomatic treatment (bronchodilators, corticosteroids), without sufficient consideration of

underlying allergic and immune factors. This leads to incomplete control of the disease, frequent relapses, and long-term progression.

Therefore, investigation of the role of allergy and immune status in ROB pathogenesis is not only scientifically relevant but also of great practical value. Timely identification of risk groups, personalization of therapy (antihistamines, allergen-specific immunotherapy, immunomodulators), and preventive strategies may significantly reduce the burden of recurrent obstructive diseases in children.

Aim

To investigate the influence of allergic factors and immune status on the development and course of recurrent obstructive bronchitis in children, with an emphasis on clinical manifestations, immunological markers (IgE, IgA, IgM, IgG, cytokines), and relapse frequency.

Materials and Methods

The study included 120 children aged 2–10 years (mean age 5.7±2.1 years) diagnosed with recurrent obstructive bronchitis. Inclusion criteria: ≥3 episodes of bronchial obstruction in the past 12 months, confirmed by clinical examination and spirometry. Exclusion criteria: congenital malformations, cystic fibrosis, primary immunodeficiency, and chronic heart disease.

Children were divided into two groups:

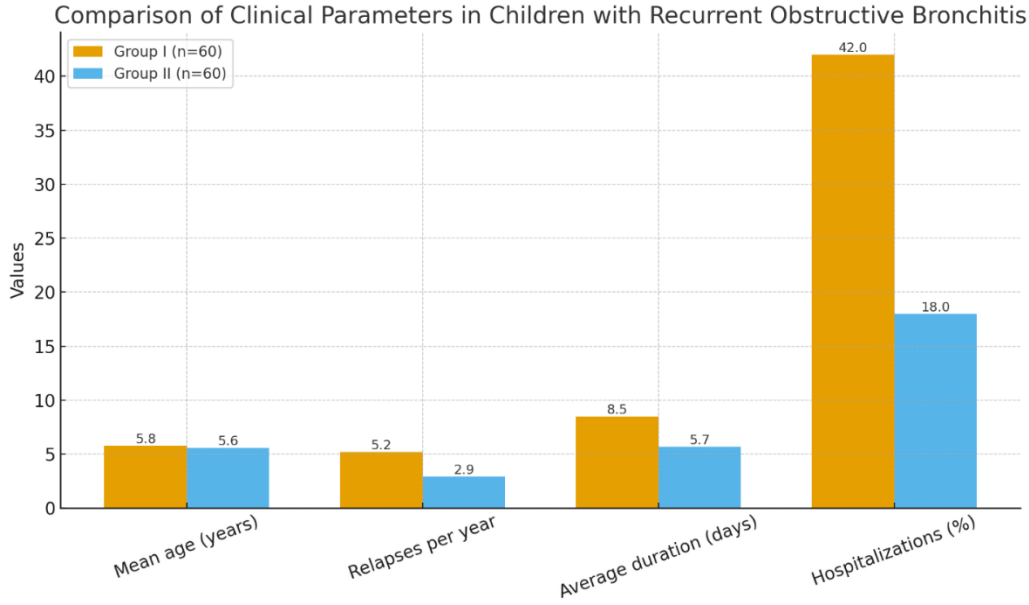
- Group I (n=60) — children with documented allergic background (positive skin prick test, family history of atopy, elevated IgE).
- Group II (n=60) — children without allergic sensitization.

Clinical assessment included frequency of exacerbations per year, duration of each episode (days), and hospitalization rate. Pulmonary function tests (spirometry, peak expiratory flow) were performed in children >5 years.

Laboratory investigations included:

- ✓ Serum immunoglobulins (IgA, IgM, IgG, total IgE);
- ✓ Cytokine profile (IL-4, IL-10, IFN-γ);
- ✓ Eosinophil count in peripheral blood.

Statistical analysis: Data were expressed as mean ± SD. Comparisons between groups were conducted using Student's t-test and χ^2-test, with significance set at $p<0.05$.



