Asthma: A Comprehensive Review of Epidemiology, Pathophysiology, Diagnosis, and Management

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Abstract- **Asthma is a chronic inflammatory airway disease, which is characterized by recurrent episodes of wheezing, shortness of breath, chest tightness, and cough, often associated with circadian rhythmicity, often nocturnal or early morning. There is a remarkable complexity in the interaction of genetic, environmental, inflammatory, mucus, and airway hyperreactivity components, making it a multifactorial condition. This review gives a comprehensive insight regarding the aspects of asthma, including definition, epidemiology, types, pathophysiology, causes, risk factors, clinical presentations, diagnosis, and treatment. Various types of asthma, including allergic asthma, exercise-induced asthma, occupational asthma, nocturnal asthma, adults-onset asthma, T2-high, and T2-low inflammation asthma, have been elaborately mentioned in this review, because this condition is multifactorial. Various methods used for diagnosing asthma conditions, including spirometry, peak flow measurements, methacholine challenge, and laboratory tests, have been detailed. This review further gives a comprehensive view regarding the treatment of asthma, including inhaled steroids, bronchodilators, extent of mucus production, anti-leukotrienes, and newly emerging herbal drugs. There is a particular importance regarding long-term control, teaching, mucus avoidance, and correct medication regimen. There is a remarkable complexity in understanding this multifactorial condition, which will increase the control over the condition, morbidity, and quality of life.**

I. INTRODUTION TO ASTHMA

Asthma is a long-term inflammatory illness of the airways that causes chest tightness, wheezing, coughing, and shortness of breath.The inflammation of the airways causes mucus production, airway wall remodeling, and bronchial hyperresponsiveness (BHR), which is the propensity of smooth muscle cells to respond to nonspecific stimuli like cold air. While some patients may develop asthma later in life (late-onset asthma), childhood-onset asthma typically begins at a young age. There are numerous differences between childhood-onset and late-onset asthma. Compared to childhood-onset asthma, late-onset asthma is more severe and less linked to allergies. Atopy, lower lung function, and respiratory tract infections, particularly those caused by rhinovirus, are significant risk factors for children's asthma persistence. Significant risk factors for children's asthma persistence include atopy, reduced lung function, and respiratory tract infections, especially those brought on by rhinovirus. It is still unknown whether inflammation in children with asthma drives the pathogenicity of respiratory viruses or whether recurrent viral infections at an early age set the stage for the development of asthma.Controlling symptoms and underlying inflammation has been the primary goal of asthma treatment in order to prevent further flare-ups of the condition, which is not surprising given that inflammation plays a significant role in the pathophysiology of asthma.[7]

Asthma is a complicated inflammatory disease that narrows the airways and is linked to variations in the amounts of lymphocytes, mast cells, eosinophils, cytokines, and other inflammatory cell products. It is commonly known that individuals with asthma have elevated levels of particular IgE, which attaches to mast cell and other inflammatory cell receptors.[6]

When IgE antibody and antigen interact, a number of inflammatory cellular reactions are triggered, including the release of mediators like histamines,

prostaglandins, and leukA number of inflammatory cellular reactions, including the release of mediators like histamines, prostaglandins, and leukotrienes, are triggered by the interaction between IgE antibody and antigen [6]. These reactions then cause bronchoconstriction and the contraction of airway smooth muscle. The prevalence of asthma is a common condition that is increasing globally.[6]

In Canada, asthma is the most prevalent respiratory condition. Most Canadians still have poorly controlled asthma, despite tremendous advancements in the diagnosis and treatment of this condition. However, control can be attained in the majority of patients by using appropriate pharmacological interventions and avoidance strategies. For most patients, inhaled corticosteroids (ICS) are the standard of care. For the majority of adults who do not achieve control with ICS therapy, combination ICS/long-acting beta2-agonist inhalers are recommended. All across the world, bronchial asthma is a serious public health issue. With an estimated 300 million cases worldwide and 10% of children and young people under the age of 18, it most frequently starts in childhood. The prevalence in the Middle East is currently reported to be somewhat lower, ranging from 5.6% in Saudi Arabia to 8.5% in Kuwait. Every year, about 200,000 asthmatic patients in Iraq are either admitted to hospitals or receive treatment in emergency rooms. By the age of five, 50% to 80% of asthma cases are typically noticeable.[14]

