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REVIEW ARTICLE

A REVIEW OF BRONCHIAL ASTHMA: DIAGNOSIS AND TREATMENT

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ABSTRACT

Bronchial asthma is a common chronic respiratory disease characterized by variable respiratory symptoms and variable expiratory airflow limitation. Patients may experience wheezing, coughing, chest tightness, and shortness of breath, with symptoms varying over time and often worsening at night, in the early morning, or following exposure to specific triggers. Asthma develops through a complex interaction of genetic susceptibility, environmental exposures, and airway inflammation. Inflammation, bronchial smooth muscle contraction, excessive mucus production, and airway wall swelling contribute to airflow obstruction. In some patients, persistent inflammation may lead to structural changes in the airways, known as airway remodeling. The diagnosis of bronchial asthma is based on a compatible clinical history and objective evidence of variable expiratory airflow limitation, most commonly assessed through spirometry with bronchodilator reversibility testing. Peak expiratory flow monitoring, fractional exhaled nitric oxide (FeNO) measurement, and allergy testing may provide additional diagnostic information when interpreted in the appropriate clinical context. The primary objectives of asthma treatment are to achieve good symptom control, maintain normal physical activity and lung function, and minimize the risk of exacerbations and treatment-related adverse effects. Inhaled corticosteroid-containing medications play a central role in asthma management because they control underlying airway inflammation. Short-acting bronchodilators provide rapid relief of symptoms but do not adequately treat airway inflammation when used alone. Other therapeutic options include leukotriene receptor antagonists, long-acting muscarinic antagonists, short courses of oral corticosteroids for selected severe exacerbations, and biologic therapies for patients with appropriately assessed severe asthma. Patient education, proper inhaler technique, medication adherence, trigger avoidance, and regular clinical monitoring are essential components of effective asthma management. Pharmacists play an important role in asthma care by educating patients about controller and reliever medications, demonstrating correct inhaler techniques, identifying excessive reliever medication use, and promoting medication adherence. This review article discusses the overview of bronchial asthma, its risk factors, pathophysiology, classification, diagnosis, treatment approaches, complications, and the role of pharmacists in the effective management of bronchial asthma.

Keywords: *Bronchial asthma; airway inflammation; spirometry; inhaled corticosteroids; bronchodilators; asthma control; inhaler technique; pharmacist.*

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1. INTRODUCTION

Bronchial asthma is a heterogeneous, usually chronic inflammatory disorder of the airways. It is associated with a history of respiratory symptoms such as wheezing, shortness of breath, chest tightness, and cough, which vary in intensity and frequency. These symptoms are accompanied by variable expiratory airflow limitation. This variability distinguishes asthma from several other respiratory conditions, although overlap can occur, and objective testing is important. Asthma affects both children and adults and can interfere with sleep, exercise, education, employment, and social activities. Severe exacerbations may require urgent medical care or hospital admission [1].

The burden of asthma is not limited to symptoms. Poorly controlled disease can reduce quality of life, increase absence from school or work, and lead to repeated use of healthcare services. The risk of exacerbations is influenced by factors such as previous severe attacks, inadequate anti-inflammatory treatment, poor adherence, incorrect inhaler technique, smoking, environmental exposures, and coexisting conditions. Asthma control may change over time, so a diagnosis or

treatment plan should not be considered fixed. Assessment and regular review are required, even when symptoms improve [2].

2. OBJECTIVES OF THE REVIEW

- To describe the main features, causes, and risk factors of bronchial asthma.
- To explain the basic pathophysiology and classification of asthma.
- To review the clinical assessment and objective tests used in diagnosis.
- To summarize pharmacological and non-pharmacological management.
- To discuss complications and the role of pharmacists in improving asthma care.

3. CAUSES AND RISK FACTORS

Asthma does not have a single cause. It usually develops through an interaction between inherited susceptibility and environmental influences. A family history of asthma or allergic disease may increase the likelihood of developing asthma, but genetic predisposition alone does not determine whether a person will develop the condition. Environmental exposures, infections, occupational agents, and other factors may contribute to disease development or symptom worsening.

3.1 Allergens and Atopy

Common relevant allergens include house dust mites, pollens, moulds, and animal dander. In people with allergic sensitization, exposure may activate immune pathways that contribute to airway inflammation and symptoms. A positive allergy test should be interpreted alongside the patient's exposure history and symptom pattern; sensitization alone does not prove that a particular allergen is causing asthma [3].

