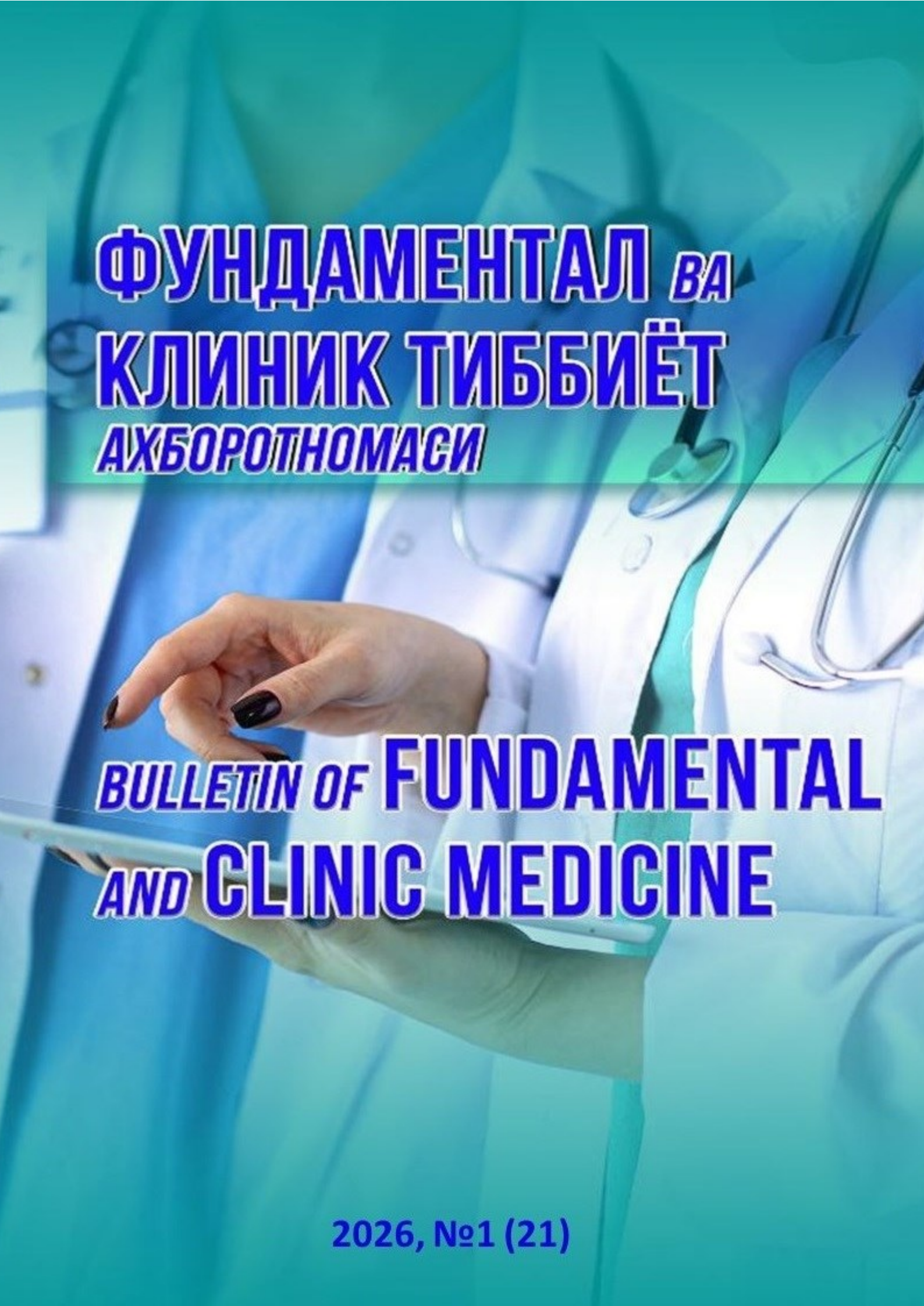

ФУНДАМЕНТАЛ ВА КЛИНИК ТИББИЁТ АХБОРОТНОМАСИ

BULLETIN OF FUNDAMENTAL AND CLINIC MEDICINE

2026, №1 (21)

МИНИСТЕРСТВО ЗДРАВООХРАНЕНИЯ
РЕСПУБЛИКИ УЗБЕКИСТАН

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ВЕСТНИК ФУНДАМЕНТАЛЬНОЙ И КЛИНИЧЕСКОЙ МЕДИЦИНЫ

Научный журнал по фундаментальным и клиническим проблемам медицины
основан в 2022 году
Бухарским государственным медицинским институтом имени Абу Али ибн Сино
выходит один раз в 2 месяца

Учредитель Бухарский государственный медицинский институт имени Абу Али ибн Сино

2026, № 1 (21)

ISSN 2181-4198

Адрес редакции:

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О журнале

Журнал зарегистрирован в Управлении печати и информации Бухарской области № 1640 от 28 мая 2022 года.