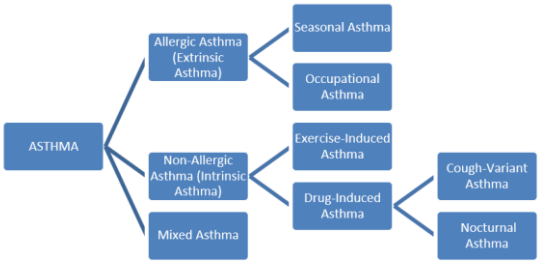
Indexterm: 7,12-dimethylbenz(a)anthracene; anthocyanins; antioxidant effects; breast cancer; Ipomoea batatas; tumor latency

II. DEFINITION OF ASTHMA

Asthma is a long-term respiratory disease that causes breathing difficulties due to inflammation and airway narrowing. It is frequently linked to symptoms like coughing, wheezing, shortness of breath, and tightness in the chest. Usually brought on by environmental factors, allergens, respiratory infections, or physical exertion, these symptoms can vary in frequency and intensity. Genetic and environmental factors interact intricately in asthma, causing obstruction and hyperresponsiveness of the airways. Medications like bronchodilators and anti-inflammatory drugs can help manage this condition, but long-term care is frequently needed to control symptoms and avoid flare-ups.[7]

Figure no.1 asthma related symptoms,common triggers ,asthmatic airway

TYPES OF ASTHMA



1. Exercise induced asthma: While exercise is one of the best things you can do for your body, there are certain risks you should be aware of. It turns out that exercising can cause asthma. This is referred to as bronchoconstriction or exercise-induced asthma. If left untreated, exercise-induced asthma symptoms may last up to 60 minutes. The narrowing of the lungs' airways during intense exercise is the cause of exercise-induced asthma. If you have exercise-induced asthma, you can still be active as long as you take the prescribed medication.[7]
2. Allergic asthma: Another category of asthma that is triggered by allergens is called allergic asthma. This category of asthma can be triggered by allergens like dust, dust mites, mold, pollen, cockroaches, or pet dander. Interestingly, allergic asthma is the most common type of asthma.[7]
3. Occupational asthma: This is another type of asthma that can be directly attributed to your environment. Some of the occupational asthma causes that may exist in your environment include chemicals, enzymes, metals, animal products, and plants. Some of the people who are also at higher risk include food production employees, veterinarians, farmers, adhesive

handlers, and others who can come into direct contact with such products. [7]

4. Seasonal Asthama: Depending on the region you are in, you could find that some health issues arise from the changing seasons, which you could have to address. Seasonal asthama could be described as asthama that occurs at a certain time of the year. This type of asthama could be caused by the change in weather that comes along with differing allergens like trees, grasses, and weeds. You must be cautious about the changing seasons in order to be equipped for the effects of asthama that could arise seasonally.[7]
5. Asthma-COPD overlap: Another condition that could make it difficult for a person to breathe is the overlap of asthma and chronic obstructive pulmonary disease. There are a few different kinds of COPDs that exist. These include emphysema and chronic bronchitis. People who have conditions are referred to as ACOS. [7]
6. Type 2 (T2) high inflammation: T2-high inflammation is currently the best-understood inflammatory endotype. The T-helper cell type 2 response is one induced by exposure to a detector antigen-presenting cell. Th2 cells secrete cytokines, including interleukins 4, 5, and 13, which drive the downstream recruitment of effector cells and facilitate the isotype switching of B cells to secrete IgE. IL-4 and IL-13 promote subepithelial fibrosis, airway remodeling, mucus hypersecretion, and airway hyperreactivity.[3]
7. T2-low inflammation: Approximately 50% are due to T2-low inflammation, in the context of which there is no eosinophilic airway inflammation. Another subset of T cells, termed Th17 cells, expresses IL-17. Its release correlates with neutrophilic inflammation and steroid resistance.[3]
8. Adult onset asthma: This is referred to when an individual develops an anasthmatic condition following reaching the age of 20 years. It predominantly affects women rather than men and in addition to being relatively distinct in terms of its prevalence. For instance, the rate compared to child-onset asthma. It can also be caused by some kind of allergic material or an allergy. It is estimated that up to perhaps 50% of adult onset .All asthmas are caused by allergies. However, asubstantial proportion of the adult-onset asthma does not would appear to be induced by the exposure to allergen(s); this is It has also been called non-allergic adult-onset asthma.[12]
9. Nocturnal asthma:Nocturnal asthma attacks occur from midnight to 8am. It is caused by the presence of allergens such as dust, pet dander or is caused by sinus.The nocturnal or nighttime asthma may occur without any daytime symptoms which can be identified by the patient. The patient may wheezing or shortness of breath when lying down and might They will not notice these symptoms until awakened by them in the- middle of the night - usually between 2 and 4 AM. Nocturnal asthma attacks may be intermittent: no attacks may occur, may occur once, or more often during a week. However, when there are no daytime symptoms which point towards the possibility of underlying cause of the nighttime cough, this type of asthma will be harder to detect - typically postponing adequate therapy. The reason for this phenomenon is yet to be determined, though many possibilities remain under investigation.[14]