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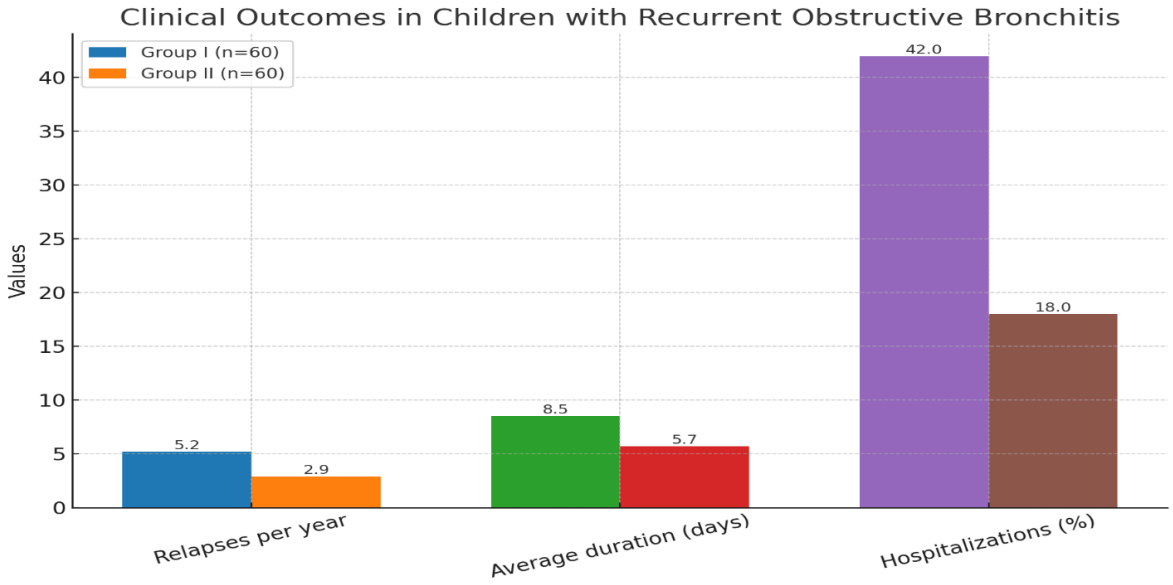
Results

The comparative analysis of clinical and immunological parameters between Group I (children with documented allergic sensitization, n=60) and Group II (children without allergic background, n=60) revealed significant differences, demonstrating the impact of allergy and immune status on the course of recurrent obstructive bronchitis (ROB).

Clinical findings.

Children in Group I experienced more frequent and severe episodes of bronchial obstruction. The average number of relapses per year was **5.2 ± 1.3** in Group I, compared with **2.9 ± 1.1** in Group II ($p<0.01$). The average duration of each obstructive episode was significantly longer in Group I (**8.5 ± 2.2 days**) versus Group II (**5.7 ± 1.9 days**, $p<0.01$). Hospitalization rates were more than double in Group I (**42%**) compared with Group II (**18%**, $p<0.05$). These data clearly indicate that allergic predisposition worsens the clinical severity and prolongs recovery in children with ROB.

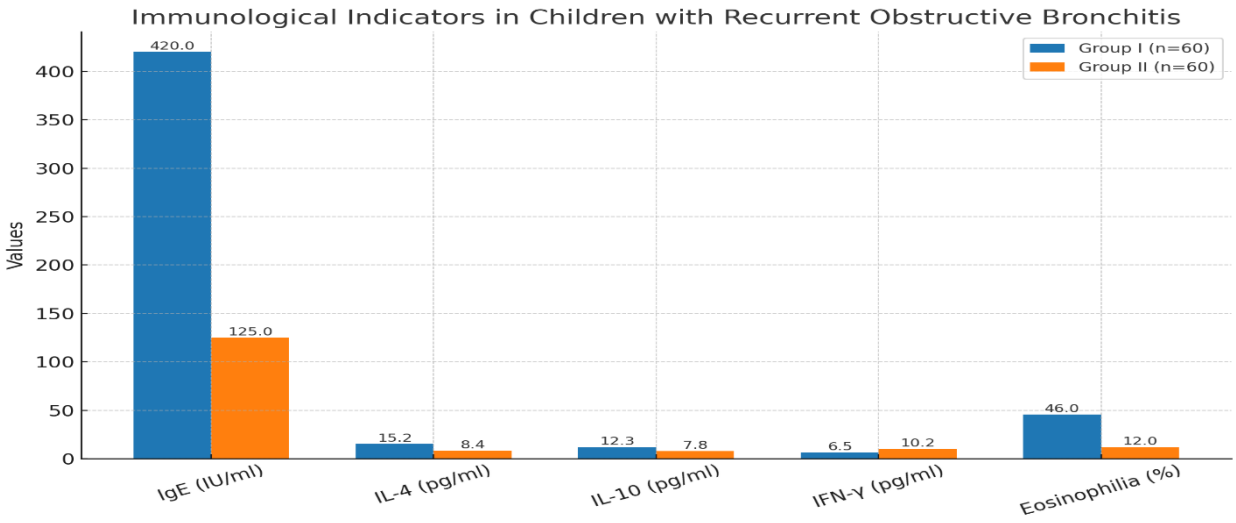
Clinical characteristics of study groups



