Unit II – Problem 3 – Clinical: Asthma

- **Definition:**
  - It is a reversible obstructive lung disease in which there is hypersensitivity reaction of bronchial tree to different stimuli/triggers.

- **Pathophysiology:**
  - A stimulus will bind to IgE antibodies which in turn will bind to mast cells that will release different inflammatory mediators. The following changes will occur within the bronchial tree:
    - Increased mucous production.
    - Constriction of bronchial smooth muscle.
    - Edema and inflammation of bronchial mucosa.

- **Epidemiology:**
  - Commonly affecting young patients. 50% of them will be free of asthma when they reach adulthood.

- **Etiology:**
  - There are two types of asthma
    - Intrinsic (non-allergic): in 50% of asthmatic patients. Secondary bronchial reaction occurs due to non-immunologic stimuli (e.g. infection, exercise). Asthma attacks are severe and prognosis of this type is poor.
    - Extrinsic (allergic): in 20% of asthmatic. It results from sensitization and serum IgE levels are elevated. There is positive family history of allergic diseases (such as eczema). Prognosis of this type is good.

- Respiratory tract infections (most common cause of asthma exacerbations): RSV in children and rhinovirus in adults.

- Pharmacologic stimuli: aspirin and other NSAIDs which cause chronic over-secretion of leukotrienes that activate mast cells. This is the reason why leukotriene inhibitors (e.g. zafirleukast) are considered to be effective in managing asthma especially in children.
- **Clinical manifestations:**
  - Cough (might be worse at night).
  - Dyspnea (difficulty in breathing).
  - Tachypnea (increased respiratory rate)
  - Diffuse wheezing with prolonged expiration.

- **Diagnosis:**
  - **Labs:** elevated eosinphils > 4% and elevated serum IgE > 100 IU
  - **Pulmonary Function Test (PFT):** which will show an obstructive pattern (FEV1 < 80% and FEV1/FVC ratio < 80%). There is improvement by ≥ 12% in FEV1 after the use of bronchodilators. If PFT is normal but you still suspect the diagnosis of asthma → do methacholine challenge test → after which there will be a decrease of 20% in FEV1/FVC ratio.
  - **Chest x-ray:** although there might be signs of hyperinflation but it is not specific unless you want to rule out an infection as the trigger for asthma exacerbation.
  - **Arterial Blood Gas (ABG):** in patients with severe asthma, it will show respiratory acidosis with hypercapnia (↑CO2).

- **Treatment (NOTICE THAT ONLY TREATMENT FOR ACUTE EXACERBATION OF ASTHMA WILL BE DISCUSSED IN THIS NOTE. FOR MORE DETAILS ABOUT THE TREATMENT OF ASTHAMTIC PATIENTS PLEASE REVIEW PHARMACOLOGY NOTE):**
  - Oxygen supply with measurement of oxygen saturation by oximetry.
  - Short-acting B2-agonists (e.g. inhaled albuterol) which can be combined with inhaled ipratropium.
  - Intravenous steroids: methyl prednisolone.
    Notice that you do not need to know the doses as mentioned in your slides (not for your level).

- **What are the indications for hospitalization in patients with asthma?**
  - Rapidly worsening of asthma of lack of response for initial treatment in emergency department.
  - Confusion, drowsiness, signs of respiratory arrest (hypoxemia with PO2 < 60 mmHg or hypercarbia with PCO2 > 45 mmHg) or loss of consciousness.
  - Intubation is required because of continued deterioration of patient’s condition despite treatment.
  - Status asthmaticus (acute exacerbation of asthma).