Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/jptcp.v30i19.4798

APPROACH TO ASTHMA AND MODALITIES OF MANAGEMENT

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Abstract:
Background: Asthma is a chronic respiratory condition characterized by inflammation in the airways, leading to recurring episodes of wheezing, breathlessness, chest tightness, and coughing. These symptoms often occur due to the airways' heightened sensitivity to various triggers, resulting in temporary narrowing and obstruction. Asthma can affect individuals of all ages, and its severity can vary from mild to severe.

Aim: The literature review aims to overview the latest update on the approach to asthma and various management modalities.

Methods: The present study is a comprehensive research of PUBMED from 2000 to 2023.

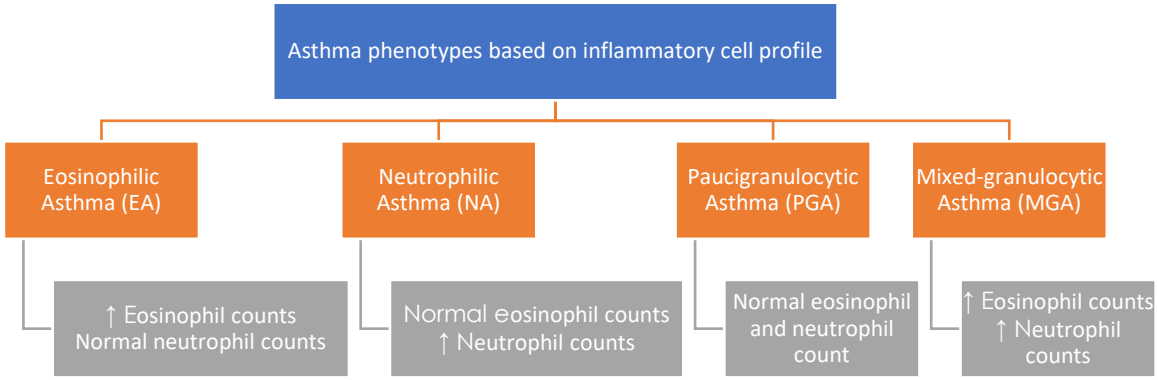
Conclusion: Despite being prevalent in both children and adults, adults tend to have higher morbidity and mortality rates. Recent research suggests a possible link between sex hormones and asthma development. The disease's prevalence has increased globally, likely due to environmental factors. Asthma's pathophysiology involves complex interactions between immune cells and molecules, leading to airway inflammation, hyperresponsiveness, obstruction, and remodeling. Symptoms include wheezing, coughing, chest tightness, and breathlessness, which vary in severity and frequency. Asthma can manifest in different phenotypes, classified based on inflammatory cell profiles and clinical features. Diagnosis relies on clinical evaluation, lung function tests, and objective measurements. Treatment aims to control symptoms and prevent exacerbations using inhaled corticosteroids, long-acting β2-agonists, and combination inhalers.

Keywords: Asthma, chronic respiratory disease, diagnosis, treatment.

Introduction:

Asthma is a chronic lung disease characterized by inflammation in the bronchioles, narrowing of the airways, and airflow obstruction, which can present in children and adults [1]. Nevertheless, Adults with asthma have a greater morbidity and mortality rate than children despite an increase in incidence and frequency. A recent review represented that females are more likely than males to have adult asthma, though this trend may be reversible. Around puberty, there is a difference in prevalence between the sexes, which suggests that sex hormones may be involved in the etiology of asthma [2]. Asthma is one of the most prevalent chronic illnesses worldwide, and the previous few decades have seen an upsurge in the prevalence of asthma globally, according to epidemiologic data. Moreover, there are over 310 million asthmatic patients in the world. The prevalence of bronchial asthma rises annually as environmental factors and air quality worsen [3]. The pathophysiology of asthma involves a complex interplay of various factors. Airway inflammation plays a major role in the development of asthma, with different cells and molecules contributing to the inflammatory process. Multiple molecular pathways are involved in asthma, including immunoglobulin E, cytokines, nitric oxide, and oxidative stress. Airway hyperresponsiveness, variable airway obstruction, mucus hypersecretion, and airway remodeling are physiological manifestations of asthma resulting from the activation of the immune system and its interaction with epithelial cells [3]. Asthma symptoms include nonspecific manifestations such as wheezing, coughing, chest tightness, and shortness of breath. These symptoms can vary between individuals and over time, spontaneously, in response to triggers, or as a result of treatment. The frequency and severity of symptoms can differ among individuals, and they may experience inadequate asthma control for various reasons, including severe disease, ineffective treatment, nonadherence to treatment, and the effects of comorbidities [4].

