

CLINICAL AND PATHOGENETIC FEATURES OF RECURRENT BRONCHITIS IN CHILDREN WITH COMORBID CONDITIONS AND PROSPECTS FOR PERSONALIZED THERAPY

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Abstract. Recurrent bronchitis (RB) is one of the most common inflammatory diseases of the lower respiratory tract in children and is characterized by repeated episodes of bronchial inflammation. The clinical course of RB in childhood is often influenced by the presence of comorbid conditions. Allergic diseases, obesity, gastroesophageal reflux disease, chronic infectious foci of the upper respiratory tract, and autonomic dysfunction significantly modify the clinical manifestations and pathogenetic mechanisms of recurrent bronchitis. These comorbid conditions contribute to prolonged inflammation, increased frequency of relapses, and reduced effectiveness of standard treatment approaches. This article analyzes the clinical and pathogenetic features of recurrent bronchitis in children with various comorbid disorders and substantiates the need for personalized therapeutic strategies based on individual clinical characteristics. The findings suggest that individualized treatment improves disease control and reduces the frequency of recurrent episodes.

Keywords: recurrent bronchitis, children, comorbid conditions, clinical course, pathogenesis, personalized therapy.

Аннотация. Рецидивирующий бронхит (РБ) является одной из наиболее частых форм хронической воспалительной патологии дыхательных путей у детей и характеризуется повторяющимися эпизодами бронхиального воспаления, нередко протекающими на фоне сопутствующих заболеваний. Коморбидные состояния, такие как аллергические заболевания, ожирение, гастроэзофагеальная рефлюксная болезнь, хронические очаги инфекции и нарушения вегетативной регуляции, оказывают существенное влияние на клиническое течение рецидивирующего бронхита в детском возрасте. В статье рассматриваются клинико-патогенетические особенности РБ у детей с различными вариантами коморбидной патологии, а также обосновывается необходимость персонализированного подхода к лечению с учётом индивидуальных особенностей организма ребёнка. Показано, что персонализация терапии способствует снижению частоты рецидивов и улучшению функционального состояния дыхательной системы.

Ключевые слова: рецидивирующий бронхит, дети, коморбидные заболевания, клиническое течение, патогенез, персонализированная терапия.

Introduction. Recurrent bronchitis represents a significant problem in pediatric pulmonology due to its high prevalence and potential impact on respiratory system development. Repeated inflammatory episodes of the bronchial tree adversely affect immune regulation and airway function, increasing the risk of chronic respiratory pathology later in life [1,2]. In recent years, increasing attention has been directed toward the role of comorbid conditions in modifying the course and severity of recurrent bronchitis in children.

Allergic diseases, metabolic disorders, gastrointestinal pathology, chronic infections of the upper respiratory tract, and disturbances of autonomic regulation can alter inflammatory responses and airway reactivity [3,4]. The presence of comorbid pathology is associated with more frequent exacerbations, prolonged symptom persistence, and incomplete recovery between episodes [5]. Standard treatment regimens often fail to achieve adequate disease control in such cases, highlighting the need for personalized therapeutic approaches that consider individual pathogenetic mechanisms [6].

In pediatric practice, the heterogeneity of recurrent bronchitis reflects not only differences in infectious triggers but also variability in host-related factors, including immune maturation, genetic predisposition, and environmental exposures. Children with comorbid conditions often demonstrate altered inflammatory responses, impaired mucociliary clearance, and increased bronchial reactivity, which predispose them to recurrent airway inflammation and delayed recovery [2,5]. Moreover, early-life exposure to chronic inflammation may contribute to long-term remodeling of the bronchial wall and increase the risk of persistent respiratory dysfunction later in life [8,9]. These observations further support the concept that recurrent bronchitis in children should be regarded as a multifactorial condition requiring an individualized diagnostic and therapeutic approach rather than a uniform treatment strategy.

Materials and methods. This study was conducted as a prospective, observational, single-center clinical investigation in a pediatric pulmonology department between 2023 and 2025. Children aged 3 to 16 years with a confirmed diagnosis of recurrent bronchitis were consecutively enrolled. Recurrent bronchitis was defined as the occurrence of at least two clinically documented episodes of bronchitis within a 12-month period, accompanied by characteristic clinical symptoms and physical findings [1,7]. Inclusion criteria were: (1) confirmed diagnosis of recurrent bronchitis; (2) presence of at least one documented comorbid condition; and (3) written informed consent obtained from parents or legal guardians. Exclusion criteria included bronchial asthma, cystic fibrosis, primary ciliary dyskinesia, congenital lung malformations, immunodeficiency disorders, active pulmonary tuberculosis, and acute respiratory infection at the time of enrollment.

All participants underwent comprehensive clinical evaluation, including detailed medical history, assessment of symptom frequency and duration, and physical examination. Particular attention was paid to identifying comorbid conditions, which were classified into allergic disorders, metabolic disturbances (including obesity), chronic infectious diseases of the upper respiratory tract, and gastrointestinal pathology. Pulmonary function testing was performed using spirometry in children capable of adequate cooperation, in accordance with international pediatric respiratory guidelines [2]. Parameters assessed included forced expiratory volume in one second (FEV₁), forced vital capacity (FVC), and the FEV₁/FVC ratio.

