BG Pulse Journal USA
ISSN:1947-2536 http://www.bgpulseusa.com/index.php/bg
BG PULSE JOURNAL

# CLINICAL AND FUNCTIONAL CHARACTERISTICS OF BRONCHIAL ASTHMA ASSOCIATED WITH GASTROESOPHAGEAL REFLUX DISEASE IN CHILDREN

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**Abstract:** Bronchial asthma and gastroesophageal reflux disease (GERD) are among the most common chronic disorders in childhood. In recent years, particular attention has been focused on the study of comorbid conditions that may affect the course and control of bronchial asthma. The aim of this study was to investigate the clinical and functional characteristics of bronchial asthma in children with concomitant gastroesophageal reflux disease. The study included 78 children aged 6 to 17 years with bronchial asthma of varying severity. All patients underwent clinical evaluation, assessment of asthma control using the Asthma Control Test (ACT), spirometry, 24-hour esophageal pH monitoring, and esophagogastroduodenoscopy when indicated. Signs of gastroesophageal reflux disease were identified in 51 (65.4%) children. Patients with concomitant GERD demonstrated a significantly higher frequency of nocturnal symptoms, reduced pulmonary function parameters, an increased rate of asthma exacerbations, and poorer disease control compared with children without GERD. The findings confirm the substantial impact of gastroesophageal reflux disease on the clinical course of bronchial asthma in children and highlight the importance of its timely diagnosis and management.

**Keywords:** bronchial asthma, gastroesophageal reflux disease, children, pulmonary function, asthma control, comorbidity.

**Introduction:**

Bronchial asthma (BA) remains one of the most common chronic respiratory diseases in children and constitutes a major medical and social challenge worldwide. According to the Global Initiative for Asthma (GINA), the prevalence of asthma among the pediatric population continues to rise despite ongoing improvements in diagnostic and therapeutic approaches.

Over recent decades, increasing attention has been focused on comorbid conditions that may influence the course and severity of asthma. Among these, gastroesophageal reflux disease (GERD) is considered one of the most significant associated disorders, with a prevalence among children with bronchial asthma substantially higher than that observed in the general population.

Pathological gastroesophageal reflux is known to contribute to increased bronchial hyperresponsiveness through several mechanisms. These include microaspiration of acidic gastric contents into the airways, vagally mediated reflex responses, and the maintenance of chronic inflammatory processes. As a result, additional factors emerge that may impair disease control, increase the frequency of exacerbations, and reduce the effectiveness of standard maintenance anti-asthmatic therapy.

Despite the considerable number of studies devoted to this issue, many aspects of the clinical interaction between bronchial asthma and gastroesophageal reflux disease in childhood remain insufficiently understood. In particular, the impact of GERD on pulmonary function parameters and the level of asthma control continues to be an important area of investigation.

**Aim of the study:** To investigate the clinical and functional characteristics of bronchial asthma in children with concomitant gastroesophageal reflux disease and to determine the impact of reflux pathology on pulmonary function parameters and the level of asthma control.

**Methods:** The study was conducted at the City Clinical Children's Hospital No. 1. A total of 78 children with bronchial asthma, aged 6 to 17 years, were enrolled and followed during the study period.

The mean age of the participants was 11.6 ± 2.9 years. Among the examined children, 46 (59.0%) were boys and 32 (41.0%) were girls.

The diagnosis of bronchial asthma was established in accordance with the Global Initiative for Asthma (GINA, 2024) criteria. The inclusion criteria were as follows:

• a confirmed diagnosis of bronchial asthma;

• age between 6 and 17 years;

• written informed consent obtained from parents or legal guardians for participation in the study.

All patients underwent a comprehensive evaluation that included:

- collection of medical history;
- assessment of clinical symptoms;
- administration of the Asthma Control Test (ACT);
- spirometry, including measurement of forced expiratory volume in one second ($FEV_1$), forced vital capacity (FVC), and peak expiratory flow (PEF);
- peak flow monitoring;
- complete blood count (CBC);
- determination of total serum IgE levels;
- esophagogastroduodenoscopy (EGD);
- 24-hour esophageal pH monitoring.

Based on the examination results, the children were divided into two groups:

Group I (BA + GERD) — 51 children;

Group II (BA without GERD) — 27 children.

Statistical analysis was performed using SPSS Statistics version 26.0. The significance of differences between groups was assessed using Student's t-test and the chi-square ($\chi^2$) test. Differences were considered statistically significant at $p < 0.05$.