Figure (1): Asthma phenotypes based on inflammatory cell profile



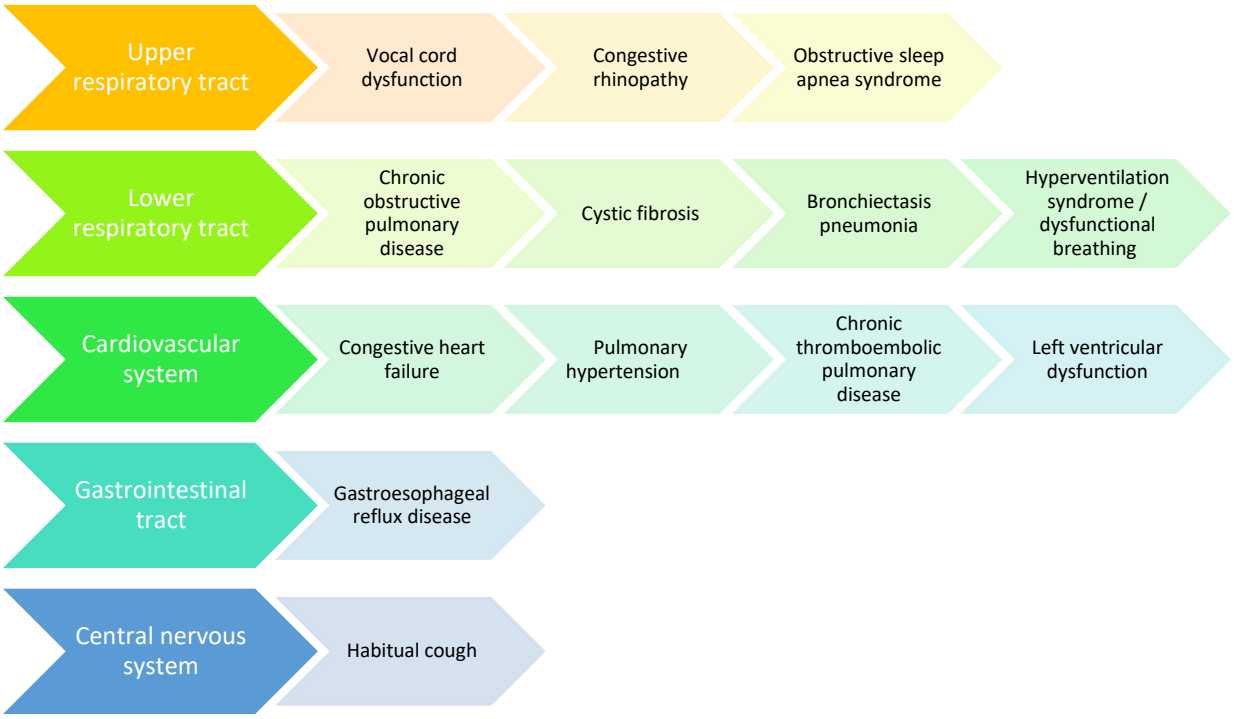
Asthma has been identified as having multiple phenotypes based on inflammatory cell profiles in sputum. These phenotypes include eosinophilic, neutrophilic, paucigranulocytic, and mixed-granulocytic asthma. In addition to these inflammatory phenotypes, there is anatomical heterogeneity in asthma, with immunopathological alterations extending beyond the central airways to involve the distal airways, alveolar parenchyma, pulmonary vessels, and extrapulmonary tissues [5,6]. The distribution of inflammation in asthma can have implications for clinical presentation and response to treatment, with small airway disease and distal lung inflammation being common features. In 2023, the Global Initiative for Asthma (GINA) has released annually revised guidelines for asthma management and prevention in children and adults. The eosinophilic phenotype is characterized by the expansion of eosinophilic infiltration in the airways, making asthmatic patients susceptible to asthma triggered by exposure to allergens. The neutrophilic phenotype is mainly due to increased neutrophilic infiltration of the airways, which makes the patients more susceptible to severe, aggressive, and uncontrolled asthma. The paucigranulocytic phenotype involves no elevation of either cell count, and lastly, the mixed-granulocytic phenotype involves concurrent increases in both cell