Журнал внесен в список утвержденный приказом № 370/6 от 8 мая 2025 года реестром ВАК в раздел медицинских наук.

Отпечатано в типографии ООО “Шарк-Бухоро”. г. Бухара, ул. Ўзбекистон Мустакиллиги, 70/2.

Редакционный совет:

UDC 616.23/.24-002.2:616-008

DOI https://doi.org/10.5281/zenodo.18372566

CLINICAL AND PATHOGENETIC DIFFERENCES IN RECURRENT BRONCHITIS ASSOCIATED WITH METABOLIC AND ALLERGIC COMORBIDITIES

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Resume. *Recurrent bronchitis (RB) is a frequent inflammatory disease of the respiratory tract characterized by repeated episodes of bronchial inflammation and persistent respiratory symptoms. Increasing evidence indicates that the presence and type of comorbid diseases significantly influence the clinical course, pathogenesis, and treatment response of RB. Metabolic disorders and allergic diseases represent two major comorbidity clusters with distinct pathogenetic mechanisms. This study aims to evaluate the clinical and functional differences in recurrent bronchitis associated with metabolic versus allergic comorbidities and to substantiate the need for differentiated, personalized treatment approaches based on comorbidity type.*

Keywords: *recurrent bronchitis, metabolic comorbidity, allergic comorbidity, clinical course, pathogenesis, personalized therapy.*

ЙЎЛДОШ МЕТАБОЛИК ВА АЛЛЕРГИК КАСАЛЛИКЛАР БИЛАН БОҒЛИҚ РЕЦИДИВЛАНУВЧИ БРОНХИТДА КЛИНИК-ПАТОГЕНЕТИК ФАРҚЛАР

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Резюме. *Рецидивловчи бронхит (РБ) нафас йўлларининг кенг тарқалган яллиғланиш касаллиги бўлиб, бронхиал яллиғланишнинг такрорланувчи эпизодлари ва барқарор респиратор симптомлар билан тавсифланади. Сўнгги тадқиқотлар шуни кўрсатадики, коморбид касалликларнинг мавжудлиги ва тури ретсидивловчи бронхитнинг клиник кечиши, патогенези ҳамда даволашга жавобига сезиларли таъсир кўрсатади. Метаболик бузилишлар ва аллергик касалликлар патогенетик механизмлари билан фарқланувчи коморбидликнинг икки асосий кластерини ташкил этади. Ушбу тадқиқотнинг мақсади метаболик ва аллергик коморбид касалликлар билан кечувчи ретсидивловчи бронхитда клиник ва функционал фарқларни баҳолаш ҳамда коморбидлик турига асосланган дифференциал, персонификасирлашган даволаш ёндашувларининг зарурлигини асослашдан иборат.*

Калит сўзлар: *рецидивловчи бронхит, метаболик коморбидлик, аллергик коморбидлик, клиник кечиш, патогенез, индивидуал терапия.*

КЛИНИКО-ПАТОГЕНЕТИЧЕСКИЕ РАЗЛИЧИЯ ПРИ РЕЦИДИВИРУЮЩЕМ БРОНХИТЕ, СВЯЗАННОМ С СОПУТСТВУЮЩИМИ МЕТАБОЛИЧЕСКИМИ И АЛЛЕРГИЧЕСКИМИ ЗАБОЛЕВАНИЯМИ

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Резюме. *Рецидивирующий бронхит (РБ) является распространённым воспалительным заболеванием дыхательных путей, характеризующимся повторяющимися эпизодами бронхиального воспаления и стойкими респираторными симптомами. Все большее число исследований свидетельствует о том, что наличие и тип коморбидных заболеваний существенно влияют на клиническое течение, патогенез и ответ на лечение при рецидивирующем бронхите. Метаболические нарушения и аллергические заболевания представляют собой два основных кластера коморбидности с различными патогенетическими механизмами. Целью данного исследования является оценка клинико-функциональных различий при рецидивирующем бронхите, ассоциированном с метаболическими и аллергическими коморбидными заболеваниями, а также обоснование необходимости дифференцированных персонализированных подходов к лечению в зависимости от типа коморбидности.*

Ключевые слова: *рецидивирующий бронхит, метаболическая коморбидность, аллергическая коморбидность, клиническое течение, патогенез, персонализированная терапия.*

Introduction. Recurrent bronchitis remains an important problem in modern pulmonology due to its tendency toward chronicity, frequent relapses, and negative impact on patients' quality of life. The disease is commonly observed in working-age individuals and is characterized by repeated inflammatory episodes of the bronchial tree occurring two or more times per year. In recent years, attention has increasingly focused

on the role of comorbid diseases as key modifiers of the clinical course and outcomes of recurrent bronchitis [1,2].