III. PATHOPHYSIOLOGY AND ETIOLOGY

Asthma has been linked to a T helper cell type 2 (Th2)-mediated immune response, which is also found in other atopic diseases. The triggers for the condition may include allergies such as dust mites, cockroach residues, animal dander, molds, and pollen, as well as non-allergic causes such as viruses, exposure to smoke, cold air, and physical exertion due to exercise. The increased number of Th2 lymphocytes results in the production of certain cytokines such as interleukin-4, interleukin-5, interleukin-9, and interleukin-13, which result in eosinophilination and the production of immunoglobulin E. Immunoglobulin E synthesis results in the release of mediators of inflammation such as histamine and cysteinyl leukotrienes, which result in the contraction of smooth airway muscles, edema, and increased production of mucous secretion, which makes up the symptoms experienced by a person with an asthmatic condition.[7]

Asthma is more common in people with other allergic problems like eczema and rhinitis, which is also sometimes referred to by the name “hay fever.” Urbanization is linked with higher instances of

asthma, which may be attributed to lifestyle-related issues.

Exposures to various allergens and irritants in the environment are also believed to contribute to an increased incidence of asthma, for example, air pollution, house dust mite, molds, chemical, dust, or smoke in the working environment.Children and adults who are overweight or obese are at a greater risk of asthma[7]