counts (figure 1) [6]. Professional associations like (the European Respiratory Society, American Thoracic Society, Global Initiative for Asthma, etc.) tend to accentuate a mix of clinical and pathophysiological factors. Another classification of asthma was identified according to the clinical phenotypes: atopic asthma, nonatopic asthma, obese asthma, late-onset asthma with severe obstructive syndrome, occupational asthma, and aspirin-sensitive asthma [7].

DIFFERENTIAL DIAGNOSIS

The differential diagnosis for asthma involves considering other diseases with similar clinical manifestations. A detailed history and supportive pulmonary function tests are necessary to diagnose asthma properly, as the differential diagnosis is broad (Figure 2).

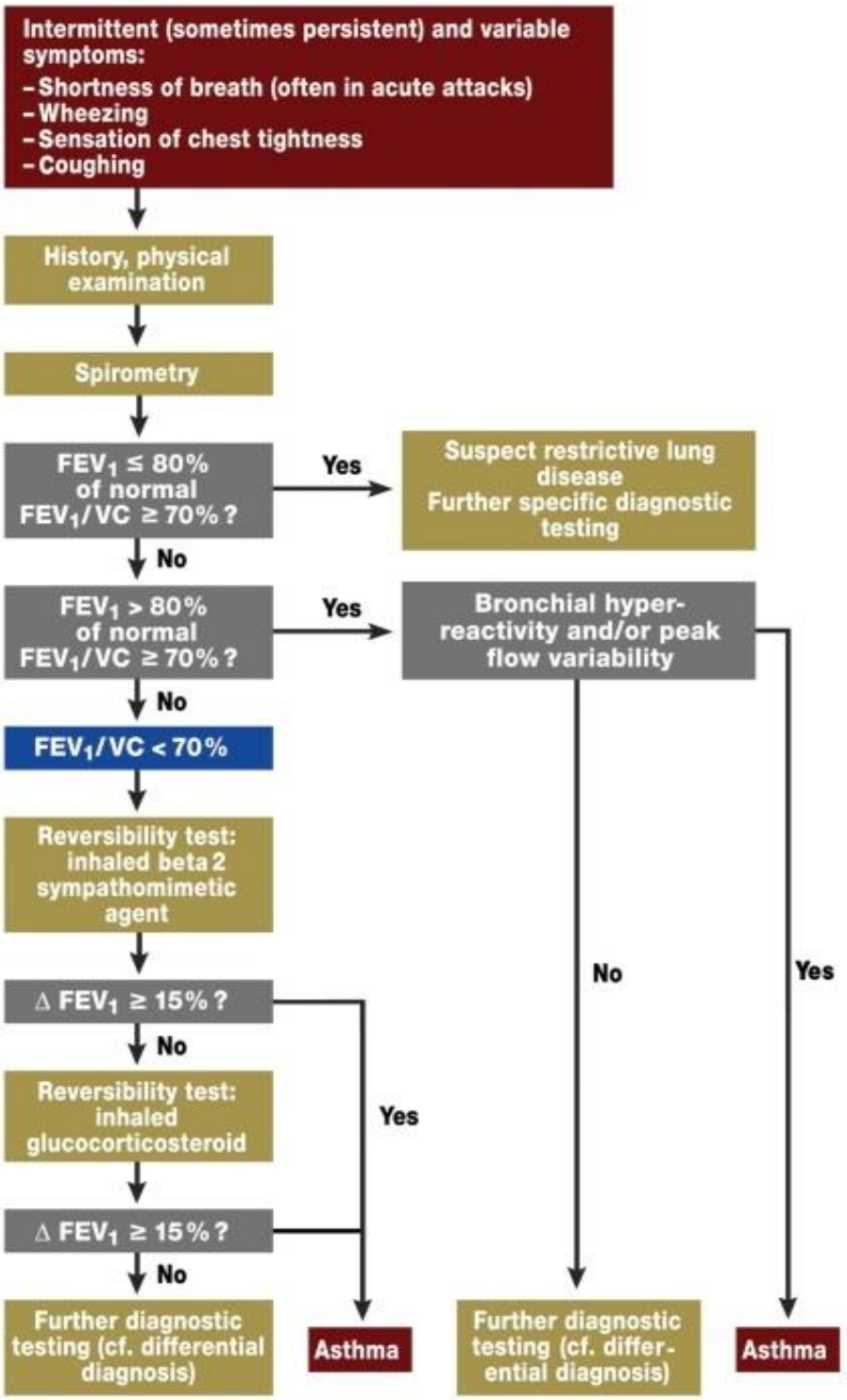
Figure (2): Differential diagnosis of Asthma



