

# **Bronchial Asthma Management**

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## BRONCHIAL ASTHMA

- INTRODUCTION
- CLASSIFICATION
- RISK FACTORS
- Diagnosis
- Treatment & Prevention



# INTRODUCTION

# Introduction

- **Asthma** is a chronic inflammatory disorder of the airways that is characterized:
    - *clinically* by recurrent episodes of wheezing, breathlessness, chest tightness, and cough, particularly at night/early morning.
    - *physiologically* by widespread, reversible narrowing of the bronchial airways and a marked increase in bronchial responsiveness.
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# Introduction

- In 2015, 358 million people globally had asthma, up from 183 million in 1990
  - It caused about 397,100 deaths in 2015, most of which occurred in the developing world.
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**CLASSIFICATION**

# Classification

## ➤ **Extrinsic /allergic :70%**

- Most common type
  - Environmental agent: dust, pollen, food, animal dander
  - Family history - present
  - Serum IgE levels - increased
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# Classification

- **Intrinsic /non-allergic( 30%)**
  - Triggered by respiratory tract infection
    - Viruses - most common cause
    - Family history uncommon
    - IgE level normal
    - No associated allergy
    - Cause- hyperirritability of bronchial tree
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# Classification

## ➤ Drug induced asthma

- Several pharmacologic agents
  - Aspirin sensitive asthma.
    - sensitive to small doses of aspirin.
    - Inhibits COX pathway
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# Pathophysiology

I. Chronic inflammation

II. Airway Hyperresponsiveness

# Pathophysiology

## I. Inflammation

- Chronic inflammatory state
  - Involves respiratory mucosa from trachea to terminal bronchioles, predominantly in the bronchi.
  - Activation of mast cell , infiltration of eosinophils & T-helper type 2 (Th2) lymphocytes
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# Pathophysiology

## I. Inflammation

- Exact cause of airway inflammation is unknown.
- Thought to be an interplay between endogenous and environmental factors.

### □ Endogenous factors

- Genetic predisposition to IgE mediated type I hypersensitivity
  - The major risk factor for asthma
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# Pathophysiology