**Results:**

Comprehensive evaluation revealed signs of gastroesophageal reflux disease (GERD) in 51 of the 78 children with bronchial asthma, accounting for 65.4% of all cases. Among patients with GERD, children with partially controlled and uncontrolled asthma predominated. Analysis of the distribution of bronchial asthma according to the presence of reflux pathology demonstrated that GERD occurred significantly more frequently in children with moderate-to-severe and severe asthma. In contrast, signs of gastroesophageal reflux were identified considerably less often among patients with well-controlled asthma.

**Table 1. Distribution of the Examined Children According to the Level of Asthma Control**

| Parameter | BA + GERD (n = 51) | BA without GERD (n = 27) |
|---|---|---|
| Controlled asthma | 10 (19,6%) | 12 (44,4%) |
| Partially controlled asthma | 21 (41,2%) | 10 (37,0%) |
| Uncontrolled asthma | 20 (39,2%) | 5 (18,6%) |

The obtained findings indicate that the presence of gastroesophageal reflux is associated with poorer asthma control and a higher proportion of patients with uncontrolled bronchial asthma.

Particular attention was paid to the analysis of clinical manifestations. Children with concomitant pathology significantly more often experienced nocturnal cough, episodes of nighttime dyspnea, a sensation of breathlessness, and a greater need for the additional use of short-acting $\beta_2$-agonists.

Table 2 presents the main study outcomes in children with bronchial asthma, including the prevalence of gastroesophageal reflux disease (GERD), clinical symptoms, pulmonary function parameters, and changes observed following antisecretory therapy.

**Table 2. Frequency of Major Clinical Symptoms in the Examined Children**

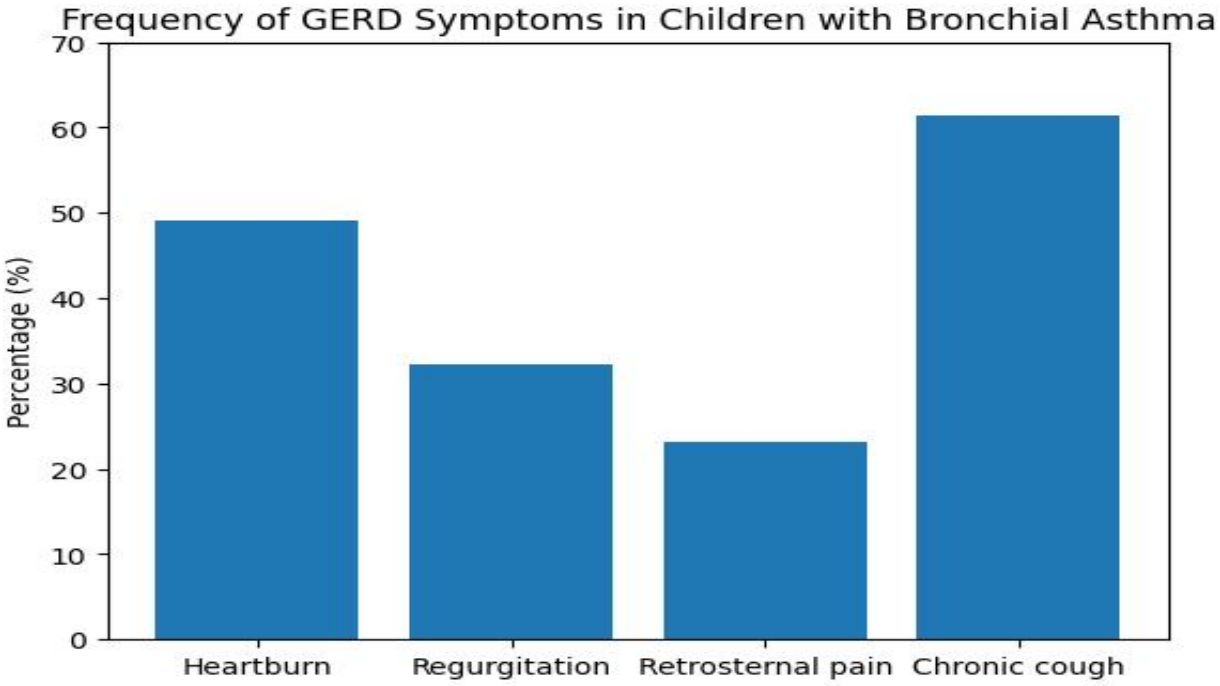
| Clinical Feature | BA + GERD (%) | BA without GERD (%) |
|---|---|---|
| Nocturnal cough | 72,5 | 33,3 |
| Nocturnal asthma attacks | 56,9 | 22,2 |
| Heartburn | 49,0 | 7,4 |
| Regurgitation | 35,3 | 3,7 |
| Retrosternal pain | 27,5 | 0 |
| Need for $\beta_2$-agonists more than twice per week | 68,6 | 29,6 |
| Chronic cough | 64,7 | 37,0 |

It should be noted that in a number of patients, gastroenterological complaints were absent or only minimally expressed. In such cases, the diagnosis of gastroesophageal reflux disease (GERD) was established only after instrumental investigations had been performed. This finding underscores the importance of active screening for GERD in children with bronchial asthma, even in the absence of typical gastrointestinal symptoms. Assessment of pulmonary function revealed statistically significant differences between the study groups.