DIAGNOSIS OF ASTHMA:

Asthma diagnosis is an area of ongoing research, and there have been recent updates in this field. The lack of a gold standard test for asthma diagnosis has contributed to both overdiagnosis and underdiagnosis of the condition. As a result, current international guidelines emphasize the need for a standardized approach to diagnosis, including objective measurements before treatment. Asthma diagnosis involves clinical assessment, diagnostic testing, and objective lung function measurements. Symptoms of asthma include cough, dyspnea, and wheezing, although they can vary greatly between patients and over time [8]. Objective tests such as spirometry with bronchodilator reversibility testing are the mainstays for diagnosing asthma in children and adults (Figure 3) [9]. These tests demonstrate airway obstruction and variability in the degree of obstruction, characteristic of asthma. Additional tests, such as bronchial challenge testing and measurement of eosinophilic inflammation or atopy by sputum eosinophil counts, checking IgE levels can provide supportive evidence for the diagnosis of asthma.

Figure (3): Algorithm for The Diagnosis of Asthma [10]



Laboratory test for asthma:

It is important to follow up on kidney function for asthmatic patients using a high dose or repeats of salbutamol, urea, and electrolytes as it may temporarily shift potassium into the intracellular space, which might result in temporary iatrogenic hypokalemia. Also, arterial blood gas may detect hypoxemia and respiratory acidosis [11].

Imaging:
Chest X-ray (CXR) is commonly used in the management of acute asthma exacerbation despite guidelines advising against routine use. Other radiological imaging modalities, such as computed tomography (CT) and magnetic resonance imaging (MRI), can play a role in identifying distinct asthma phenotypes and assessing response to therapy.

Figure (4): Chest -x ray for asthmatic patient with Chronic Obstructive Disease [11].

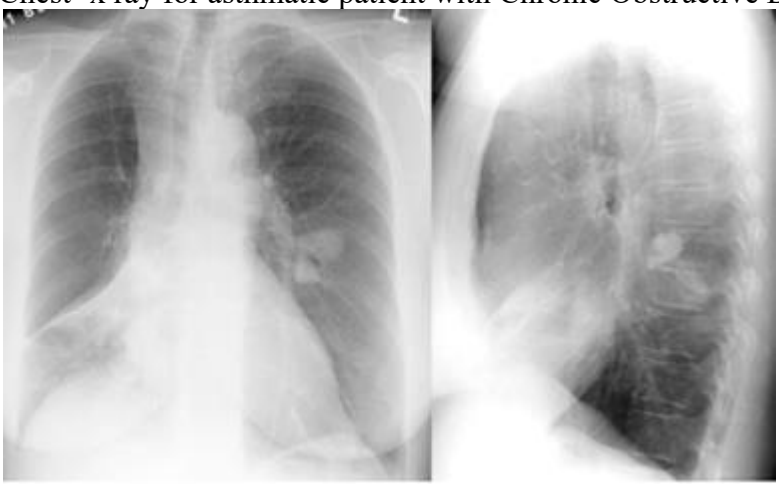
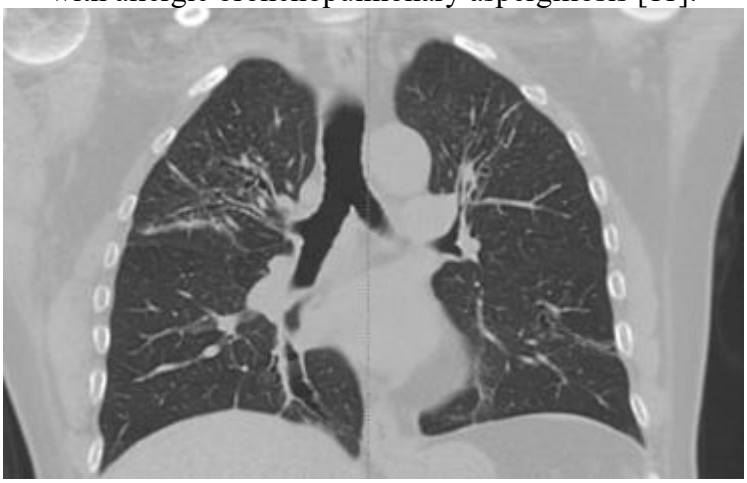


