

ASSESSMENT OF RISK FACTORS FOR THE DEVELOPMENT OF BRONCHO-OBSTRUCTIVE SYNDROME IN CHILDREN

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ABSTRACT

Background: Broncho-obstructive syndrome (BOS) is a common complication of acute lower respiratory diseases in children and is associated with an increased risk of bronchial asthma.

Objective: To identify and systematize risk factors contributing to the development of BOS in children with acute obstructive bronchitis (AOB).

Methods: A retrospective cohort study included 912 children aged 2 months to 5 years hospitalized from 2012 to 2015. Group 1 consisted of 494 children with BOS on the background of AOB, while Group 2 included 418 children with acute bronchitis without obstruction. Statistical analysis was performed using Pearson's chi-square (χ^2) test.

Results: Among 49 identified factors, 28 were statistically significant. Major risk factors included male gender, older age, allergic predisposition, atopic dermatitis, thymomegaly, passive smoking, early artificial feeding, and seasonal factors (winter and spring). Predisposing factors included frequent respiratory infections, rickets, prematurity, adverse environmental conditions, and delayed medical care.

Conclusion: BOS development in children is multifactorial. Identification of modifiable risk factors enables early prevention and reduces the likelihood of progression to bronchial asthma.

Keywords: broncho-obstructive syndrome, children, risk factors, acute bronchitis, asthma, epidemiology

Broncho-obstructive syndrome (BOS) is one of the most common clinical conditions in pediatric pulmonology. It often complicates the course of acute obstructive bronchitis and may serve as a precursor to bronchial asthma. Early identification of risk factors is essential for prevention and improving clinical outcomes.

Materials and methods. A retrospective cohort study was conducted based on 912 medical records of children aged 2 months to 5 years treated between 2012–2015.

- **Group 1 (n=494):** AOB with BOS
- **Group 2 (n=418):** Acute bronchitis without BOS

Data sources included:

- medical history
- clinical examination
- laboratory and instrumental findings

Statistical analysis:

- Pearson's chi-square (χ^2) test
- significance level: $p < 0.05$

RESULTS

General Characteristics

- Infants (<1 year): 54.7%
- Boys: 59.2% (predominant in BOS group – 65.8%)
- Rural residents: 58%

Seasonality

Higher incidence of AOB with BOS:

- Winter – peak
- Spring – high
- Summer/Autumn – lower

Premorbid Background

Common findings:

- Artificial feeding – 63.4%
- Perinatal CNS damage – 56.3%
- Rickets – 45%
- Anemia – 97.4%

Clinical Features

Key BOS signs:

- wheezing and expiratory dyspnea
- diffuse dry rales
- chest retractions
- hyperinflation on X-ray

RISK FACTORS ANALYSIS

Major Risk Factors ($p < 0.05$, $\chi^2 > 6.635$)

- Male gender
- Older age
- Atopic dermatitis
- Allergic family history
- Thymomegaly
- Passive smoking
- Early artificial feeding
- Food allergy
- Paratrophy

- Lymphatic-hypoplastic diathesis
- Winter and spring seasons

Predisposing Factors (p < 0.01)

- Frequent respiratory infections
- Recurrent BOS episodes
- Rickets
- Prematurity
- Poor socio-economic conditions
- Environmental pollution
- Complicated pregnancy (gestosis)
- Late hospitalization
- Use of traditional/self-treatment methods

Possible Factors (p > 0.1)

- Rural residence
- Summer/autumn season
- Hypoxic-ischemic encephalopathy
- Muscular hypotonia
- Chest deformities

FOLLOW-UP (CATAMNESIS)

35 children were followed for 1 year:

- High-risk group: BOS recurrence in **59.2%**
- Low-risk group: **14.3%**

Bronchial asthma developed in several cases, confirming BOS as a predictor.

DISCUSSION. The present study provides a comprehensive evaluation of risk factors associated with the development of broncho-obstructive syndrome (BOS) in children with acute obstructive bronchitis (AOB). The findings confirm the multifactorial nature of BOS and highlight the interaction between biological predisposition, environmental exposure, and social determinants of health.

One of the key findings of this study is the significant predominance of BOS among male patients. This observation is consistent with previously published data and may be explained by anatomical and physiological особенностями дыхательных путей у мальчиков, включая более узкий просвет бронхов и повышенную реактивность бронхиального дерева. Additionally, age-related differences revealed a higher statistical significance of BOS development in older children, despite the overall higher incidence of respiratory diseases in infants. This suggests that repeated exposure to infectious and environmental triggers over time may contribute to airway remodeling and increased bronchial hyperreactivity.

A strong association was identified between BOS and allergic predisposition. The high prevalence of atopic dermatitis and burdened family allergic history supports

the concept that BOS may represent an early clinical manifestation of the atopic march. In particular, maternal transmission of allergic diseases appears to play a crucial role, which is consistent with immunogenetic mechanisms described in current literature. These findings emphasize the importance of early identification of children at risk for allergic diseases and bronchial asthma.

Thymomegaly emerged as one of the significant risk factors, which may reflect underlying особенностей иммунной системы у детей раннего возраста. Enlarged thymus could be associated with altered immune responses, increased susceptibility to infections, and prolonged inflammatory processes in the respiratory tract. Similarly, lymphatic-hypoplastic diathesis and paratrophy were identified as important contributors, likely due to their association with tissue edema, impaired drainage function, and decreased resistance to infections.

Environmental and behavioral factors also demonstrated a strong impact on BOS development. Passive smoking showed a high level of statistical significance, confirming its well-established role in damaging bronchial epithelium, impairing mucociliary clearance, and reducing local immune defense. Early transition to artificial feeding was another significant factor, which may be explained by the absence of protective immunological components of breast milk, including immunoglobulins and anti-inflammatory cytokines.

Among predisposing factors, frequent respiratory infections and recurrent BOS episodes play a crucial role in the formation of chronic bronchial hyperreactivity. These repeated inflammatory processes may lead to structural and functional changes in the airways, increasing the risk of persistent obstructive conditions. Prematurity and complicated pregnancy were also associated with BOS, likely due to incomplete development of the respiratory and immune systems.

It is important to highlight the role of socio-economic and environmental conditions. Poor living conditions, air pollution, and delayed access to medical care were significantly associated with BOS. Moreover, the use of non-evidence-based traditional treatment methods contributed to disease progression by delaying appropriate therapy. These findings underline the importance of public health interventions and parental education.

Interestingly, iron-deficiency anemia, despite its high prevalence, was not identified as a statistically significant risk factor for BOS. This suggests that while anemia may aggravate the general condition of the child, it does not directly influence the development of bronchial obstruction.

The follow-up data further подтвердили прогностическую значимость выявленных факторов риска. Children with major and predisposing risk factors demonstrated significantly higher recurrence rates of BOS and a tendency toward the

development of bronchial asthma. This supports the hypothesis that BOS may serve as an early predictor of chronic allergic airway diseases.

Overall, the results of this study emphasize the importance of a comprehensive approach to risk assessment in children with respiratory diseases. Identification of modifiable risk factors, such as passive smoking, artificial feeding, and delayed medical care, provides an opportunity for targeted preventive strategies. Early intervention in high-risk groups may reduce the incidence of BOS and prevent its progression to bronchial asthma.

CONCLUSION. BOS in children is associated with multiple interacting risk factors. Early identification and elimination of modifiable risks can significantly reduce disease severity and prevent progression to bronchial asthma.

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