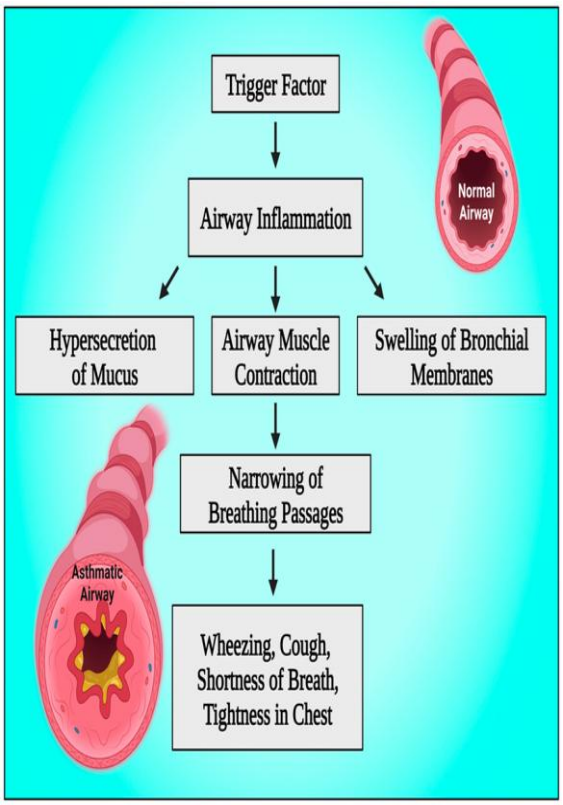


Figure no.2 Pathophysiology of asthma

IV. COMMON CAUSES AND COMMON THREAT FACTORS[8]

1. Smoking: Smoking literature has revealed that patients presenting with psoriasis are more active and passive smokers compared to the normal population. Smoking has also been found to significantly correlate with the development and severity of lesions on the skin caused by psoriasis. Conversely, the most important reason for the development of Chronic Obstructive Pulmonary Disease is also a consequence of smoking. Other Lung Diseases caused through Smoking include Asthma and Idiopathic Pulmonary Fibrosis. Consequently, the increased prevalence of lung diseases among patients presenting with psoriasis can also thus be caused by the aforestated fact.
2. Obesity: Obesity and Physical Inactivity Obesity and physical inactivity have been determined to be risk factors for the development of psoriasis, with an increased prevalence of obesity among individuals with psoriasis.Obesity is an important risk factor for respiratory conditions such as asthma, pulmonary hypertension, and obstructive sleep apnea.It is also associated with chronic obstructive pulmonary disease.Also, the increased prevalence of lung disease among individuals with psoriasis may be attributed to obesity
3. Pollutant: Cadmium, an element used in batteries and dental fillings in the aviation and television sectors, has been proposed as an air pollutant contributing to the pathogenesis of psoriasis. studies showed that patients with psoriasis had elevated levels of cadmium in the blood. On the one hand, the elevated levels of cadmium in the blood are known to affect patients with chronic obstructive pulmonary disease in men who are non-smokers. Therefore, cadmium or air pollutants can affect the onset of both psoriasis and respiratory diseases.
4. Infection: Infections may be an important part of the development of psoriasis and lung disease. The altered lower respiratory tract microbiome, which might increase the risk for psoriasis, interacts with the mucosal innate immune system and is associated with the development of asthma. Besides, human immunodeficiency virus is known to be one of the risk factors associated with both psoriasis and respiratory diseases, including asthma, chronic obstructive pulmonary disease, and pulmonary arterial hypertension. HIV infection plays a key role in developing or aggravating both psoriasis and lung disease.
5. Gene: It is estimated that possibly 100 genes can be linked to asthma.
   It has become important because genes linked to asthma also play roles in managing the immune system and inflammation. There have, however, been consistent results from genetic studies. across populations; hence, further studies would be necessary. to unravel the complicated interactions that drive asthma. Three-fifths of all asthma cases are hereditary.

The Centers for Disease Control, USA, say having a Having a parent with asthma can increase one's risk by three to six times. Genetics may also be interacting with environmental factors. For example, exposure to the bacterial product endotoxin and carrying the genetic variant CD14 single nucleotide polymorphism-single-nucleotide polymorphism C-159T-the following have remained A well replicated example of a gene-environment The interaction associated with asthma.[12]

V. SIGN AND SYMPTOMS [7]

1. Common Symptoms (Patient-felt)
   - Wheezing (whistling sound while breathing)
   - Shortness of breath
   - Cough, especially at night or early morning
   - Chest tightness or heaviness
   - Difficulty in breathing, worse on exertion
2. Common Signs (Clinically observed)
   - Prolonged expiration
   - Use of accessory muscles of respiration
   - Rapid breathing (tachypnea)
   - Rapid heart rate (tachycardia)
   - Reduced air entry on auscultation
   - Barrel-shaped chest (in chronic cases)
3. Severe / Acute Asthma Attack
   - Severe breathlessness
   - Inability to speak full sentences
   - Cyanosis (bluish lips or nails)
   - Restlessness or anxiety
   - Silent chest (very little air movement)

VI. DIAGNOSIS [12]

Physical Exam: Physical examination will be done generally in the upper respiratory, chest, and skin surfaces. The doctor would utilize a stethoscope to check for any symptoms of asthma in your lungs as you breathe. The high-pitched whistling sound while you exhale - or wheezing - that presents an important aspect of both obstructed and unobstructed air passages. Airway and asthma. Physical examination will be done generally in the upper respiratory, chest, and skin surfaces. The doctor would utilize astethoscope to check for any symptoms of asthma in your lungs as you breathe. The high-pitched whistling sound while you exhale - or wheezing - that presents an important aspect of both obstructed and unobstructed air passages. Airway and asthma. Doctors will also evaluate for a runny nose, a swollen Nasal passages, and Nasal Polyps. Skin will be or for conditions such as eczema and hives, which have been: has also been linked with asthma. Physical symptoms may or may not occur in asthma are sufferers, and individuals can be asthma suffers without showing any physical ailments during an examination.

Asthma test

Pulmonary function tests, or lung function tests, A third asthma diagnosis is associated with spirometry. It is a non-invasive test in which one needs to take deep breaths and with forceful exhalation into a hose from which the exhaled air goes through the machine called a spirometer. The spirometer then gives a readout of two key measurements:

Forced vital capacity (FVC) - the maximum amount of air one can inhale and exhale.

Forced expiratory volume (FEV-1) - the maximum amount of air exhaled in one second.

These data are compared to certain standards developed for one’s age, and readings lower than may be a sign of obstructed airways. It’s common practice for the physician to administer a drug called a bronchodilator prior to reprotesting with the spirometer because it opens the air passages. If the passages were obstructed and the retesting indicates improved results after taking the drug, there may increased chances of an asthma diagnosis being made. Children Below 5 years of age are difficult to test using spirometry, so asthma diagnoses will depend mainly on Evidence suggests on symptoms, medical histories, and other aspects of the physical exam. It is quite common for physicians to prescribe asthma medications for a period of 4-6 weeks and observe the effect of a Young child responds.