Figure (5): A CT scan for an asthmatic patient shows bronchiectasis in both upper lobes consistent with allergic bronchopulmonary aspergillosis [11].



TREATMENT:
Asthma treatment aims to minimize the symptoms and maintain daily activity without deterioration. The new gold standard for asthma treatment uses gold nanoparticles for drug delivery. Medical practitioners must approach the patients with a guideline-based plan to avoid specific environmental triggers, including pollutants, respiratory viruses, allergens, non-allergen substances, or irritants encountered in occupational, household, or environmental settings.
Current pharmacological treatments for asthma include inhaled corticosteroids (ICS), long-acting β2-agonists (LABA), and combination inhalers containing both ICS and LABA. These treatments effectively control the underlying airway inflammation and reduce symptoms and exacerbations [12]. Additionally, long-acting antimuscarinic agents (LAMA) have been added to ICS/LABA treatment to improve asthma control by targeting small airway disease [13]. However, there are still unmet needs in treating severe asthma, motivating research to identify novel targets and develop improved therapies [14]. Leukotriene antagonists, a new class of anti-asthma therapy, have been developed but are less efficient than currently available medications [15]. The success of fixed-dose combination inhalers has created "bifunctional" drugs with two distinct pharmacological actions. The new gold

standard for asthma treatment uses gold nanoparticles for drug delivery. Gold nanoparticles have many advantages, such as high dispersion power and reduced drug side effects when used in conjunction with the drug [16]. Additionally, probiotics have shown potential beneficial effects on asthma prevention and treatment, making them an attractive therapeutic option [17]. However, the use of gold compounds as a steroid-sparing agent in chronic severe asthma has shown only small treatment effects and significant side effects, limiting their recommendation [18]. Overall, while current pharmacological treatments are effective in managing asthma, there is a need for further research and development to address the limitations and unmet needs in asthma treatment.

How do nurses collaborate with other healthcare professionals to effectively manage asthma?
Nurses collaborate with other healthcare professionals to effectively manage asthma through a multidisciplinary and collaborative approach. They are crucial in assessing patients' risk of developing respiratory failure, monitoring patients, evaluating their care, and coordinating an interdisciplinary approach. Nursing interventions are relatively effective in improving the quality of life and reducing asthma-related emergencies, acute attacks, and hospitalizations among childhood asthma patients [19]. Nurses and care coordinators can partner with and empower older adults with asthma to practice disease self-management and improve their health-related outcomes through adult learner techniques, clear communication, education, and care coordination support [20]. Effective, shared decision-making and improved quality of life for people with asthma can be achieved through good communication skills and empowering patients to be involved in asthma management, which requires training for healthcare professionals [21].

Conclusion:
Asthma is a chronic lung condition marked by inflammation, airway narrowing, and airflow blockage. Despite being prevalent in both children and adults, adults tend to have higher morbidity and mortality rates. Recent research suggests a possible link between sex hormones and asthma development. The disease's prevalence has increased globally, likely due to environmental factors. Asthma's pathophysiology involves complex interactions between immune cells and molecules, leading to airway inflammation, hyperresponsiveness, obstruction, and remodeling. Symptoms include wheezing, coughing, chest tightness, and breathlessness, which vary in severity and frequency. Asthma can manifest in different phenotypes, classified based on inflammatory cell profiles and clinical features. Diagnosis relies on clinical evaluation, lung function tests, and objective measurements. Treatment aims to control symptoms and prevent exacerbations using inhaled corticosteroids, long-acting β2-agonists, and combination inhalers.

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