3.2 Air Pollution and Tobacco Smoke

Tobacco smoke, traffic-related pollution, diesel exhaust, indoor smoke, and other airborne irritants can worsen symptoms and may contribute to poor asthma control. Active smoking can reduce treatment responsiveness and is associated with additional respiratory and cardiovascular harm. Avoidance of tobacco smoke and reduction of relevant pollutant exposure are important components of care.

3.3 Respiratory Infections

Respiratory viral infections, including rhinovirus infections, are common triggers of acute worsening, particularly in children but also in adults. An infection can increase airway inflammation and sensitivity, producing cough, wheezing, and breathlessness. A history of exacerbations during viral seasons may help with risk assessment and treatment planning [4].

4. PATHOPHYSIOLOGY

Asthma involves chronic airway inflammation, bronchial hyperresponsiveness, and variable airflow limitation. The airway lining becomes inflamed and sensitive, so otherwise modest exposures may provoke an exaggerated response. Different inflammatory patterns occur in asthma. Type 2 inflammation, involving pathways associated with eosinophils, interleukins, and immunoglobulin E in some patients, is important in allergic and eosinophilic asthma. Other patients have different inflammatory patterns, and asthma is therefore considered a heterogeneous disease.

4.1 Bronchoconstriction

Contraction of bronchial smooth muscle narrows the airway lumen and increases resistance to airflow. This can produce wheezing, chest tightness, and difficulty breathing, particularly during expiration. Bronchodilator medicines relax airway smooth muscle and can improve airflow relatively quickly.

4.2 Airway Inflammation, Oedema, and Mucus

Inflammation causes swelling of the airway wall and can increase mucus production. Mucus plugs and oedema further reduce the diameter of the airways. Because airway narrowing is not always present to the same degree, symptoms and lung function measurements may vary from day to day and may be normal between episodes [5].

5. CLASSIFICATION OF ASTHMA

Asthma can be classified in several ways. Symptom frequency and night waking have traditionally been used to describe severity before treatment, while current assessment also considers the level of treatment required to achieve control and the risk of future exacerbations. Classification systems should be applied using the relevant guidelines and the patient's age group.

5.1 Symptom-Based Severity

A traditional classification divides asthma into intermittent, mild persistent, moderate persistent, and severe persistent categories. Intermittent asthma is associated with symptoms on two days per week or less and infrequent night symptoms. Mild persistent asthma involves symptoms more than twice weekly but not every day, with night waking occurring several times a month. Moderate persistent asthma is associated with daily symptoms, more frequent night waking, and some limitation of activity. Severe persistent asthma may involve symptoms throughout the day, frequent

night waking, and substantial activity limitations. These descriptions are useful for educational purposes, but they should not replace current individualized assessments [6].

5.2 Classification by Control

Asthma control is commonly described as well-controlled, partly controlled, or uncontrolled. Assessment includes recent daytime symptoms, night waking, reliever use, and activity limitations. Future risk must be considered separately: a patient with few current symptoms may still be at risk of severe exacerbations because of a previous attack, low lung function, inadequate inhaled corticosteroid (ICS) use, or other risk factors.

5.3 Phenotypes and Triggers

Asthma may also be described by phenotype or clinical pattern, including allergic, non-allergic, eosinophilic, exercise-related, occupational, childhood-onset, and adult-onset asthma. These labels can help guide investigation and treatment selection, especially in severe disease. However, phenotypes may overlap, and the label alone does not determine treatment.

6. CLINICAL FEATURES

The most characteristic symptoms are wheezing, shortness of breath, chest tightness, and cough. Symptoms may vary in frequency and severity, worsens at night or in the early morning, and be triggered by exercise, allergens, smoke, pollution, cold air, or respiratory infections. Some patients mainly experience coughing, while others report episodic chest tightness or breathlessness. Examination may reveal wheezing during symptomatic periods, but it can be normal between episodes. A normal examination at one visit, therefore, does not exclude asthma.

Warning features during an acute episode include severe breathlessness, difficulty speaking in full sentences, exhaustion, confusion, cyanosis, or very poor air movement. These findings require urgent medical assessment. Patients should be taught to recognize deterioration and follow a written asthma action plan [7].

