

**DYNAMICS OF THE PREVALENCE OF PULMONARY DISEASES (COPD, PNEUMONIA, BRONCHIAL ASTHMA) AND ANALYSIS OF RISK GROUPS IN THE REPUBLIC OF KARAKALPAKSTAN**

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Abstract

This article analyzes the prevalence dynamics and epidemiological characteristics of bronchopulmonary system pathologies (COPD, pneumonia, bronchial asthma) among the population of the Republic of Karakalpakstan, an area of the Aral Sea environmental crisis, during the period of 2024–2025. A retrospective analysis was conducted based on the official statistical reports of regional medical institutions. The results of the study demonstrated a stable increase in overall respiratory morbidity by 17.5% within a single year. A demographic evaluation of the disease structure revealed a sharp surge in acute pneumonia by 74.8% and bronchial asthma by 31%. Multifactorial analysis established that women over the age of 60 constitute the highest clinical risk group. The obtained data medically substantiate the urgent need to optimize early screening systems, non-invasive diagnostics, and to develop targeted preventive pulmonological strategies in environmentally distressed regions.

Keywords: COPD (Chronic Obstructive Pulmonary Disease), pneumonia, bronchial asthma, Form F-030/u, bronchiectasis, sarcoidosis, PM2.5 and PM10 particulate matter.

Introduction

The specific extreme ecological conditions of the Aral Sea region, particularly the chronic high-level pollution of the atmospheric air with aerosol dust and toxic salt particles, render the systemic study of the long-term epidemiological and nosological dynamics of respiratory system pathologies among the population of the Republic of Karakalpakstan a highly urgent socio-medical issue. Epidemiological monitoring and statistical data analysis indicate that the total incidence of respiratory system pathologies rose from 1,092 cases in 2024 to 1,283 cases by the end of 2025, demonstrating a steady increase of nearly 17.5% in both primary and chronic morbidity within just one calendar year.

In particular, the sharp manifestation of acute pneumonia cases by 74.8% and bronchial asthma complications by 31%, as well as the absolute dominance of chronic obstructive pulmonary disease (COPD) with a 52% share in the overall structure of respiratory morbidity, underscores the critical need to fundamentally improve pulmonological screening, early diagnosis, and treatment strategies in the region. The fact that the main clinical burden of the morbidity falls upon the geriatric population over 60 years of age (615 cases) and, gender-wise, upon women, further enhances the scientific and practical significance of developing targeted regional prophylaxis and preventive rehabilitation measures for these socio-demographic risk groups.



Objective of the Study

The aim of the study is to conduct a comprehensive and multifactorial analysis of the prevalence and structural-nosological dynamics of lung diseases (COPD, pneumonia, bronchial asthma, etc.) under the specific ecologically unfavorable and biogeochemically altered conditions of the Republic of Karakalpakstan, as well as to develop scientific and practical recommendations for optimizing the regional system of preventive and prophylactic measures, and detecting diseases at the early manifestation stage for the identified high-risk demographic groups (the elderly population over 60 and the female population).

Research Materials and Methods

The research materials comprised official annual statistical reports of the Ministry of Health of the Republic of Karakalpakstan and regional medical institutions for the years 2024–2025, dispensary surveillance records for respiratory diseases (Form F-030/u), and medical histories of hospitalized patients. During the study, a total of 2,375 cases of lung diseases (1,092 cases in 2024 and 1,283 cases in 2025) were subjected to comprehensive analysis.

The dynamics of morbidity were examined using retrospective clinical-epidemiological analysis. Based on the total population of the region (2,053,173 people as of January 1, 2026), the intensive indicators (the risk rate per 100,000 population) and extensive indicators (the share in the total structure of morbidity, %) were calculated. Utilizing nosological, demographic, and gender analysis methods, grouping and comparative analysis techniques were applied based on the types of pathologies, as well as the age and sex of the patients. Modern biostatistical and graphical software packages were utilized for the mathematical and statistical analysis of the obtained data, and the statistical reliability of the results was rigorously evaluated.

Results

The results of the clinical-epidemiological study indicated that while a total of 1,092 cases associated with lung diseases were recorded in 2024, this figure reached 1,283 cases by the end of 2025. This confirms a steady 17.5% increase in pulmonary pathologies within a single year. Taking into account that the population of the Republic of Karakalpakstan stood at 2,053,173 people as of January 1, 2026, the calculated overall intensive indicator for 2025 was 62.5 cases per 100,000 population.

The nosological evolution and growth rates of the disease structure across the years are presented in detail in Table 1.

