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Clinical and Functional Characteristics of Children with Bronchial Asthma and Gastrointestinal Disorders

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Abstract This article examines the clinical and functional characteristics of children with bronchial asthma and gastrointestinal disorders. It reviews current data on the prevalence of comorbid conditions in pediatric patients, their pathogenetic mechanisms, and clinical significance. Particular attention is paid to the relationship between immunological disorders, the state of the intestinal microbiota, and respiratory function. It is shown that children with bronchial asthma and comorbid gastrointestinal disorders have a higher exacerbation rate, significant changes in respiratory function, decreased fecal elastase-1 levels, and intestinal dysbiotic changes. These factors are associated with the severity of the clinical picture, decreased effectiveness of basic therapy, and a deterioration in the quality of life of patients. A comprehensive approach to diagnostics, including respiratory function assessment, gastrointestinal examination, and analysis of the microbiota and immunological parameters, enables the timely identification of comorbid conditions and individualized therapy. The obtained data highlight the need for a multidisciplinary approach in the management of children with bronchial asthma and concomitant gastrointestinal disorders.

Keywords Bronchial asthma, Children, Gastrointestinal tract, Microbiota, Fecal elastase-1, Clinical and functional features

1. Introduction

Bronchial asthma (BA) in children remains one of the most common chronic respiratory diseases, characterized by inflammation of the bronchial tree, hyperreactivity, and recurrent exacerbations. According to GINA (Global Initiative for Asthma, 2022), the prevalence of BA in the pediatric population reaches 8–12% and is increasing. In recent decades, the problem of comorbid conditions in which BA is combined with gastrointestinal (GI) diseases has attracted the attention of researchers [1,5,8].

Gastrointestinal pathologies are significantly more common in children with asthma than in the general population. This is due to both common pathogenesis factors (immune mechanisms, microbiota, inflammatory cytokines) and the influence of background therapy (inhaled and systemic glucocorticosteroids, β2-agonists), which can alter gastrointestinal motility and the intestinal microbiome. Scientific literature has accumulated data indicating that gastroesophageal reflux disease (GERD), chronic gastroduodenitis, intestinal dysbiosis, and pancreatic insufficiency are 1.5–2 times more common in children with asthma than in healthy peers (Global Asthma Report, 2021; Martynenko et al., 2020).

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2. Purpose of the Research

The purpose of this review is to present modern data on the clinical and functional characteristics of children with bronchial asthma and gastrointestinal disorders, and to substantiate the need for an integrated approach to the diagnosis and treatment of comorbid conditions.

In recent years, increasing attention has been paid to the study of comorbid conditions in asthma. Clinical practice shows that the disease's course is significantly complicated when combined with gastrointestinal (GI) pathology. According to several studies, 40–60% of children with asthma have various GI disorders, including gastroesophageal reflux disease (GERD), chronic gastroduodenitis, peptic ulcer disease, intestinal dysbiosis, and pancreatic insufficiency. Such combinations not only alter the clinical picture but also directly impact the effectiveness of standard therapy [2,3,12].

The immunopathogenetic mechanisms of comorbidity are of particular interest. It is known that in asthma, a leading role belongs to the Th2-mediated immune response, with hyperproduction of cytokines IL-4, IL-5, and IL-13, increased IgE levels, and eosinophil activation. These same immune inflammatory pathways are also involved in chronic gastrointestinal diseases, particularly those associated with

an allergic component. Thus, inflammatory processes in the respiratory and gastrointestinal tracts are inextricably linked and mutually potentiate each other [4,7,11].

The role of the intestinal microbiota, considered a key regulator of the immune response, deserves special attention. Recent studies (Fujimura et al., 2019; Bisgaard et al., 2020) have convincingly demonstrated that an imbalance in the intestinal flora in young children increases the risk of developing allergic diseases, including asthma. For school-age children with an established diagnosis of asthma, intestinal dysbiosis is associated with a more severe course of the disease, decreased lung function, and frequent exacerbations [6,13].

Pharmacological factors are also important. Long-term therapy with glucocorticosteroids and β2-agonists, which is the standard treatment for asthma, can have a negative impact on the gastrointestinal mucosa, alter gastrointestinal motility, and contribute to the development of pancreatic insufficiency. In this regard, assessing fecal elastase-1 levels in children with asthma is of high clinical significance, as it allows for the timely detection of exocrine pancreatic dysfunction [5,8,9].