In patients with persistent hack as a dominant manifestation, other typical causes of hack, for example, post-nasal trickle and gastroesophageal reflux infection, may likewise be considered.3 Chronic obstructive pneumonic infection (COPD) is some other typical disorder that should be included in a diagnosis of asthma, more so in grown-up patients .It is highlighted by smoking. In more chronic patients, failure of the cardiovascular system may present with unpredictable signs of wheezing and dyspnea. More exotic infections which may also

present as an addition to the presentation of an asthmatic condition include vocal cord damage, bronchiolitis obliterans, cystic fibrosis, and immunosensitive bronchopulmonary aspergillosis. Asthma may also appear as part of a fundamental problem such as Churg Strauss syndrome.[6]

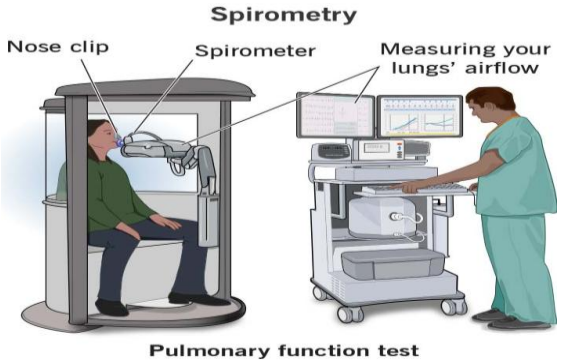


Figure no. 2 spirometer instrumentation

Children wheezing will have either atopic asthma or viral wheeze; differentiating these has important implications for management, If its wheeze it must be asthma, and if it is asthma, it must equal bronchodilators and inhaled corticosteroids sufficiently straightforward. Certainly, with asthma being so common this perspective may seem to be valid. Asthma is more complicated, however, especially in children. We are often uncertain whether children who wheeze actually have asthma, and some claim that diagnosing asthma in extremely young children is impossible. A growing body of evidence suggests that asthma is a complex problem and that different patterns of disease have different underlying pathogenesis. (D2).[6]

For epidemiologic studies, the analysis rests on polls (and not pneumonic tests) including various side effects, often called ‘‘doctor analyzed asthma’’). Given that there are no normal side effects, this could render the analysis a little dubious. The reversible bronchial obstruction is the truly clinical component of asthma. However, the non-obstructive instruments may likewise assume a heavy job in both asthma and issues with a closeness to asthma. These would incorporate debilitating shortness of breath set off by stimulation of the aviation course receptor trigger, little aviation course sickness aviation course tangible hyperreactivity, ineffective breathing, hyperventilation, psychoactive impacts of the breathing example, and irritations of the chest versatility [D3].[6]

Asthma is a common infection in small children and is associated with significant morbidity and an increasing prevalence over time. Wheezing and asthma in children are heterogeneous issues; hence, identifying phenotypes of asthma remains a goal to identify high-risk children who may benefit from specific therapies or secondary prevention interventions. Management strategies for persistent asthma include daily inhaled corticosteroids, daily leukotriene receptor antagonists, and combination therapies. Finally, regular monitoring of symptom control and medication side effects is paramount along with titrating controllers to the minimally effective dose.[6]

Peak flow: A peak flow meter is a simple device that tracks how powerfully you can breathe out. When your peak flow values are lower than normal, this means your lungs are not functioning normally and your asthma is getting worse. It will be possible to learn ways to handle this because your physician will teach you.[2]

Methacholine Challenge: Methacholine is a common asthma trigger. When inhaled, it slightly constricts your airways. If you respond to methacholine, you likely have asthma. This test may be given even if your initial lung function test is normal.[2]

Nitric Oxide Test: It is a test that measures the levels of nitric oxide in your breathing. When your air passages become inflamed due to irritation, which is common in people who have asthma attacks, the levels of nitric oxide may become high. Such a test is not easily accessible.[2]

Eosinophils in Sputum: This test looks for the presence of eosinophils, which are white cells, using saliva and mucus, or sputum, that are coughed up. Eosinophils are present as symptoms appear and can be identified by staining them with a pigment that is rose-colored dye.[2]

Provocative testing, exercise, cold, and induced asthma: In these, your air flow in the lungs will be tested before and after exercise or after several challenging breaths of cold air.[2]
Also some other diagnosis[10]

Upper airway

- Vocal cord dysfunction

- Allergic rhinitis and sinusitis
- Tracheobronchomalacia
- Tracheal stenosis

Lower airway

- Chronic obstructive pulmonary disease
- Allergic bronchopulmonary aspergillosis
- Endobronchial obstruction from
- mass or foreign body
- Churg-Strauss syndrome
- Obliterative bronchiolitis