7. DIAGNOSIS

Diagnosis requires a compatible history and, whenever possible, objective evidence of variable expiratory airflow limitation. No single symptom or test establishes asthma in every patient. Testing may need to be repeated when symptoms are present or after withholding bronchodilator medicines according to clinical instructions. Treatment can make confirmation more difficult, so objective testing should be obtained before starting long-term controller treatment when this is safe and practical.

7.1 Clinical History and Examination

The history should establish the type, frequency, timing, and variability of symptoms; night waking; activity limitation; possible triggers; seasonal variation; personal or family history of allergic disease; smoking; occupational exposures; current medicines; and previous exacerbations or hospital visits. The examination may identify wheezing or signs of allergic disease, but these findings are not always present.

7.2 Spirometry and Bronchodilator Reversibility

Spirometry measures forced expiratory volume in one second (FEV_1) and forced vital capacity (FVC), including the FEV_1/FVC ratio. Obstructive airflow limitation and a significant improvement in FEV_1 after bronchodilator administration support the diagnosis of asthma when consistent with the clinical history. A rise in FEV_1 of at least 12% from baseline is a commonly taught criterion in adults, although current guidelines may use additional absolute-volume criteria and age-specific standards. Results should be interpreted using accepted technical standards and the relevant guidelines.

7.3 Peak Expiratory Flow Monitoring

Peak expiratory flow (PEF) monitoring can document variation in airflow over time, especially when spirometry is unavailable or when work-related symptoms are suspected. Measurements should be taken using a consistent technique, and serial readings may be recorded in a diary. PEF is effort-dependent and less comprehensive than spirometry; therefore, it should not be used alone to establish the diagnosis.

7.4 Fractional Exhaled Nitric Oxide

Fractional exhaled nitric oxide (FeNO) can provide evidence of type 2 airway inflammation and may support the diagnosis in an appropriate clinical setting. A raised value can be seen in some patients with eosinophilic inflammation, but results are influenced by factors including atopy, smoking, and corticosteroid use. FeNO does not independently confirm or exclude asthma and should be interpreted alongside symptoms and lung function testing [8].

8. TREATMENT AND MANAGEMENT

The goals of asthma treatment are to control symptoms, maintain normal activity, preserve lung function, prevent exacerbations, and reduce adverse effects from medicines. Treatment should be reviewed regularly and adjusted according to symptom control, future risk, adherence, inhaler technique, comorbidities, and patient preferences. Patients should not change their prescribed treatment without discussing their plan with a healthcare professional.

8.1 Education and Self-Management

Education is essential at every stage of care. Patients should understand the difference between controller and reliever medicines, how and when to use each inhaler, how to recognize worsening asthma, and when to seek urgent help. A written asthma action plan can explain the usual treatment, how to respond to deterioration, and when emergency

care is needed. Avoiding relevant triggers, stopping smoking, staying physically active as tolerated, and addressing comorbidities support overall asthma control.

8.2 Inhaled Corticosteroids

Inhaled corticosteroids are the foundation of anti-inflammatory treatment for most people with asthma. They reduce airway inflammation and the risk of exacerbations. They are controller medicines and need to be used as prescribed, even when symptoms are absent. Local adverse effects can include oral candidiasis and hoarseness. Rinsing the mouth and spitting after use, together with correct inhaler technique and the use of an appropriate spacer for compatible inhalers, can reduce these effects.

8.3 Reliever Medicines and ICS-Formoterol

Short-acting beta$_2$-agonists (SABAs), such as salbutamol, provide rapid bronchodilation and can relieve acute symptoms. However, SABAs do not treat airway inflammation, and frequent reliance on a reliever is a sign that asthma needs reassessment. Contemporary strategies recommend ICS-containing treatment rather than SABA-only treatment for most patients. In appropriate regimens, low-dose ICS-formoterol can be used as a reliever and, at specified treatment steps, as both maintenance and reliever therapy. Formoterol has a rapid onset of action, but this approach applies only to suitable products and prescribed regimens.

8.4 Other Controller and Add-On Medicines

Leukotriene receptor antagonists, including montelukast, may be useful for selected patients, although they are generally less effective than ICS in preventing exacerbations. Montelukast requires discussion of its potential neuropsychiatric adverse effects. Long-acting muscarinic antagonists, such as tiotropium, may be added for selected patients whose asthma remains uncontrolled despite appropriate inhaled treatment. Long-acting beta$_2$-agonists should not be used alone in asthma; they should be used in combination with ICS.