Among the wide spectrum of comorbid conditions, metabolic disorders – such as obesity, diabetes mellitus, and metabolic syndrome and allergic diseases, such as allergic rhinitis and atopic conditions are particularly prevalent in patients with recurrent bronchitis. These two comorbidity groups differ fundamentally in their pathogenetic mechanisms. Metabolic comorbidities are associated with systemic low-grade inflammation, oxidative stress, endothelial dysfunction, and impaired microcirculation, all of which contribute to prolonged bronchial inflammation and reduced response to standard therapy [3,4].

In contrast, allergic comorbidities are characterized by immune-mediated inflammation, increased bronchial hyper reactivity, eosinophilic airway infiltration, and heightened sensitivity to environmental triggers. Patients with allergic conditions often present with nocturnal cough, episodic bronchospasm, and recurrent symptoms even in the absence of infection [5,6]. These pathogenetic differences suggest that recurrent bronchitis associated with metabolic comorbidities may represent a distinct clinical phenotype compared with allergic-associated disease.

Despite these differences, standard treatment approaches for recurrent bronchitis are often applied uniformly, without sufficient consideration of comorbidity type. This may explain the limited effectiveness of conventional therapy in certain patient subgroups and the high rate of disease recurrence. The concept of personalized medicine emphasizes the importance of tailoring therapeutic strategies to individual pathogenetic mechanisms, including the dominant comorbid background [7].

Therefore, comparative analysis of recurrent bronchitis in patients with metabolic versus allergic comorbidities is essential for improving disease stratification, optimizing treatment selection, and enhancing long-term outcomes.

Materials and Methods. This prospective, observational, single-center study was conducted in a pulmonology department between 2023 and 2025. The study included adult patients aged 35–65 years with a confirmed diagnosis of recurrent bronchitis, defined as at least two clinically documented episodes of bronchitis within one year. Diagnosis was based on clinical evaluation, laboratory findings, and instrumental examinations.

Patients were eligible for inclusion if they had at least one confirmed comorbid condition belonging to either the metabolic or allergic category. Metabolic comorbidities included obesity, diabetes mellitus, and metabolic syndrome, while allergic comorbidities included allergic rhinitis, atopic conditions, and other IgE-mediated disorders. Patients with bronchial asthma, chronic obstructive pulmonary disease, pulmonary tuberculosis, lung malignancies, severe heart failure, immunodeficiency disorders, pregnancy, or lactation were excluded from the study.

All participants underwent comprehensive clinical assessment, including detailed medical history, physical examination, complete blood count, C-reactive protein measurement, glucose and lipid profile analysis, and chest radiography. Pulmonary function was evaluated using spirometry with assessment of FEV1, FVC, and peak expiratory flow (PEF). The presence and type of comorbid conditions were confirmed through consultations with endocrinologists and allergologists as appropriate.

Based on comorbidity type, patients were divided into two comparative groups: the metabolic comorbidity group and the allergic comorbidity group. Standard therapy included bronchodilators, mucolytics, and anti-inflammatory agents, while personalized treatment strategies incorporated targeted management of the underlying comorbid condition. Patients were followed longitudinally to assess clinical symptoms, respiratory function dynamics, and disease recurrence.

Statistical analysis was performed using standard statistical software, with continuous variables expressed as mean ± standard deviation and categorical variables as percentages. Group comparisons were conducted using Student's t-test and χ^2 test, with statistical significance defined as $p < 0.05$. The study protocol complied with the Declaration of Helsinki, and written informed consent was obtained from all participants.

Results and Analysis. The study included 100 patients aged 35–65 years diagnosed with recurrent bronchitis who were observed between 2023 and 2025. All patients experienced at least two clinically documented episodes of bronchitis per year, accompanied by persistent cough, sputum production, and varying degrees of general weakness. Based on the type of comorbid condition, patients were divided into two comparative groups: those with metabolic comorbidities (obesity, diabetes mellitus, metabolic syndrome) and those with allergic comorbidities (allergic rhinitis and other atopic conditions).