Cardiovascular

- Congestive heart failure
- Pulmonary embolism
- Pulmonary hypertension

Gastrointestinal

- Gastro-oesophageal reflux disease

Psychiatric

- Anxiety
- Panic attacks

VII. TREATMENT[7]

Control of asthma is the main aim of its treatment, which leads to prevention of exacerbations, meaning sudden worsening or progressive worsening of asthma symptoms often requiring immediate health care attention, including the use of oral steroid therapy. There are also other aims of treatment, which include the prevention of asthma symptoms, preventing the need for relieving medication, restoring normal physical functioning, as well as restoring lung functions.

The pharmacologic agents commonly used for the treatment of asthma can be classified as:

1. Controllers (Prescribed medications that have anti-inflammatory properties and need to be taken on a long-term basis, achieving control over asthma.)
2. Relievers (medications used on an as-needed basis-Inhaled medication delivery devices)

- Controller medications:

1. Inhaled corticosteroids (ICSs):

The first anti-inflammatory agents used for the treatment of asthma proved to be the inhaled corticosteroids (ICSs), which remain the most effective anti-inflammatory agents used for the treatment of asthma and the backbone of therapy for the overwhelming number of patients with asthma. The use of low-dose monotherapy involving the use of ICSs has proved effective and has become first-line maintenance therapy for the overwhelming number of patients with asthma. The use of ICSs has proved beneficial in cutting the frequency of symptoms, exacerbations, and improvement in the function of the lungs. The discontinuation of the use of ICSs is, however, usually associated with the re-appearance of symptoms within a short period of time, usually weeks to months. The use of the above therapy is thus required for a lifetime.

Because ICSs can be highly effective when used appropriately, other issues besides treatment effectiveness should be addressed when ICS therapy fails to result in control of asthma. These other issues are as follows: wrong diagnosis of underlying disease. Inadequate adherence to ICS therapy. Inadequate inhalation technique. Continued exposure to triggers or presence of other diseases. If patients cannot result in control with a moderate dose of ICS use & other issues above have been addressed, treatment regimens should be changed. The goal of treatment in most pediatric patients would be to increase ICS therapy to a moderate dose. Addition of a new class of medications (LABA) can be recommended in patients above 12 years

Inhaled corticosteroids include:-s

- Fluticasone (Flovent HFA, Arnuity Ellipta, others)
- Budesonide (Pulmicort Flexhaler)
- Mometasone (Asmanex Twisthaler)
- Beclomethasone (Qvar RediHaler)
- Ciclesonide (Alvesco)

2. Reliever medications:

Inhaled rapid-acting beta2-agonists are preferred reliever medications for treatment of acute symptoms, and should be prescribed to all patients with asthma. In Canada, several short-acting beta2-agonists (SABAs; e.g., salbutamol, terbutaline) and one LABA (formoterol) are approved for this indication. SABAs should only be taken on an as needed basis for symptom relief. Use of an as-needed SABA in the absence of a controller therapy should be reserved for patients with symptoms less than twice per month, without nocturnal wakening in the past month, or an exacerbation within the past year. In children with well controlled asthma, a SABA should be used less than three times per week. Unlike other LABAs, formoterol has a rapid onset of action and, therefore, can be used for acute

symptom relief. Given that LABA monotherapy has been associated with an increased risk of asthma-related morbidity and mortality, formoterol should only be used as a reliever in patients 12years of age or older who are on regular controller therapy with an ICS Ipratropium bromide, a short acting anticholinergic bronchodilator, can also be used as a reliever medication. These medications appear to be less effective than inhaled rapid acting beta 2 agonists. Hence, these medications should be used as second line therapy in patients who cannot use SABAs. These medications can also be used in patients with moderate to severe wheezing due to asthma as a supplemental therapy. The treatment with short acting anticholinergic bronchodilators should not be administered to pediatric patients.

3. Inhaled medication delivery devices :

Inhalers for people who have been diagnosed with asthma may also take many different forms. These may include pressurized metered-dose inhalers (pMDIs) and dry powder inhalers (DPIs) (e.g., Turbuhaler, Diskus, Twisthaler, Ellipta). Not all medications will come in inhalers. Some inhalers may come with dose counters; others, like pMDIs, will not. The most critical aspect when choosing which device to deliver medication is to see to it that it is used correctly.