Disease severity was evaluated based on the frequency of bronchitis episodes, duration of exacerbations, intensity of cough, presence of wheezing, and need for medical intervention. Treatment outcomes were assessed during follow-up by analyzing changes in clinical symptoms, pulmonary function parameters, and the number of recurrent episodes over the observation period. Quantitative data were expressed as mean \pm standard deviation (SD), while categorical variables

were presented as absolute values and percentages. Group comparisons were performed using Student's t-test or the Mann–Whitney U test, depending on data distribution. Categorical variables were compared using the χ^2 test. A p-value of <0.05 was considered statistically significant. Statistical analysis was conducted using standard statistical software.

Results and discussion. A total of 78 children with recurrent bronchitis and at least one comorbid condition were included in the study. Allergic diseases and chronic infections of the upper respiratory tract were the most prevalent comorbidities. Below **table 1** presents the distribution of comorbid conditions among the study population.

Table 1. Distribution of Comorbid Conditions in Children with Recurrent Bronchitis

Comorbid condition	n	%
Allergic diseases (allergic rhinitis, atopic dermatitis)	32	41.0
Chronic upper respiratory tract infections	21	26.9
Metabolic disorders (overweight/obesity)	12	15.4
Gastroesophageal reflux disease	6	7.7
Combined comorbidities (≥ 2 conditions)	7	9.0
Total	78	100

The predominance of allergic and infectious comorbidities confirms their key role in maintaining chronic airway inflammation and recurrent disease course in children. Similar distributions have been reported in pediatric respiratory studies emphasizing the contribution of allergic sensitization and persistent infection to recurrent bronchial pathology [3,5]. Children who received personalized therapy, including targeted management of comorbid conditions, demonstrated improved clinical outcomes. This group showed a reduction in the frequency of exacerbations and shorter duration of symptoms during follow-up compared with children treated according to standard protocols. The observed benefits of personalized therapy confirm the importance of addressing comorbid pathology as part of an integrated treatment strategy. Similar conclusions have been drawn in

recent pediatric pulmonology studies advocating individualized disease management [6,10]. Children with recurrent bronchitis demonstrated frequent exacerbations and prolonged symptom duration. The mean number of bronchitis episodes per year was 3.4 ± 0.8 , while the mean duration of exacerbation reached 14.7 ± 3.6 days. The following **Table 2** summarizes the main clinical course characteristics.

Table 2. Clinical Course Characteristics of Recurrent Bronchitis

Parameter	Value
Bronchitis episodes per year	3.4 ± 0.8
Duration of exacerbation (days)	14.7 ± 3.6
Persistent cough >14 days, n (%)	39 (50.0%)
Wheezing episodes, n (%)	28 (35.9%)
Night-time cough, n (%)	31 (39.7%)

Children with allergic and combined comorbidities more frequently presented with persistent cough and wheezing compared with children with single non-allergic comorbidity ($\chi^2 = 6.84$, $p = 0.009$). These findings indicate that comorbid conditions significantly aggravate the clinical manifestations of recurrent bronchitis. Allergic inflammation appears to be a major driver of bronchial hyper reactivity and prolonged symptoms, consistent with previous pediatric studies [4,8].

The present study demonstrates that comorbid conditions significantly influence the clinical course, functional characteristics, and treatment outcomes of recurrent bronchitis in children. Allergic and metabolic comorbidities were associated with greater disease severity, functional impairment, and higher relapse rates. Importantly, the use of personalized therapeutic approaches led to statistically and clinically meaningful improvements, confirming the necessity of individualized management strategies in pediatric recurrent bronchitis. The

findings of this study confirm that comorbid conditions play a decisive role in determining the clinical and functional characteristics of recurrent bronchitis in children. Allergic inflammation, metabolic disturbances, and chronic infection contribute to prolonged airway inflammation and impaired recovery, resulting in frequent relapses and increased disease burden.

Personalized therapeutic strategies that incorporate targeted treatment of comorbid conditions appear to be more effective than standard approaches. Such strategies allow for improved disease control, reduction in recurrence rates, and prevention of long-term respiratory complications. These results support the growing consensus that recurrent bronchitis in childhood should be managed as a multifactorial condition requiring individualized care [1,6,8].

Conclusions. This study confirms that recurrent bronchitis in children represents a clinically heterogeneous condition whose course and severity are significantly modulated by the presence of comorbid diseases. The high prevalence of allergic disorders, metabolic disturbances, and chronic infectious foci underscores the pivotal role of systemic and immune-related mechanisms in sustaining bronchial inflammation and promoting recurrent disease episodes. Children with comorbid conditions demonstrated a more unfavorable clinical profile, characterized by increased frequency and duration of exacerbations, persistent respiratory symptoms, and reduced responsiveness to standard therapeutic approaches. The findings highlight that comorbidity-associated recurrent bronchitis should be regarded as a multifactorial disorder requiring comprehensive clinical evaluation rather than a purely episodic inflammatory condition of the lower airways. The observed associations between comorbid backgrounds and adverse clinical outcomes emphasize the necessity of early identification and stratification of patients according to their individual risk profiles.

Importantly, the results substantiate the clinical value of a personalized, comorbidity-oriented treatment strategy. Incorporating targeted management of

underlying allergic, metabolic, and infectious conditions into standard therapy may enhance symptom control, reduce recurrence rates, and improve overall disease prognosis. In this context, personalized therapeutic approaches represent a rational and effective direction for optimizing care in pediatric patients with recurrent bronchitis. Further multicenter, longitudinal studies with larger cohorts are warranted to refine risk stratification models, evaluate long-term outcomes, and establish evidence-based personalized treatment algorithms for children with recurrent bronchitis and comorbid conditions.

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