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Review Paper

Introduction of Asthma, Which is Treated by Bronchodilator

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ABSTRACT

Numerous comorbidities, including cardiovascular disorders, depression, diabetes mellitus, dyslipidemia, osteoporosis, rhinosinusitis, and primarily gastro-oesophageal reflux disease and allergic rhinitis, are frequently linked to asthma. Despite the fact that bronchodilators are crucial for treating asthma, their overall effects on comorbid asthma, whether positive or negative, are not well described. This narrative review investigates how bronchodilators may affect asthmatic comorbidities.

INTRODUCTION

Numerous comorbidities are frequently linked to asthma, which may impact the severity and clinical intensity of the condition [1]. Even while the prevalence of these comorbidities varies greatly between research, which may cause the significance of this link to be underestimated, we firmly feel that serious consideration of how we need to thoroughly examine the phenomena is necessary.

While inhaled corticosteroids (ICSs) are the mainstay of asthma pharmacotherapy, bronchodilators, including long-acting β_2 -agonists (LABAs) and/or long-acting muscarinic antagonists (LAMAs), are crucial adjunctive treatments when necessary, and short-acting β_2 -

agonists (SABAs) are recommended for prompt alleviation of asthma symptoms and bronchoconstriction [2].

Despite the fact that bronchodilators are crucial for treating asthma, their effects on comorbid asthma are not well described, regardless of whether favorable or negative.

In this narrative review, we plan to examine the potential effects of bronchodilators on comorbidities of asthma.

TYPES OF ASTHMA

Types of Asthma by Trigger

- **Allergic Asthma:**

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Allergens such as mold, dust mites, pollen, and pet dander can cause asthma symptoms.

- **Non-Allergic Asthma:**

Non-allergenic causes like stress, certain drugs (like NSAIDs, like aspirin), infections, or air pollution might cause symptoms.

- **Occupational Asthma:**

This kind is brought on by inhaling dust, fumes, gasses, or other materials from the workplace.

- **Exercise-Induced Bronchoconstriction (EIB):**

This disorder, which is also known as exercise-induced asthma, arises when physical activity causes airway restriction.

- **Cough-Variant Asthma:**

The persistent cough is the sole or main symptom.

SYMPTOMS

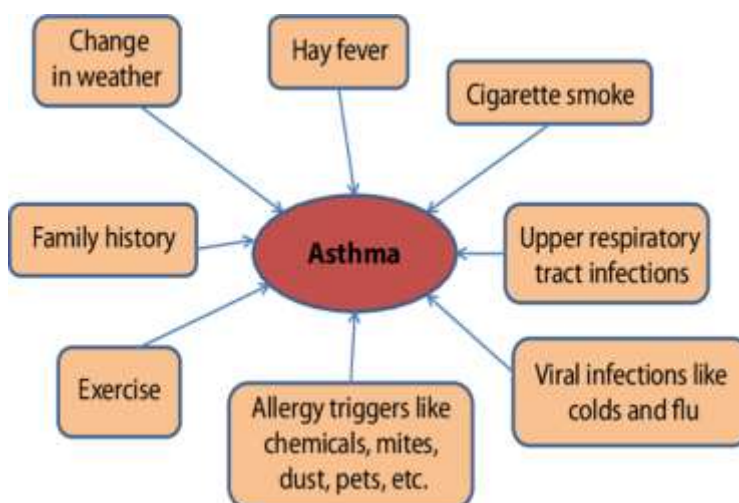
Symptoms of Asthma (Enlisted Form)