## I. Inflammation

### □ Environmental factors

- ***Viral infections:*** Mycoplasma, Chlamydia
  - ***Air pollution***
  - ***Allergens***: house dust mite
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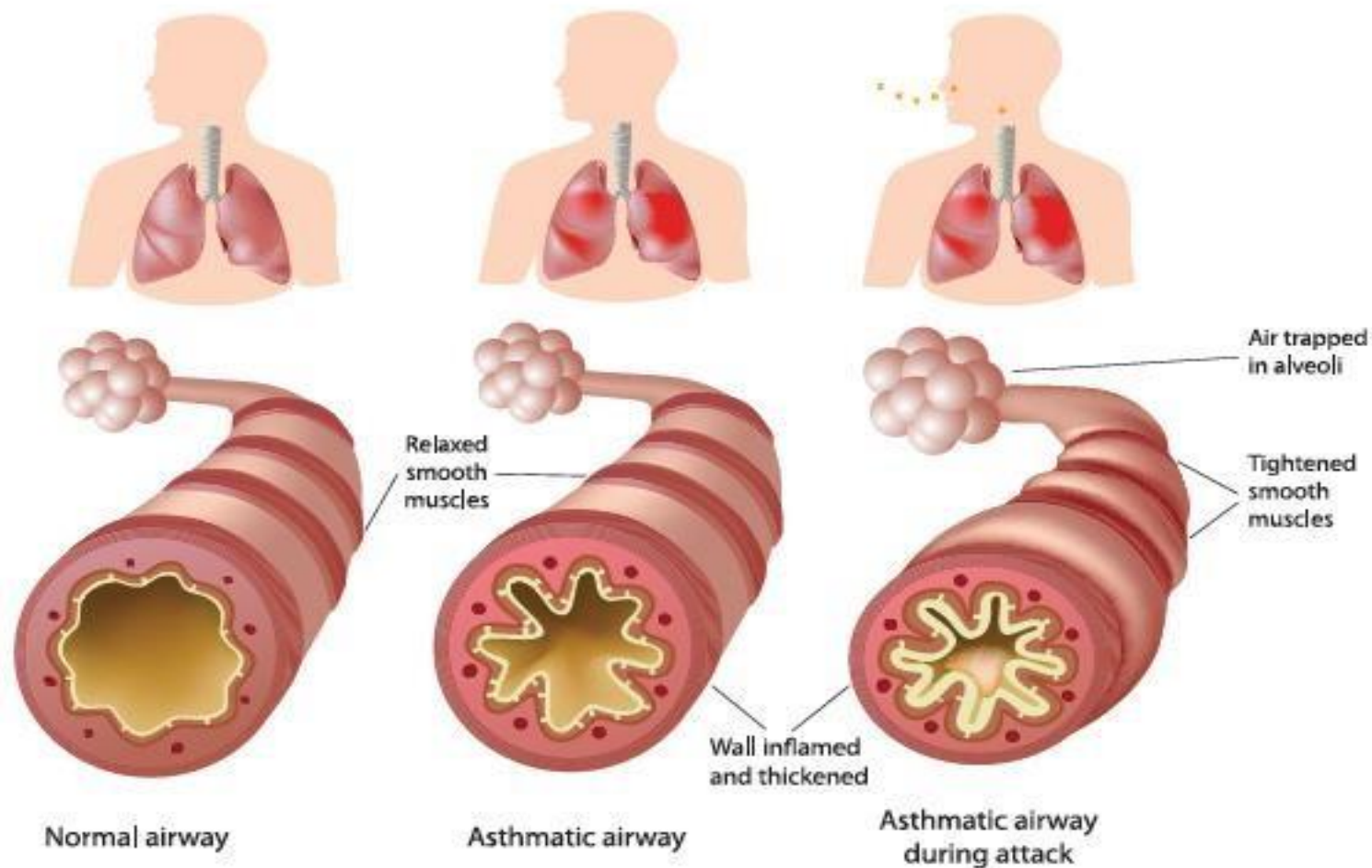


# Pathophysiology

## II. Airway Hyperresponsiveness (AHR)

- The excessive bronchoconstrictor response to multiple inhaled triggers that would have no effect on normal airways.
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# Pathophysiology





**RISK FACTORS**

# Risk factors

## ➤ Host factors:

- predispose individuals to, or protect them from, developing asthma
    - i. Genetic
    - ii. Gender
    - iii. Obesity
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# Risk factors

## ➤ Environmental factors:

- Indoor allergens , Outdoor allergens
  - Occupational sensitizers
  - Tobacco smoke , Air Pollution
  - Respiratory Infections
  - Diet
-



# Triggers

## □ Asthma Triggers

- Allergens
  - Virus Infections
  - Drugs
  - Exercise
  - Food
  - Air pollutants
  - Physical factors
  - Stress
-



**DIAGNOSIS**

# Clinical manifestations

## ➤ Symptoms

- Wheezing, dyspnea and cough.
  - Variable – both spontaneously and with therapy.
  - Symptoms worse at night.
  - Nonproductive cough
  - Limitation of activity
-

# Clinical manifestations

## ➤ Signs

- ↑respiratory rate, with use of accessory muscles
  - Expiratory sounds
  - No findings when asthma is under control
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# Classification for asthma severity

Grade	Symptoms	Night-time Symptoms
<b>Mild intermittent</b> متقطع	Symptoms $\leq 2$ times/week	$2 \geq$ times/month
<b>Mild persistent</b> متواصل	Symptoms $\geq 2$ times/week but $\leq 1$ /day	$2 \leq$ times/month
<b>Moderate persistent</b>	Daily Symptoms	$/1 \leq$ week
<b>Severe persistent</b>	Continued Symptoms Limited physical activity	Frequent



# Clinical manifestations



Dyspnea



Cough



Wheezing



Weakness



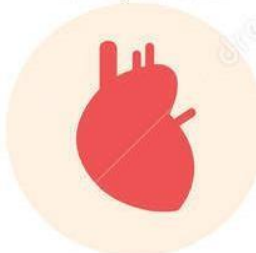
Night cough



Headache



Tachycardia



Allergy



Shortness of breath



# Laboratory diagnosis

## ➤ Pulmonary function tests:

- Using Spirometry
- Estimate degree of obstruction.



