



ASTHMA CASES : CLASSIFICATION, PATHOPHYSIOLOGY, DIAGNOSIS & TREATMENT

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ABSTRACT :

The lungs are primarily affected by the long-term illness known as asthma. The number of people with asthma worldwide is about 300 million. 255,000 people worldwide lose their lives to this chronic condition each year. Shortness of breath, wheezing, chest tightness, and coughing are symptoms of asthma, a disease that causes the airways in the lungs to constrict and enlarge. Asthma is brought on by airway inflammation, or swelling. During an asthma attack, the muscles that surround the airways contract and the airway lining swells. As a result, less air can pass through the opening.

Introduction :

About 10% of Canadians suffer from asthma, which continues to be the most prevalent chronic respiratory condition [1]. Despite the widespread belief that asthma is a lung-specific condition, recent research suggests that it may be a part of a systemic airway disease that affects the entire respiratory system. This is corroborated by the fact that asthma frequently coexists with other atopic disorders, especially allergic rhinitis [2].

Asthma control in Canada is still below ideal, despite notable advancements in the diagnosis and treatment of the condition over the last ten years, as well as the availability of thorough and generally recognised national and international clinical practice standards for the condition. More than half of Canadians with asthma have uncontrolled asthma, according to the findings of the most recent Reality of Asthma Control (TRAC) in Canada research [3]. Ineffective asthma management leads to needless morbidity, restrictions on day-to-day activities, and a decline in general quality of life [1].

Definition :

The definition of asthma is a long-term inflammatory condition of the airways. Airway hyperresponsiveness, or an increased airway-narrowing reaction to triggers like allergens and exercise, is linked to chronic inflammation and causes recurrent symptoms like coughing, chest tightness, wheezing, and dyspnoea. Episodes of symptoms are typically linked to a broad but fluctuating blockage of airflow in the lungs, which is typically reversible either naturally or with the right asthma medication. [4].

Mechanism

An asthma attack can occur in two stages, known as the early phase and the late phase. IgE antibodies, which are sensitised and produced by plasma cells, start the early phase. Certain environmental stimuli, including the risk factors mentioned above, cause these antibodies to react. After that, IgE antibodies attach to basophils and mast cells with high affinity. The mast cells gradually de-granulate after releasing cytokines in response to an inhaled contaminant or risk factor. Mast cells release leukotrienes, prostaglandins, and histamine. The smooth muscle is then contracted by these cells, which tightens the airways. [10]

Th2 lymphocytes are essential because they generate GM-CSF and a number of interleukins (IL-4, IL-5, and IL-13) that facilitate cell-to-cell contact and maintain inflammation. Eosinophils and basophils are aided in their survival by IL-3 and IL-5. IL-13 plays a role in hyperplasia, fibrosis, and remodelling. [11] The late phase, which takes place over the course of the following few hours, is characterised by the localisation of eosinophils, basophils, neutrophils, and helper and memory T-cells to the lungs, which results in inflammation and bronchoconstriction. Additionally, mast cells are crucial for transporting late-phase reactants to the sites of inflammation. [13]

Pathophysiology

The simplest definition of asthma is repeated, reversible bronchospasm brought on by a trigger. But asthma is a complicated illness that can include multicellular

inflammation, airway hyperresponsiveness, and even persistent airway blockage [5]. There is an inflammatory and cellular infiltration into the airways as a result of the recruitment and activation of mast cells, macrophages, dendritic cells, neutrophils, eosinophils, and T lymphocytes.

An further inflammatory response (late-phase asthmatic response) is triggered by the mediators and cytokines generated during the early phase of an immune response to an instigating allergen, which results in increased airway inflammation and bronchial hyperreactivity [6]. There may be a hereditary predisposition to asthma, according to the evidence. Several chromosomal areas have been linked to asthma susceptibility, including those involving the synthesis of inflammatory mediators, the expression of airway hyperresponsiveness, and the creation of IgE antibodies. To identify the precise genes linked to asthma and the gene-environment interactions that could result in the disease's manifestation, more research is necessary [5,6]

Diagnosis :

In order to diagnose asthma, a thorough medical history, physical examination, and objective assessment of lung function—preferably spirometry—were required. When objective measurements of lung function are normal even when asthma symptoms are present, bronchoprovocation challenge testing and evaluating for markers of airway inflammation may also be useful in diagnosing the condition [4,6,7].

Types of Asthma :

1. Extrinsic asthma

Extrinsic asthma, commonly referred to as allergic asthma, affects 50% of asthmatic patients and is more common in children and young adults. Patients with this type of asthma typically have a hereditary allergy tendency, and breathing in particular allergens can cause an acute asthma attack.

2. Intrinsic asthma

According to the theory of endobiogeny, vagotonic patients who experience a spasmopilic reaction to a physiological demand in which adequate oxygen is not supplied develop intrinsic asthma, a non-allergic form of asthma. This demand may be structural or functional, such as during menstruation or exercise.