**Table 3. Pulmonary Function Parameters in Children of the Study Groups**

| Parameter | BA + GERD | BA without GERD | p-value |
|---|---|---|---|
| $FEV_1$ (%) | 76,4±5,7 | 88,1±6,2 | <0,05 |
| FVC (%) | 81,3±6,1 | 90,4±5,8 | <0,05 |
| PEF (%) | 74,9±5,3 | 86,8±5,9 | <0,05 |
| ACT score (points) | 17,2±2,5 | 21,4±2,8 | <0,05 |

Diagramm 1. Frequency of gastroesophageal reflux disease (GERD) symptoms in children with bronchial asthma:




Patients with comorbidity more frequently experienced nocturnal coughing episodes, an increased need for $\beta_2$-agonists, and lower ACT scores compared with children without GERD (17.2 ± 2.5 vs. 21.4 ± 2.8, $p < 0.05$).

As demonstrated by the presented data, the presence of GERD was associated with a statistically significant reduction in indices of bronchial patency. The most pronounced changes were observed in $FEV_1$, which reflects the degree of airway obstruction. Correlation analysis revealed a significant inverse relationship between the number of pathological reflux episodes detected by 24-hour esophageal pH monitoring and $FEV_1$ values ($r = -0.51$; $p < 0.01$). A similar negative correlation was found between the duration of acid reflux episodes and the level of asthma control assessed by the ACT score ($r = -0.47$; $p < 0.05$).

Particular interest was devoted to the evaluation of the allergic status of the examined patients. In children with concomitant bronchial asthma and GERD, the mean total IgE level was 398.6 ± 45.2 IU/mL, whereas in the group without GERD this parameter was significantly lower, averaging 254.7 ± 38.9 IU/mL ($p < 0.05$). Peripheral blood eosinophilia was detected in 62.7% of children with GERD, compared with only 37.0% of patients without signs of reflux disease.

These findings suggest the presence of common pathogenetic mechanisms linking allergic inflammation and gastroesophageal reflux disease, which may contribute to the progression and more severe clinical course of bronchial asthma in children.

**Conclusions:**

From a practical perspective, the findings of this study highlight the importance of a multidisciplinary approach to the management of children with bronchial asthma. The high prevalence of gastroesophageal reflux (GER) symptoms among patients with asthma and the mutual influence of these conditions confirm the need for thorough evaluation of the upper gastrointestinal tract in children with bronchial asthma, particularly in cases that are resistant to standard therapy.

Several important issues remain unresolved, including the impact of antisecretory therapy on objective pulmonary function parameters in patients with concomitant GERD and bronchial asthma, as well as the potential adverse effect of bronchodilator therapy on the tone of the lower esophageal sphincter.

These aspects warrant further investigation and may contribute to the development of more effective strategies for the diagnosis and management of children with combined respiratory and gastrointestinal pathology. Patients with concomitant bronchial asthma and gastroesophageal reflux disease should receive comprehensive treatment, including anti-reflux and antisecretory therapy (proton pump inhibitors, prokinetic agents, and antacids) in combination with standard maintenance anti-asthmatic therapy, such as inhaled corticosteroids (ICS) and long-acting $\beta_2$-agonists (LABAs).

1. Gastroesophageal reflux disease (GERD) was identified in 65.4% of children with bronchial asthma and occurred more frequently in patients with partially controlled and uncontrolled asthma.
2. The presence of GERD was associated with a significant reduction in pulmonary function parameters, including forced expiratory volume in one second ($FEV_1$), forced vital capacity (FVC), and peak expiratory flow (PEF).
3. Children with concomitant bronchial asthma and GERD more frequently experienced nocturnal cough, episodes of dyspnea, and an increased need for bronchodilator therapy.
4. Gastroesophageal reflux disease represents a significant factor contributing to poor asthma control and a more severe clinical course of bronchial asthma.
5. Early diagnosis and timely management of reflux-related disorders can improve treatment effectiveness and enhance the quality of life of children with bronchial asthma.

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