Analysis of clinical manifestations revealed distinct differences in the course of recurrent bronchitis between the two groups. Patients with metabolic comorbidities demonstrated a more prolonged and persistent clinical course characterized by continuous cough, increased sputum production, and slower resolution

of inflammatory symptoms. These patients more frequently reported reduced exercise tolerance and general fatigue, which may be associated with systemic low-grade inflammation and metabolic dysregulation. Similar observations have been reported in studies indicating that metabolic disorders exacerbate chronic inflammatory processes in the airways and reduce responsiveness to conventional therapy [3,4].

In contrast, patients with allergic comorbidities exhibited a more episodic pattern of symptoms. Bronchial manifestations were often accompanied by nasal congestion, sneezing, and seasonal symptom variability. Nocturnal cough episodes and signs of bronchial hyperreactivity were significantly more common in this group. These findings are consistent with the immunoallergic mechanisms underlying airway inflammation, as described in previous studies [5].

Spirometric evaluation demonstrated a more pronounced reduction in external respiratory function parameters in patients with metabolic comorbidities. Decreased FEV1 and PEF values indicated a higher degree of bronchial obstruction in this group, reflecting the impact of systemic inflammation, endothelial dysfunction, and impaired microcirculation associated with metabolic disorders. Russian and international studies have similarly reported greater functional impairment in bronchopulmonary diseases among patients with metabolic syndrome and diabetes mellitus [4].

Patients with allergic comorbidities showed comparatively milder reductions in baseline spirometric indices; however, they demonstrated increased variability in respiratory function, particularly during periods of allergen exposure. This variability may reflect reversible bronchial obstruction related to allergic inflammation and heightened airway reactivity [6].

Evaluation of treatment outcomes revealed that standard therapy alone was less effective in patients with metabolic comorbidities, as evidenced by slower symptom regression and higher relapse rates during follow-up. In contrast, the introduction of personalized treatment strategies that addressed metabolic abnormalities led to improved clinical outcomes, including faster symptom resolution and stabilization of respiratory function. These findings support the concept that metabolic-associated recurrent bronchitis represents a phenotype requiring intensified and targeted therapeutic interventions [7].

In the allergic comorbidity group, personalized treatment incorporating anti-allergic measures resulted in a significant reduction in nocturnal cough episodes and improved symptom control. Patients in this group demonstrated better short-term clinical response compared with those receiving standard therapy alone, highlighting the importance of addressing the underlying allergic component of airway inflammation [5].

During longitudinal follow-up, patients receiving personalized treatment in both groups exhibited a reduction in relapse frequency compared with those managed using standard protocols. However, the magnitude of improvement was more pronounced in the allergic comorbidity group, whereas patients with metabolic disorders continued to demonstrate a tendency toward recurrent episodes, underscoring the chronic systemic nature of metabolic inflammation.

Overall, the results indicate that recurrent bronchitis associated with metabolic comorbidities is characterized by a more severe, persistent, and treatment-resistant course, while allergic-associated recurrent bronchitis presents with episodic symptoms and pronounced airway hyper reactivity. These findings emphasize the heterogeneity of recurrent bronchitis and support the need for phenotype-oriented, personalized treatment strategies to optimize clinical outcomes.

Conclusion. The findings of this study demonstrate that the clinical course and functional characteristics of recurrent bronchitis differ significantly depending on the type of comorbid pathology. Patients with metabolic comorbidities, including obesity, diabetes mellitus, and metabolic syndrome, exhibit a more severe and persistent disease course, characterized by prolonged inflammatory activity, greater impairment of external respiratory function, and reduced responsiveness to standard therapeutic approaches. These features reflect the role of systemic inflammation, metabolic dysregulation, and microcirculatory disturbances in the pathogenesis of recurrent bronchitis.

In contrast, recurrent bronchitis associated with allergic comorbidities presents a more episodic clinical pattern, with pronounced bronchial hyperreactivity and symptom variability related to allergen exposure. Although baseline respiratory function impairment in this group is generally less severe, inadequate control of allergic inflammation contributes to frequent symptom recurrence and nocturnal manifestations.

Overall, the study confirms that recurrent bronchitis is a heterogeneous condition requiring individualized assessment and treatment planning. Incorporation of comorbidity-specific therapeutic strategies into routine clinical practice may significantly improve disease control, reduce recurrence rates, and enhance patients' quality of life. Further large-scale and long-term studies are warranted to refine personalized treatment algorithms and to evaluate their impact on long-term outcomes in patients with recurrent bronchitis.

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For citation: Achilova D.N., Ochilova D.K. Clinical and pathogenetic differences in recurrent bronchitis associated with metabolic and allergic comorbidities // Bulletin of Fundamental and Clinic Medicine. – 2026. – № 1(21). – P. 463–466. doi: https://doi.org/10.5281/zenodo.18372566