

## Chapter-2 | Pharmacotherapeutics | (b) Respiratory System

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### (b) Respiratory System

- Asthma
- COPD

**Introduction**—Exchange of gases during internal and external respiration is the major function of the respiration system.

Respiration system includes the vocal cords for producing sound, lungs for controlling body PH level and olfactory bulbs for smelling.

Respiration includes the ventilation of lungs for inward and outward movement of air alveolar air. Excretion of water vapour. Supplying air to the larynx for voice production.

### Asthma

**Definition**— **Asthma** is a condition in which our airways become narrow, swell up and become more glandular (produce extra mucus). This can make breathing difficult and trigger coughing, a whistling sound (wheezing) when we breathe out and shortness of breath.

The word “asthma” originates from the Greek meaning short of breath, meaning that any patient with breathlessness was asthmatic.

### Classification of Asthma—

- **Seasonal asthma**—Some of the people not tolerate even the minute changes in the season (cold, hot, rain). Due to seasonal variation allergic reaction also occurs, and leads to complicated if not treated during the starting conditions.
- **Allergic asthma**—Allergens (pollen, animal dander, dust etc.)
- **Occupational asthma**—In the chemical industries many chemicals cause the asthma.
- **Exercise-induced asthma**—Due the excessive exercise also leads the asthma.



- **Asthma-COPD overlap**— COPD (emphysema and Bronchitis) also responsible the hyper activity of the glandular activity of the mucosal cells and leads to the Asthma.

## Etiopathogenesis

1. It is arising due to the hyper- responsiveness of immune system causing variable and reversible airflow obstruction. Many factors for the hyperactivity include-
  - Allergens (pollen, animal dander, dust etc.)
  - Upper respiratory tract infections (URTIs).
  - Air pollution, cigarette smoke, other chemicals.
  - Drugs (aspirin, NSAIDS, Beta-blockers).
  - Food allergens, cold air and other etc.
  - Genetic factor includes HLA gene mutations, defects in bronchial airway epithelium.
2. When these factors are interacted with the respiratory/bronchial mucosa then cause the hypersensitivity reactions and stimulate/triggers the helper T-cell (TH1, TH2).
3. Stimulation of B-cells to produce IgE, which binds to mast cell surface. Now, activated Helper-T cells and IgE sensitized mast cells now line the airways.
4. Now again exposure with factors, activated mast cells release histamines, leukotrienes, and other inflammatory mediators which leads to vascular permeability (Oedema of airway mucosa), Glandular cell hyperplasia (more mucus secretion), Bronchial smooth muscle contraction.
5. In other ways helper T cell, and activated mast cell also secrete the cytokines and stimulate the maturation of the granular WBCs (eosinophils, basophils, neutrophils). Finally, these cells are migrated into the other passage like airways (leads to Bronchial contraction), eyes (conjunctivitis), nose (rhinitis) etc.
6. Repeated procedure leads to the Asthma condition.

## Clinical manifestations—

- Wheezing.
- Dyspnoea.
- Cough.
- Chest tightness/pain.
- Expiration may prolong.
- Thick, gelatinous sputum/mucus.



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- Cardiac diseases (tachycardia).

**Pharmacological managements—** For management of COPD general bronchodilator and fixed combination drugs are used.

## General bronchodilator

### 1. $\beta$ -agonists

- Short acting  $\beta$ -agonists (SABA).  
Ex- Albuterol/salbutamol, fenoterol, terbutaline.
- Long acting  $\beta$ -agonists (LABA).  
Ex- salmeterol, formoterol.

## General bronchodilator

### 2. Muscarinic antagonist (anticholinergic).

- Short acting (SAMA).  
Ex- Ipratropium.
- Long acting (LAMA)  
Ex- Acilidinium, tiotropium, glycopyrrolate bromide.

### FIXED COMBINATION.

- Albuterol + Ipratropium.
- Fenoterol + Ipratropium.
- Budesonide + Formoterol.
- Fluticasone + Salmeterol.

## Non-pharmacological management—

- Avoid the allergen which is responsible for the allergic condition.
- Avoid the smoking, drinking, chewing and risks factors which is responsible for other disease manifestations.
- Regular uses of home remedies and natural products in the daily life.
- Follow/doing the regular pranayama, yoga, exercise etc. to increase the lung capacity or health.
- Sometime diets plan also required to manage the disease so, always follow the rules and regulation which are regulated by our government.



## COPD

**Definition**—COPD (Chronic obstructive pulmonary disease) is a multifactorial entity with a wide range of clinical manifestations and leading cause of morbidity and mortality globally.

It is characterised by progressive, partially reversible airflow obstruction and lungs hyperinflation with significant extra pulmonary manifestations and comorbid conditions.

It is a group of progressive lungs disease. It is a preventable and treatable respiratory disorder largely caused by smoking, and long-term exposure to irritating gases and particulate matter. COPD often occurs in people exposed to fumes from burning fuel during cooking and heated in poorly ventilated homes.

**Symptoms**—Symptoms include breathing difficulty (Dyspnoea on exertion), cough, more mucus production (sputum), and wheezing.

### **Etiopathogenesis—**

- It is mainly cause by the smoking or allergic substances. Due to long term exposure with contaminant. Respiratory receptors are modified into the secretory/glandular receptors some extent and release the large amount of mucus and obstruct the path of air.
- In the smoking, heat is entering into the respiratory path and leads to damaging of the immunological cells or receptors create the resistance or functional deformity so it also leads to the COPD conditions.
- Some harmful gaseous present in the smoking and industrial waste which are particulate, enters into the alveolar sac or alveoli and accumulate by forming the ligand compound with alveolar chemical and leads to decrease the surface area of the alveoli.
- In about 1% of people with COPD, the disease results from the genetic disorder that cause low level of protein called alpha-1-antitrypsin. It is made in the liver and secreted into the blood stream.
- Two main causes of COPD—



1. EMPHYSEMA—Emphysema destroys the air sacs in the lungs and responsible for the fibration, reduce elasticity and surface decrease of the alveoli, so finally obstruct the gaseous exchange.

2. CHRONIC BRONCHITIS—It cause inflammation and narrowing of bronchial tube, which carry air towards lungs. It is characterized by daily cough and mucus production.

**Clinical manifestations**— COPD leads to many clinical manifestations.

- Heart disease- congestive heart disease, ischemic heart disease.
- Liver disease.
- Lung cancer.
- Respiratory infection (URTIs commonly include: Cough, Sore throat).
- Mental disorders.
- Pulmonary hypertension.
- Muscle fatigue etc.

**Pharmacological managements**— For management of COPD general bronchodilator and fixed combination drugs are used.

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## Non-pharmacological management—

- Cigarette smoking is the major causes of the COPD, so best management of COPD to avoid the smoking or to stop smoking now.
- Tobacco consumption also leads to this disease so prevent the tobacco chewing (for managing tobacco chewing, many type of the pharmaceutical chewing products are available so you can replace these with tobacco).
- Occupational exposure of chemical or particulate matter is another risk factor for the COPD, so you apply all the precautions during the working condition.
- COPD with pneumonia is also many time the cause of death so regular vaccination requires against Pneumococcal pneumonia.
- Try to avoid the industrial area and visit in good environmental conditions.
- Follow/doing the regular pranayama, yoga, exercise etc. to increase the lung capacity or health.
- Sometime diets plan also required to manage the disease so, always follow the rules and regulation which are regulated by our government.