For children, the pMDI should be employed together with a spacer device because pMDI with a spacer is equally effective to nebulizers, and the pMDI with a spacer was also preferred over nebulizers. In children between the ages of 2-4 years, the preference is the spacer with a face mask, while the spacer with a mouthpiece is preferred in children aged 4-6 years. Before a child can move to using the pMDI with a spacer using the mouthpiece, the child needs to be able to make a seal with the mouthpiece and breathe through the mouth. In children above 6 years, the pMDI with the spacer using the mouthpiece or DPI would be preferred. The reason children will have to have enough inspiratory force to be able to handle the DPI means the DPI will not be appropriate to give to children below the age of 6 years.

4. Short Acting beta-Blockers:

Short-acting beta-agonists are also widely used as rescue medications and are recognized as bronchodilators. They can also be used just before exercise as prevention for exercise-induced symptoms of asthma.Short-acting beta-agonists help in relaxing your air passage muscles, which permits easier breathing during an attack. If you find that you are using quick relief medications on two days in a week or more, then your asthma is probably not being effectively managed, and you must consult your healthcare provider for adjusting your medications.

Some quick-relief asthma medicines include:-

- Albuterol (ProAir HFA, Proventil HFA, Ventolin HFA)
- Levalbuterol (Xopenex HFA)
- Metaproterenol
- Terbutaline

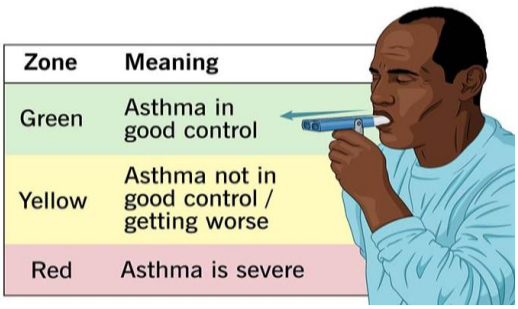


Figure no.3 various zone of asthma

5.ORAL: STEROIDS

Your provider might prescribe oral steroids during an asthma attack for which your symptoms are not getting better. These are medications that you can take orally in the form of tablets, capsules, or liquids.

Oral steroids are not quick-relief medicines but are often given for 7 to 14 days when your symptoms flare-up.

Oral steroids include:

- Methylprednisolone
- Prednisone
- Prednisolone

SYNTHETIC (ALLOPATHIC) DRUGS USED IN ASTHMA

Action	Class	Drug name	types	mechanism	Uses	Side effect
Bronchodilators	β_2-Adrenergic Agonists	Salbutamol, Terbutaline	Short-acting (SABA)	Relax bronchial smooth muscle by increasing cAMP.	Acute asthma attack	Tremors, tachycardia

		Salmeterol, Formoterol	Long-acting (LABA)		Prophylaxis (with steroids)	
	Methylxanthines	Theophylline	-	Inhibit phosphodiesterase → bronchodilation.	Manage chronic respiratory diseases,	Narrow therapeutic index, nausea, arrhythmia
		Aminophylline			COPD	
	Anticholinergics	Ipratropium bromide		Block muscarinic receptors → prevent bronchoconstriction	COPD & asthma	Constipation
		Tiotropium bromide				Urinary retention
Anti-Inflammatory Drugs	Corticosteroids	Beclomethasone, Budesonide, Fluticasone	Inhaled	Reduce airway inflammation and edema	Reducing inflammation	High blood sugar
			Oral/iv			Weight gain
	Mast Cell Stabilizers	Cromolyn sodium	-	Prevent release of histamine and leukotrienes.	asthma	Cough
		Nedocromil				Sore/itchy thorat
	Leukotriene Modifiers	Montelukast	-	Block leukotriene-mediated inflammation.	Allergic and exercise-induced asthma	Headache
		Zafirlukast				
	Monoclonal Antibodies (Biologics)	Omalizumab	-	Bind to specific inflammatory mediators to block key pathway involved in allergic	Uncontrolled asthma	Fatigue
		Mepolizumab				Joint pain

VIII. HERBAL (NATURAL) DRUGS USED IN ASTHMA[13]

1. Aerva lanta Linn (Amaranthaceae)

Aerva lanta or A. lanta is an erect or prostrate herba ceous

It is a common roadside weed with white and axillary groups of small woolly flowers. It is very frequent in The plains in the warmer parts of India.The ethanol extract ofaerial parts of A. lanata at 100 mg/mL in the isolated goat tracheal chain preparation model and 30 and 60 mg/kg

is administered orally in clonidine-induced catalepsy and mast cell degranulation in mice, exhibits anti-asthmatic properties.