# Laboratory diagnosis

- **Chest X- ray**
  - **Arterial blood-gas analysis**
    - hypoxia & hypocarbia
  - **Sputum & blood eosinophilia**
  - **Elevated serum IgE levels**
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First Aid  
Surgeon  
Emergency

MEDICAL

Health Care  
Doctor  
Hospital

Health Care  
Doctor  
Hospital  
Pharmacist  
Nurse

**TREATMENT**

# Management

I. Non-Pharmacological

II. Pharmacological



# Non-Pharmacological

- Reduce exposure to indoor allergens
  - Avoid tobacco smoke
  - Avoid vehicle emission
  - Identify irritants in the workplace
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# Non-Pharmacological

- **Influenza Vaccination**
    - Should be provided to patients with asthma when vaccination of the general population is advised
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# Pharmacological treatment

## ❑ Classification of drugs

➤ **Bronchodilators** : rapid relief, by relaxation of airway smooth muscle

- $\beta$ 2 Agonists
- Anticholinergic Agents
- Methylxanthines

➤ **Controllers** : inhibit the inflammatory process

- Glucocorticoids
  - Leukotrienes pathway inhibitors
  - Cromones
  - Anti-IgE therapy
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# Pharmacological treatment

## ➤ $\beta$ 2 Agonists in asthma

- Potent bronchodilators.
  - Usually given by inhalation route.
  - Effects:
    - Relaxation of airway smooth muscle
    - Inhibition of mast cell mediator release
    - Increased mucociliary transport
    - Inhibition of sensory nerve activation
  - No effect on airway inflammation
-

# Pharmacological treatment

## ➤ $\beta$ 2 Agonists in asthma

### a) Short-Acting $\beta$ 2 Agonists

- E.g salbutamol
  - Rapid onset, without significant systemic side effect
  - Bronchodil. of **choice in acute severe** asthma
  - Used for symptomatic relief
  - Only treatment required for mild, intermittent asthma.
  - Use >2 times a week indicates need of a regular controller therapy.
-

# Pharmacological treatment

## ➤ $\beta$ 2 Agonists in asthma

### b) Long-Acting $\beta$ 2Agonists

- E.g salmeterol ,
  - Duration of action - >12 hrs.
  - Used in combination with inhaled corticosteroid therapy.
  - Improve asthma control
  - Should not be used as monotherapy (increased mortality)
  - Not effective **for acute bronchospasm.**
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# Pharmacological treatment

## ➤ Anticholinergic agents

- E.g Ipratropium bromide, tiotropium.
- Prevent cholinergic nerve induced bronchoconstriction.
- Less effective than  $\beta 2$  agonists.
- Use in asthma
  - Intolerance to inhaled  $\beta 2$  agonist.
  - Status asthmaticus –additive effect with  $\beta 2$  agonist

# Pharmacological treatment

## ➤ Anticholinergic agents

### ■ Ipratropium:

- Slow

### ■ Tiotropium:

- longer acting

- Dryness of mouth



# Pharmacological treatment

## ➤ Methylxanthines

- Medium potency bronchodilator
- E.g Theophylline, theobromine, caffeine
- Recently interest has declined in this class of drugs:
- Still widely used drugs especially in developing countries due to their lower cost.

