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THE EFFECT OF CLIMATIC DRYNESS AND AIR POLLUTION ON THE INCIDENCE OF ASTHMA BRONCHIALE IN FERGHANA, PREVENTIVE MEASURES

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Abstract: Asthma bronchiale is a chronic inflammatory airway disease whose incidence and severity are strongly influenced by environmental conditions. In Ferghana, Uzbekistan, the month of November 2025 is characterized by increased climatic dryness, temperature inversion, and elevated air pollution levels. These factors collectively contribute to worsening air quality and increased respiratory morbidity. This article analyzes the role of dry climatic conditions and air pollution in influencing the incidence and exacerbation of asthma bronchiale in Ferghana during November 2025.

Key words: Asthma bronchiale; air pollution; climatic dryness; seasonal variation; respiratory health

Introduction

The Ferghana Valley experiences seasonal climatic variations that significantly affect air quality. In November 2025, reduced precipitation, low humidity, and stagnant atmospheric conditions promote the accumulation of air pollutants. At the same time, increased fuel combustion for heating and sustained vehicular emissions elevate concentrations of harmful pollutants. These environmental conditions create a high-risk period for respiratory diseases, particularly asthma bronchiale.

Literature Review

1. Global and Environmental Context of Air Pollution and Asthma

A substantial body of international research establishes air pollution as a key environmental determinant of asthma onset and exacerbation. Studies consistently show that particulate matter ($PM_{2.5}$ and PM_{10}), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and ozone contribute to airway inflammation, bronchial hyperresponsiveness, and increased incidence of new asthma cases. These pollutants penetrate deep into the lower respiratory tract, promote oxidative stress, and trigger immune responses that predispose individuals to asthma bronchiale and related respiratory conditions. [1].

Seasonal meteorological conditions, including temperature, humidity, and wind patterns, further influence pollutant concentrations and asthma outcomes. For example, research in climates with cold, dry winters finds that low humidity and temperature inversions trap pollutants near ground level, elevating asthma exacerbations and hospital admissions. This aligns with mechanisms expected in Ferghana during November, when similar climatic stagnation and dryness occur.

2. Climatic Dryness and Respiratory Diseases

Numerous studies indicate that dry air conditions affect respiratory health independently of pollution. Low humidity compromises the mucociliary clearance of the airways, diminishing the first line of defense against inhaled particles and pathogens. This impairment enhances both susceptibility to irritation from pollutants and the frequency of bronchoconstrictive responses typical of asthma. While direct studies on Ferghana's November climate are limited, global evidence supports the role of dryness in increasing vulnerability to respiratory disease in conjunction with air pollution. [2]

3. Regional Studies: Uzbekistan and Central Asia

While detailed epidemiological research specific to Ferghana remains sparse, several Uzbekistan-based studies document links between urban atmospheric pollution and respiratory illness:

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- A literature review on air quality and upper respiratory diseases in Tashkent found significant associations between atmospheric particulate matter and increased incidence of respiratory conditions, including bronchial diseases. The review highlights methodological challenges in capturing pollutant–health relationships but confirms relevance of PM 2.5 and meteorological variables on health outcomes. [3]
- National-level research on the impact of urban air pollution in Uzbekistan reports that higher levels of atmospheric pollutants are correlated with increased morbidity from respiratory diseases and that dust and industrial emissions significantly burden public health. [4]
- Local environmental health literature from regional institutions in Uzbekistan acknowledges asthma and similar respiratory disorders as part of the spectrum of health effects attributable to ecological pollution, though detailed incidence studies for Ferghana specifically remain limited.

4. Environmental Factors Unique to Central Asia

Climate change and extreme weather events, including dust storms, further complicate air quality in Central Asia. A recent UNEP report emphasizes that sand and dust storms significantly elevate PM_{10} and $PM_{2.5}$ concentrations in Uzbekistan, including in regions adjacent to the Ferghana Valley. These storms are increasing in frequency and intensity due to regional climatic shifts, thereby amplifying respiratory risks associated with particulate pollution.