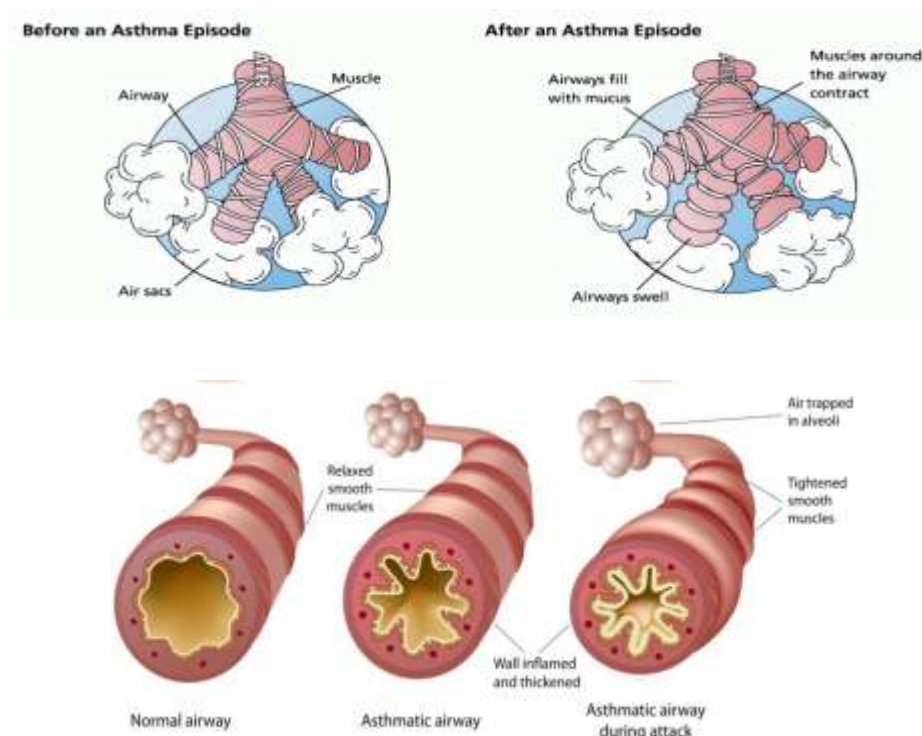
1. Breathlessness (dyspnea)
2. Whistling sound when breathing, or wheezing
3. Coughing, particularly in the early morning or at night

4. Tightness or pressure in the chest
5. Breathing difficulties when exercising or exposed to cold
6. Rapid respiration, or tachypnea
7. Weariness during or following exercise
8. Coughing or breathing issues that keep you from falling asleep
9. An increase in the production of mucous
10. Restlessness or anxiety during an asthma episode

CAUSES OF ASTHMA

1. Genetic susceptibility
2. History of allergies or asthma in the family
3. Environmental allergens, such as mold, dust mites, pollen, and pet dander
4. Tobacco smoke and air pollution
5. Exposure to dust or chemicals at work
6. Infections of the respiratory system, particularly viral
7. Changes in the weather (humidity, chilly air)
8. Some drugs (NSAIDs, β -blockers, aspirin)
9. Food preservatives and additives (sulfites)
10. Exercise-induced bronchoconstriction
11. Emotional strain or intense feelings
12. Low birth weight or premature delivery
13. Lack of breastfeeding in infancy
14. Exposure to second-hand smoke during childhood





HOW BRONCHODILATOR ACT ON ASTHMA

Mechanism of Action of Bronchodilators in Asthma

Drugs known as bronchodilators assist asthmatics breathe easier by relaxing and widening (dilating) their bronchial airways.

How Bronchodilators Work:

The bronchial smooth muscles relax and broaden as a result of their action on the surrounding muscles.

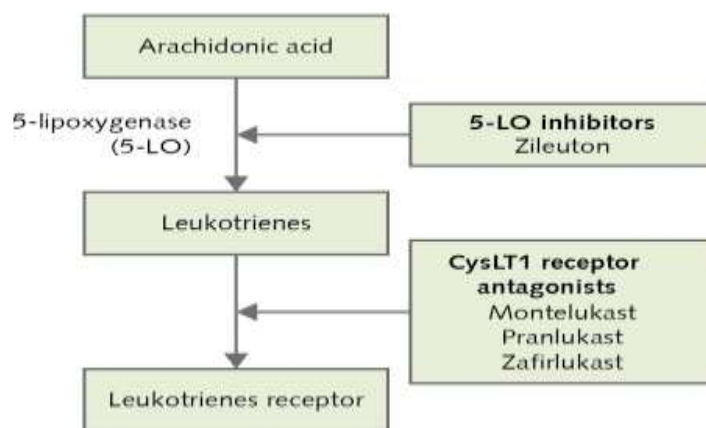
Decrease airway resistance and enhance oxygen flow by dilatation of the bronchi and bronchioles.