# Pharmacological treatment

## ➤ Methylxanthines

### ■ Adverse effects

- Anorexia, nausea, vomiting, abdominal discomfort
- headache, and anxiety
- Seizures or arrhythmias

### ■ Doxophylline

- long acting, oral

# Pharmacological treatment

## ➤ Corticosteroids in asthma

- Effective drugs for treatment of asthma.
  - Development of inhaled corticosteroids is a major advance in asthma therapy.
  - Used prophylactically as a controller therapy.
  - Reduce the need for  $\beta_2$  agonist.
  - Benefit starts in 1 week but continues up to several months.
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# Pharmacological treatment

## ➤ Corticosteroids in asthma

- **Effects:** Broad anti-inflammatory effects:
    - Marked inhibition of infiltration of airways by inflammatory cells.
    - Modulation of cytokine and chemokine production
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# Pharmacological treatment

## ➤ Corticosteroids in asthma

### ■ Inhaled corticosteroids( ICS)

- Use of  $\beta$ 2Agonists >2 times a week indicates need of a ICS
  - E.g Beclomethasone , Fluticasone
-

# Pharmacological treatment

## ➤ Corticosteroids in asthma

- **Inhaled corticosteroids( ICS(**
- Adverse effects:
  - Oropharyngeal candidiasis, dysphonia
  - Decreased bone mineral density.
  - Skin thinning
  - Growth retardation in children

# Pharmacological treatment

## ➤ Leukotrienes pathway inhibitors

- a) Inhibition of 5-lipoxygenase, thereby preventing leukotriene synthesis. Zileuton.
- b) Inhibition of the binding of LTD<sub>4</sub> to its receptor on target tissues, thereby preventing its action. E.g Montelukast.
  - Oral route.
  - **Adverse effects**
    - Liver toxicity

# Pharmacological treatment

## ➤ Leukotrienes pathway inhibitors

- They are less effective than ICSs in controlling asthma
- Use in asthma
  - Patients unable to manipulate inhaler devices.
  - Aspirin induced asthma.
  - Mild asthma – alternative to ICS.
  - Moderate to severe asthma – may allow reduction of ICS dose



# Pharmacological treatment

## ➤ Cromones

- E.g Cromolyn sodium
  - On chronic use (four times daily) reduce the overall level of bronchial reactivity.
  - They are only of value when taken prophylactically.
  - Inhalation route
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# Pharmacological treatment

## ➤ Cromones

- May act by stabilization of Mast cells with inhibition of mediator release
  - **Uses**
    - Asthma - Prevention of asthmatic attacks in mild to moderate asthma
  - **Adverse effects**
    - Well tolerated drugs
    - Minor side effects- throat irritation, cough, and mouth dryness, rarely, chest tightness, and wheezing
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# Pharmacological treatment

## ➤ Anti-IgE therapy:

- Omalizumab أوماليزوماب
- Antibody targeted against IgE.
- **Action:**
  - IgE bound to omalizumab cannot bind to IgE receptors on mast cells and basophils, thereby preventing the allergic reaction

# Pharmacological treatment

## ➤ Anti-IgE therapy:

- Use in asthma
  - Persons >12 years of age with moderate-to-severe asthma.
- Omalizumab is **not an acute bronchodilator**
- Expensive drug
- Has to be given under direct medical supervision due to the risk of anaphylaxis

# Status asthmaticus (severe acute asthma)

- Severe airway obstruction
  - Severe dyspnea & unproductive cough
  - Sweating , central cyanosis ,tachycardia

# Status asthmaticus (severe acute asthma)

- **Treatment of Status asthmaticus**
    - High conc. of oxygen through facemask
    - Salbutamol in oxygen given immediately
    - Ipratropium bromide + salbutamol in oxygen, who don't respond within 15-30 min
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# Status asthmaticus (severe acute asthma)

- **Treatment of Status asthmaticus**
  - Terbutaline s.c. or i.v.
  - Hydrocortisone hemisuccinate i.v. , followed by infusion.
  - Endotracheal intubation & mechanical ventilation if above ttt fails

# Prophylaxis

- Preservation of the environment, healthy life-style (smoking cessation, physical training) – are the basis of primary asthma prophylaxis.
  - These measures in combination with adequate drug therapy are effective for secondary prophylaxis.
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