Sign and symptoms :

- Shortness of breath
- Chest tightness or pain
- Wheezing when exhaling which is a common sign of asthma
- Trouble sleeping caused by shortness of breath coughing or wheezing

Causes :

- Pollution
- Dust
- Smoking
- Genetic

Classification of anti - asthmatic drug –

1. Bronchodilators –

- a) Beta 2 sympathomimetic -
Salbutamol, Terbutalin, Bambuterol, salmeterol, Formoterol, Ephedrine
- b) Methylxanthines –
Theophylline, Aminophylline, choline theophyllinate, Hydroxyethyl theophylline, Doxophylline
- c) Anticholinergic –
Ipratropium bromide, tiotropium bromide

2. Leukotriene Antagonists –

Montelukast, Zafirlukast

3. Mast cell stabilisers –

Sodium Cromoglycate, Kerotifin

4. Anti IgE antibody –

Omalizumab

5. Corticosteroids –

Systemic – Hydrocortisone, Prednisolone and other

Inhalation – Beclomethasone dipropionate, Budesonide, Fluticasone Propionate

Treatment :

Therapy In order to prevent exacerbations—a sudden and/or progressive worsening of asthma symptoms that frequently necessitate immediate medical attention and/or the use of oral steroid therapy—and lower the risk of morbidity and mortality, the main objective of asthma management is to attain and maintain control of the condition. Using the standards listed in Table 2, the degree of asthma control should be evaluated at every visit, and therapy should be customised to reach control. The majority of asthma sufferers may be controlled with a combination of medication and avoidance techniques.

ICSs, leukotriene receptor antagonists (LTRAs), long-acting beta2-agonists (LABAs) in combination with an ICS, and anti-IgE treatment are examples of controller medications.

Rapid-acting inhaled beta2-agonists and inhaled anticholinergics are examples of relieving medications [4,6,7]. Most individuals with allergic asthma may also benefit from allergen-specific immunotherapy, but only if administered by medical professionals who are sufficiently skilled in treating allergies [9 ,10].

Acute asthma flare-ups may also need to be treated with systemic corticosteroid therapy.

Prognosis And Complications

Prognosis

One chronic condition is asthma. Attacks range in severity from minor annoyances that don't interfere with the patient's daily activities to serious exacerbations that could put the patient's life in jeopardy.

The likelihood of its symptoms going completely away is slim. However, in cases that are quite moderate, remission may occur. Smokers are at a higher risk of developing long-term lung damage.

Complications

- Reduced capacity to exercise and engage in other activities is a marker of a lower quality of life. In addition to psychological issues including stress, worry, and despair, the patient experiences exhaustion, poor performance, or absences from work.
- Serious respiratory consequences, such as pneumonia (lung infection), the collapse of a portion or the entire lung, and respiratory dysfunction, can result from asthma. Complete blockage of the bronchial passages occurs in acute respiratory failure. The blood's oxygen content either drops dangerously low or rises dangerously high in carbon dioxide. To prevent death, such individuals must be moved on ventilators right away.

Differential Diagnosis

The differential diagnoses for asthma include the following conditions:

- Bronchiectasis
- Pulmonary eosinophilia
- Interstitial lung disease
- Post-viral tussive syndrome
- Heart failure
- Exercise-induced anaphylaxis
- Aspergillosis
- Eosinophilic bronchitis
- Bordetella pertussis infection
- Upper respiratory tract infection
- α 1-antitrypsin deficiency
- Gastroesophageal reflux disease
- Chronic obstructive pulmonary disease
- Post-viral tussive syndrome
- Cough induced by angiotensin-converting enzyme inhibitors

Over-The-Counter

"Primatene Mist" and "Bronkaid" are two common over-the-counter bronchodilators that offer temporary relief from asthma. However, these medications do not treat chronic asthma and should not be taken daily to alleviate symptoms. Before taking over-the-counter medications, consult a doctor.

Metered-Dose Inhalers

The metered-dose inhaler is the most widely used tool for administering medication to asthmatics' lungs. The two components of an inhaler are 1) a canister that contains the medication and stabilisers, and 2) an actuator or mouthpiece that has a dust cap and a discharge nozzle. Inhaling the gas emitted from an inhaler is as simple as pressing down on the top of the canister. Metered dosage inhalers typically provide a bronchodilator, corticosteroid, or mast cell stabiliser.

Dry Powder Inhalers

Dry powder inhalers are an alternative to aerosol-based metered-dose inhalers that administer medication in the form of powdered capsules. These devices can be more difficult to operate than metered-dose inhalers, and association studies have found differences in many devices that enter the lungs.

CONCLUSIONS

A variety of disorders together referred to as asthma cause recurrent, reversible bronchial blockage. Even while the illness can strike at any age, most cases begin with symptoms in childhood. There is a significant hereditary component to asthma, and there are genes throughout the genome that somewhat raise the risk of developing the condition. The aetiology, causes, symptoms, and treatment of persistent asthma were thoroughly covered in this review.

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