Table 1. Nosological structure and dynamics of lung diseases (2024–2025)

<i>Disease Type (Nosology)</i>	<i>2024 (Cases)</i>	<i>2025 (Cases)</i>	<i>Extensive Indicator (2025, %)</i>	<i>Growth Rate (%)</i>
<i>COPD</i>	680	667	52.0%	-1.9%
<i>Pneumonia</i>	179	313	24.4%	+74.8%
<i>Bronchial asthma</i>	203	266	20.7%	+31.0%
<i>Bronchiectasis</i>	15	21	1.6%	+40.0%
<i>Sarcoidosis</i>	1	3	0.2%	+200.0%
<i>TOTAL</i>	<i>1092</i>	<i>1283</i>	<i>100%</i>	<i>+17.5%</i>



Results & Discussion. The analysis of extensive indicators demonstrated that chronic obstructive pulmonary disease (COPD) firmly retained its status as the primary nosological entity, accounting for a dominant **52.0%** share of the total respiratory disease burden with 667 recorded cases in 2025. Concurrently, a critical shift was observed in the absolute morbidity dynamics, characterized by an alarming escalation in acute pneumonia (**+74.8%**) and bronchial asthma exacerbations (**+31.0%**). These epidemiological shifts strongly indicate that the compounding effects of regional anthropogenic and ecological distress factors have significantly amplified airway hyperreactivity and accelerated acute infectious-inflammatory pulmonary processes among the local population.

Stratified demographic and gender-based analysis revealed that the morbidity trajectories are explicitly contingent upon age and sex determinants:

- **Geriatric Cohort (Aged 60+):** This subpopulation exhibited the highest clinical and epidemiological burden in 2025, accumulating a total of **615 cases**. Gender disaggregation within this cohort revealed a pronounced female predominance (**347 cases** vs. **268 cases** in men), underscoring an increased vulnerability among elderly women.
- **Mature Adult Cohort (Aged 45–60):** A substantial cluster of **317 cases** was registered within this age bracket. Consistent with the geriatric cohort, a distinct gender asymmetry was observed, with female patients constituting the absolute majority (**192 cases**).
- **Young Adult Cohort (Aged 19–29):** Conversely, this demographic segment demonstrated a highly favorable down-trend, with clinical manifestations dropping sharply from **68 cases** in 2024 to **26 cases** in 2025.

Discussion

The identified upward trajectories in respiratory pathologies, particularly the aggressively progressive manifestation of pneumonia and bronchial asthma exacerbations, exhibit a pathogenetically linear correlation with environmental degradation factors inherent to the Aral Sea region. These are driven by chronic atmospheric exposure to fine mineral dust, persistent pesticide residues, and toxic hypersaline aerosol particles ($\text{PM}_{2.5}$ and PM_{10}), compounded by the shifting demographic architecture (population aging) of the local inhabitants. The pronounced susceptibility observed within the female population can be attributed to heightened biological vulnerability to regional environmental aerosol hazards—specifically an elevated propensity for systemic oxidative stress and endothelial dysfunction—alongside socio-domestic determinants. Consequently, these findings provide a robust scientific and clinical rationale for regional healthcare authorities to strategically intensify targeted prophylactic protocols and early pulmonological screening programs specifically desi

Conclusion

Throughout the 2024–2025 period in the Republic of Karakalpakstan, the total volume of respiratory system pathologies escalated from 1,092 to 1,283 cases, demonstrating an annual growth rate of 17.5% and an intensive indicator of 62.5 cases per 100,000 population. These metrics unequivocally reflect an intensifying pulmonological risk driven by environmental and climatic triggers within the region. Nosological structure analysis revealed that while chronic obstructive pulmonary disease (COPD) maintained its epidemiological dominance with an extensive share of 52.0%, the most substantial growth rates were documented in acute pneumonia (**+74.8%**) and bronchial asthma (**+31.0%**). This trend



underscores the potent capacity of atmospheric mineral salt and dust aerosols ($PM_{2.5}$ and PM_{10}) to induce airway hyperreactivity and precipitate acute infectious-inflammatory complications among the local population.

Furthermore, the analysis of demographic and gender determinants clinically substantiated that the subpopulation most susceptible to pulmonary pathologies and representing the highest risk cohort in the region comprises the geriatric population aged over 60 (615 cases), with a distinct gender predisposition toward the female population (347 cases in the geriatric cohort and 192 cases in the mature adult group). Collectively, these systemic data provide a robust scientific and practical rationale for public health preservation in the Aral Sea region, necessitating the optimization of regional preventive pulmonology networks and the immediate implementation of targeted screening and non-invasive diagnostic protocols for elderly women within the primary health care sector.

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