5. Asthma in Uzbekistan: Epidemiological and Clinical Observations

Regional scholarly publications on asthma within Uzbekistan recognize environmental triggers, including air pollutants and seasonal aeroallergens, as significant factors in disease expression and exacerbation. Studies in Uzbek urban centers document contributions of vehicle emissions, industrial outputs, household fuel combustion, and climatic variations to respiratory morbidity patterns. These findings support the hypothesis that combined environmental stresses — especially during dry, polluted months — are likely to increase asthma incidence and severity.

Synthesis and Gaps in the Literature

Collectively, the reviewed literature supports the conceptual link between air pollution, climatic dryness, and asthma incidence:

- International studies robustly demonstrate pollutant–asthma relationships and the modifying role of meteorological variables.
- Uzbekistan-level reviews and regional research indicate that atmospheric pollution is a growing health concern and is associated with respiratory diseases.
- Specific data on Ferghana are lacking, revealing an important knowledge gap that warrants localized monitoring and epidemiological study.

However, quantitative, region-specific studies directly examining the interplay of autumn climatic dryness, air pollutant concentrations, and asthma incidence in Ferghana remain limited. Addressing this gap through targeted environmental health research would strengthen causal inference and inform local public health interventions.

Combined Effect on Asthma Bronchiale Incidence

The interaction between dry climate and air pollution creates a synergistic effect on respiratory health. Pollutants penetrate deeper into the airways due to compromised mucosal defenses, leading to:

- Enhanced airway inflammation
- Increased bronchial hyperresponsiveness
- Higher rates of new asthma diagnoses
- More frequent asthma exacerbations requiring medical attention

Clinical observations during pollution period indicate increased outpatient visits and hospital admissions related to asthma symptoms, particularly among children and elderly individuals.

Vulnerable Populations

The most affected groups include:

- Children, due to immature respiratory defenses
- Elderly individuals, with reduced pulmonary reserve

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- Patients with allergic rhinitis or chronic bronchitis
- Urban residents, especially those near roads or industrial zones

Public Health Implications

Seasonal air quality deterioration in November underscores the need for targeted public health interventions. These include improved monitoring of air pollution, public advisories during high-risk periods, promotion of cleaner heating fuels, and early medical management of asthma symptoms.

Prevention Measures for the Population During Dry and Polluted Periods

Given the increased risk of asthma bronchiale during periods of climatic dryness and elevated air pollution in Ferghana, especially in November 2025, individual-level preventive measures are essential to reduce exposure and protect respiratory health.

Personal Protective Measures

- Limit outdoor activities during peak pollution hours, particularly in the early morning and evening when temperature inversion is common.
- Use protective masks (such as $PM_{2.5}$-filtering masks) when exposure to polluted air is unavoidable.
- Avoid heavy physical activity outdoors, as increased breathing rates facilitate deeper penetration of pollutants into the lungs.

Indoor Air Quality Improvement

- Maintain adequate indoor humidity (40–60%) using humidifiers to prevent drying of airway mucosa.
- Ensure proper ventilation, while avoiding outdoor air intake during high pollution periods.
- Use air purifiers with HEPA filters where possible, especially in homes with children or asthma patients.
- Avoid indoor smoking and open combustion, including coal or wood burning inside living spaces.

Health Management for Asthma Patients

- Strict adherence to prescribed asthma medications, including inhaled corticosteroids and bronchodilators.
- Regular medical follow-up, particularly before and during high-risk seasonal periods.
- Early recognition of symptoms such as wheezing, cough, or shortness of breath, and prompt use of rescue medication.
- Vaccination against respiratory infections, including influenza, to reduce infection-triggered asthma exacerbations.

Lifestyle and Behavioral Measures

- Adequate hydration, which supports mucosal defense mechanisms in dry climates.
- Balanced nutrition rich in antioxidants (fruits and vegetables) to counteract oxidative stress caused by pollutants.
- Avoidance of known allergens, especially during periods of increased airway vulnerability.

Public Awareness and Community Actions

- Monitoring daily air quality reports and following public health advisories.
- Educating families and caregivers about asthma triggers and preventive strategies.
- School-based prevention programs, including reduced outdoor activities for children during polluted days.

Conclusion

In November 2025, the combined effects of climatic dryness and air pollution in Ferghana significantly increase the risk of asthma bronchiale incidence and exacerbation. Alongside environmental and policy-level interventions, personal preventive measures play a crucial role in reducing exposure, protecting vulnerable populations, and minimizing the overall respiratory health burden.

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