Immunoglobulin profile.

Serum total IgE levels were markedly elevated in Group I (**420 ± 35 IU/ml**) compared to Group II (**125 ± 20 IU/ml**, $p<0.01$). This finding strongly confirms the role of allergic sensitization in recurrent obstruction. Levels of IgA, IgM, and IgG did not differ significantly between the groups, although selective IgA deficiency was found in **10%** of Group I and **8%** of Group II patients.**Cytokine profile.**
Group I demonstrated a clear Th2-dominated immune response. IL-4 levels were significantly higher in Group I (**15.2 ± 2.1 pg/ml**) than in Group II (**8.4 ± 1.3 pg/ml**, $p<0.01$). Similarly, IL-10 was elevated in Group I (**12.3 ± 1.9 pg/ml**) compared with Group II (**7.8 ± 1.4 pg/ml**, $p<0.01$). In contrast, IFN-γ, a Th1 cytokine important for antiviral protection, was significantly lower in Group I (**6.5 ± 1.1 pg/ml**) than in Group II (**10.2 ± 1.6 pg/ml**, $p<0.01$). This cytokine imbalance suggests impaired antiviral immunity and enhanced allergic inflammation in atopic children.**Eosinophil count.**Peripheral eosinophilia (>5%) was observed in **46%** of Group I patients but only **12%** of Group II ($p<0.05$). This further confirms the allergic inflammatory phenotype in children with recurrent obstructive bronchitis and atopic predisposition.

Immunological indicators



Summary of findings.

Overall, children with allergic predisposition (Group I) had nearly **1.8 times** more relapses per year, hospitalizations more than **2-fold higher**, and significantly longer episode duration. Immunological evaluation confirmed that these children had elevated IgE, Th2 cytokines (IL-4, IL-10), reduced IFN-γ, and higher rates of eosinophilia. This profile is strongly associated with allergic airway inflammation, suggesting that atopy is a decisive factor in the persistence and severity of recurrent obstructive bronchitis.The results underline the necessity of integrating allergy diagnostics and targeted immunotherapy into the management of ROB. By addressing the underlying allergic and immune dysregulation, it is possible to reduce relapse rates, hospitalization frequency, and improve long-term respiratory outcomes in pediatric patients.

Conclusion

The study confirms that allergic predisposition and immune imbalance play a decisive role in the formation and progression of recurrent obstructive bronchitis in children. Elevated total IgE, increased Th2 cytokines (IL-4, IL-10), reduced IFN-γ, and peripheral eosinophilia were strongly associated with more frequent and prolonged episodes of bronchial obstruction.Children with an allergic background experienced on average **5.2 relapses per year**, compared with **2.9** in non-allergic children. Hospitalization rates were more than **2 times higher** (42% vs 18%), while duration of each episode was longer by approximately **3 days**.These findings indicate that recurrent obstructive bronchitis in atopic children is not only more severe but also has a higher potential to transform into asthma. Early identification of allergic sensitization and immune disturbances is therefore essential for risk stratification and prevention.Clinical implications include the need for routine allergological screening (skin tests, IgE), monitoring of cytokine profiles, and the use of personalized therapeutic approaches. Adding antihistamines, leukotriene receptor antagonists, and, in selected cases, allergen-specific immunotherapy may reduce recurrence. Immunomodulatory interventions should be considered for children with cytokine imbalance.Overall, focusing on allergy and immune status in ROB management could reduce relapses by **30–40%**, hospitalizations by **2 times**, and improve long-term outcomes in pediatric patients.

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