2. Ageratum conyzoides L

A conyzoides is a herbaceous, erect perennial plant. annual plant of the family Asteraceae (Compositae), indigenous to to tropical America, with its distribution range in tropical and subtropical regions of the world. Hydroalcoholic Extract of leaves of A. conyzoides at doses of 250, 500 and 1 000 mg/kg exhibits antihistaminic activity by inhibiting Clonidine-Induced Catalepsy in Mice.

3. Argemone Mexicana

Argemone mexicana (A. mexicana) occurs throughout all by roadsides and fields in India. It has antiallergic properties.inne and antistress activity of aqueous extracts of A. mexicana stem at dose 50 mg/kg, i.p. using milk-induced leucocyt milk-induced eosinophilia.

4. Asystasia gangetica T. Adams (Acanthaceae)

Asystasia gangetica, or A. gangetica, has numerous uses in of Nigeria for the management of asthma. Akah, et al. assessed hexane, ethyl acetate, and methanol extracts of the leaves of A. gangetica to antiasthmatic activity using guinea pigs. Pig trachea; rat stomach strip; guinea pig ileal preparation injections, with S. epidermidis-induced acute inflammation. The indicated that the extracts showed neither contractile nor muscle relaxant activity in isolated tissue preparations; however, they inhibited contraction induced by spasmogens.

5. Bacopa monnieri L. (Scrophulariaceae)

Ether, chloroform, methanol, and water extracts of B. monnieri leaves at concentrations of 10 mg/mL for mast cell stabilization activities in rats. The

result of the investigation showed that all inhibits mast cell degranulation in the extract significantly.

6. Cassia sophera (caesalpiniaceae)
C. sophera, also Cassia sophera, can be found in traditional treatment of asthma and bronchitis. Chloroform, ethyl acetate and ethanol fractions derived from the ethanol extract of the leaves of C. sophera has pronounced antiasthmatic properties activity in carrageenan-induced paw edema, histamine induced bronoconstriction, and drugs given were induced catalepsy, milk induced leukocytosis, eosinophilia and passive anaphylaxis in the paw in 250, 500, and 750 mg/kg doses and this activity could be attributed to presence of flavonoids.

7. Eclipta alba Linn (Asteraceae)
Antianaphylactic and anti-ulcer activities are manifested in the 50% ethanol extract, and it becomes antihistaminic activity at doses 250 and 500 mg/kg on degranulation of mast cell induced by compound 48/80, egg albumin induced passive Cutaneous and paw anaphylaxis; BAL study on guinea pig trachea. and determination of histamine.

Other herbal drug include:-
1. Adhatoda vasica (Vasaka)
Active constituent: Vasicine
Actions:
- Bronchodilator
- Expectorant
- Antitussive

Use: Chronic bronchitis, asthma

2. Ephedra sinica
Active constituent: Ephedrine
Actions: β-adrenergic stimulation → bronchodilation
Limitation: Hypertension, tachycardia

3. Glycyrrhiza glabra (Liquorice)
Active constituent: Glycyrrhizin
Actions:
- Anti-inflammatory
- Demulcent

Use: Soothing irritated airways

4. Tylophora indica
Actions:
- Anti-allergic
- Immunosuppressant

Use: Bronchial asthma

5. Curcuma longa (Turmeric)
Active constituent: Curcumin
Actions:
- Anti-inflammatory
- Antioxidant

6. Ocimum sanctum (Tulsi)
Actions:
- Bronchodilator
- Anti-allergic
- Immunomodulatory

IX. CONCLUSION

Asthma is a common chronic respiratory condition with a multifactorial pathophysiology process due to airflow variation. The heterogeneity of manifestations of varying intensity warrants a tailored diagnosis and treatment approach to ensure adequate control of the condition. Prompt recognition of the symptoms and starting appropriate treatment measures remain a key milestone in a successful treatment process. While inhaled corticosteroids form the cornerstone of chronic management of the condition, bronchodilators help to promptly relieve symptoms of the sudden attack. With rising research on biologics and herbal medications, these new options come as a boon to patients who experience persistent and uncontrolled attacks. Environmental control measures and patient education are equally vital in minimizing attacks and maximizing efficiency of treatment. While a cure to the condition appears to be distant at this stage, the condition can be successfully managed with a multidisciplinary approach. Further research on the different subgroups of the condition with a thrust on discovering new medications will definitely go a long way to optimize the treatment of the condition.

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