From a clinical perspective, children with asthma and concomitant gastrointestinal disorders have a more severe course of the underlying disease. They experience more frequent nocturnal coughing fits, worse symptom control, decreased quality of life, and an increased number of hospitalizations. Furthermore, concomitant gastrointestinal pathology complicates the selection of basic therapy and reduces treatment adherence [14].

Despite existing publications devoted to specific aspects of comorbidity, comprehensive studies assessing the clinical and functional characteristics of children with asthma and gastrointestinal disorders remain insufficient. Data are particularly scarce regarding the relationship between respiratory function indicators (spirometry, body plethysmography), immunological markers, and the state of the intestinal microbiota [15].

An unfavorable antenatal period is considered to be a significant factor in the development of atopy. According to obstetric history data, only 22 (29.9%) mothers in the study group, compared to 27 (57.6%) in the comparison group, had a normal pregnancy. Among the pathological pregnancy and childbirth outcomes, the most common in the study group were gestosis (43.5%), threatened miscarriage (29.4%), and cesarean section (11.8%), while in the comparison group, gestosis (52.8%).

It is known that the gastrointestinal tract of infants in the first year of life is adapted exclusively to the species-specific, autolytic nutrition of breast milk. Transferring a child to mixed or artificial feeding increases the risk of large quantities of foreign proteins entering the body and the development of sensitization, primarily to cow's milk proteins, with the development of the most unfavorable forms of allergy [3,7,14].

An analysis of the feeding patterns of infants with asthma revealed that they were initially switched to formula feeding, and only 13.1% were breastfed during the first 12 months of life. 29% of infants were formula fed from birth, and 39.3% were fed early (before 3 months).

Early childhood illnesses, prior to the onset of asthma, undoubtedly played a significant role in the development of asthma and associated pathologies. Children with asthma often had a history of acute diarrhea, interpreted as acute intestinal infections, although the bacterial pathogen was rarely confirmed. Acute diarrhea in children could be a clinical manifestation of intestinal dysbiosis associated with allergic dermatitis or an intestinal manifestation of food allergy to various obligate allergens. This is supported by a clear association between exacerbations of skin manifestations and diarrhea and the ingestion of the causative allergen. Frequent respiratory illnesses, classified as acute respiratory viral infections, were noted as early as the first year of life, and the first manifestations of obstructive syndrome also appeared at this time. It can be assumed that this symptom complex was a multi-organ manifestation of allergy, which occurred in the form of an exacerbation of the skin process and, in some patients, gastrointestinal manifestations.

A review has shown that asthma in children often coexists with gastrointestinal diseases, significantly complicating the clinical course and reducing the effectiveness of standard therapy. These patients exhibit more severe respiratory distress, a combination of obstructive and restrictive changes based on functional assessments, and a high frequency of nocturnal symptoms and exacerbations.

Of particular importance is the study of the intestinal microbiota and pancreatic exocrine function. Decreased fecal elastase-1 levels and severe dysbiosis correlate with the severity of asthma and the frequency of hospitalizations, confirming the pathogenetic relationship between respiratory and gastrointestinal pathologies.

Therefore, children with bronchial asthma and associated gastrointestinal disorders require a comprehensive examination, including mandatory assessment of respiratory function, immunological parameters, and digestive system function. A personalized approach to diagnosis and treatment allows for improved disease control, a reduction in the frequency of exacerbations, and an improvement in patients' quality of life.

3. Conclusions

1. Asthma in children often occurs in combination with gastrointestinal disorders, which aggravates the clinical picture, complicates the course of the disease, and reduces the effectiveness of standard therapy.
2. Patients with comorbidity (bronchial asthma and gastrointestinal tract) more often experience nocturnal symptoms, more pronounced functional respiratory impairment, and a combination of obstructive and restrictive changes based on spirometry and body plethysmography.
3. Disturbances in the intestinal microbiota and decreased fecal elastase-1 levels in children with asthma are associated with an increased frequency of exacerbations,

decreased disease control, and an increased number of hospitalizations.

4. Immunological characteristics (increased IgE, changes in the cytokine profile) indicate a pathogenetic relationship between respiratory and gastrointestinal disorders.
5. A comprehensive approach, including a functional assessment of the respiratory system, gastrointestinal tract examination, microbiota and enzyme markers, is essential for early diagnosis, individualized therapy and improving the quality of life of children with bronchial asthma and concomitant gastrointestinal diseases.

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