Reduce bronchospasm → They prevent or lessen airway constriction brought on by allergies, physical activity, or other causes.

Minimize asthma attack symptoms → Assist in relieving coughing, chest tightness, wheezing, and shortness of breath.

Types of Bronchodilators & Their Action

Type	Example Drugs	Mechanism of Action
β_2-adrenergic agonists	Salbutamol (Albuterol), Formoterol, Salmeterol	Stimulate β_2 -receptors → relax bronchial smooth muscle by increasing cAMP
Anticholinergics	Ipratropium bromide, Tiotropium	Block acetylcholine (ACh) on muscarinic receptors → prevent bronchoconstriction
Methylxanthines	Theophylline, Aminophylline	Inhibit phosphodiesterase enzyme → increase cAMP → relax airway muscles



MOA of bronchodilators

Bronchodilators Used in Asthma

Class/ Type	Examples	Mechanism of Action (MOA)	Advantages	Disadvantages/ Side Effects
1. β_2-Adrenergic Agonists	<i>Short-acting:</i> Salbutamol (Albuterol), Terbutaline <i>Long-acting:</i> Salmeterol, Formoterol	Stimulate β_2 -receptors in bronchial smooth muscle → \uparrow cAMP → muscle relaxation → bronchodilation	Rapid relief of acute attack (SABA) Long-term control (LABA) when combined with corticosteroids	Tremors, nervousness, tachycardia, tolerance on overuse
2. Anticholinergics (Muscarinic Antagonists)	Ipratropium bromide, Tiotropium	Block muscarinic (M_3) receptors → inhibit acetylcholine → prevent bronchoconstriction	Useful in patient's intolerant to β_2 -agonists Effective in COPD-asthma overlap	Dry mouth, throat irritation, headache
3. Methylxanthines	Theophylline, Aminophylline	Inhibit phosphodiesterase (PDE) → \uparrow cAMP → bronchodilation; also, mild anti-inflammatory effect	Oral route available Improves diaphragm contractility	Narrow therapeutic index, nausea, arrhythmia, insomnia
4. Combination Inhalers	Salmeterol + Fluticasone Formoterol + Budesonide	Combine bronchodilation (β_2 -agonist) and anti-inflammatory (steroid) actions	Dual benefit: long-term control + symptom relief	Costly, potential steroid-related side effects (oral thrush)

ADVANTAGES

- Provide quick relief from asthma symptoms
- Relax bronchial smooth muscles and open airways
- Improve airflow and oxygen supply to the lungs
- Reduce wheezing, coughing, and shortness of breath
- Useful in both acute attacks and long-term control (depending on type)
- Enhance effectiveness of inhaled corticosteroids when used in combination
- Improve exercise tolerance and daily activity

- Can be administered easily through inhalers or nebulizers
- Reduce frequency and severity of asthma attacks
- Improve overall quality of life for asthma patients

DISADVANTAGES

- may result in muscle shaking or tremors.
- may result in tachycardia, or elevated heart rate, or palpitations.
- Anxiety, restlessness, or nervousness may arise.
- You might feel lightheaded or have a headache.
- Irritation of the throat and dry mouth, particularly when taking anticholinergics.
- Theophylline, also known as methylxanthine, has a limited therapeutic range and a potential for toxicity.
- Sleeplessness, nausea, and vomiting are examples of potential adverse effects.
- Ineffective at reducing airway inflammation; corticosteroids are required for that.

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