8.5 Oral Corticosteroids and Acute Exacerbations

A short course of oral corticosteroids may be required for a significant exacerbation following clinical assessment. Repeated or long-term use can cause important adverse effects, including weight gain, hypertension, hyperglycaemia, mood changes, osteoporosis, and an increased risk of infection. Acute severe asthma is a medical emergency and may require repeated inhaled bronchodilators, oxygen when indicated, systemic corticosteroids, and close monitoring in an appropriate healthcare setting. Patients with severe symptoms should not delay emergency care while attempting repeated self-treatment [8].

9. COMPLICATIONS AND BURDEN

Poorly controlled asthma can cause recurrent exacerbations, emergency department visits, hospital admissions, sleep disruption, reduced exercise tolerance, and reduced quality of life. Some patients develop persistent airflow limitation. Severe exacerbations can be life-threatening. Frequent use of rescue medication may indicate inadequate anti-inflammatory control and should prompt a review rather than simply repeated refills.

The harms of treatment also need attention. Inhaled medicines can cause local adverse effects, while repeated systemic corticosteroid courses and long-term oral corticosteroid use carry greater risks. Balancing benefits and harms requires regular assessment, the lowest effective dose of controller treatment, correct inhaler technique, and shared decision-making.

10. ROLE OF THE PHARMACIST

Pharmacists are accessible healthcare professionals who can support asthma care during medicine dispensing and follow-up. Their contribution includes explaining the purpose of controller and reliever medicines, checking whether patients understand their prescribed regimens, demonstrating correct inhaler techniques, and asking patients to show how they use their devices. Inhaler techniques should be checked repeatedly because errors may develop over time.

Pharmacists can identify frequent reliever requests, missed controller refills, concerns about adverse effects, and practical barriers such as cost or difficulty using a device. These issues should be discussed without blame, and concerns requiring clinical review should be referred to the prescriber. Pharmacists can reinforce adherence, recommend mouth rinsing after ICS use, explain spacer use where appropriate, and encourage patients to keep an asthma action plan and attend scheduled reviews.

A collaborative approach involving patients, pharmacists, physicians, and other healthcare professionals can improve understanding and support safer, more effective treatment. The aim is not simply to supply medicines but also to help patients use them correctly and recognize when asthma is not adequately controlled [9].

11. DISCUSSION

Asthma is a variable condition, so diagnosis and management depend on repeated assessment rather than a single symptom report. Spirometry and evidence of variability in airflow are important because wheezing and breathlessness can occur in many disorders. When initial testing is normal but clinical suspicion remains, further testing during symptoms or serial monitoring may be needed. FeNO and allergy testing can provide additional useful information, but neither should be interpreted in isolation.

Treatment approaches have shifted towards ensuring that patients receive anti-inflammatory therapy. Reliever medicines can provide immediate relief, but reliance on bronchodilation alone leaves the inflammatory process untreated. ICS-containing strategies reduce the risk of exacerbations, while additional medicines and biologics may be appropriate for selected patients. Even effective medicines will have limited benefits when inhaler technique is poor, treatment is not taken as prescribed, or relevant comorbidities and exposures remain unaddressed [10].

Asthma care should therefore combine objective diagnosis, individualized pharmacotherapy, self-management education, and regular review. The pharmacist's role is especially practical in checking inhaler techniques, recognizing medicine-use patterns, and helping patients understand the purpose of their treatment. Better communication and a non-judgmental approach can help uncover barriers to adherence.

12. CONCLUSION

Bronchial asthma is a chronic inflammatory airway disease characterized by variable symptoms and variable airflow limitation. Genetic susceptibility and environmental factors contribute to its development, while inflammation, bronchoconstriction, mucus production, and airway wall swelling explain its clinical features. Diagnosis should be supported by objective lung function testing, particularly spirometry with bronchodilator assessment, with PEF, FeNO, and allergy testing used when appropriate. Treatment aims to control symptoms and prevent future exacerbations, and ICS-containing therapy is central for most patients. Frequent reliever use, recurrent attacks, or poor activity tolerance should prompt reassessment. Patient education, correct inhaler technique, adherence, trigger management, and regular review are essential. Pharmacists can make a meaningful contribution by improving medication understanding, supporting correct medicine use, and identifying patients who need further clinical assessment.

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14. DECLARATION COMPETING INTEREST

Not Declared

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16. INFORM CONSENT AND ETHICAL CONSIDERATION

Not Applicable

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