Asthma: Types, Causes, Symptoms, Diagnosis and Treatment

Asthma is a clinical syndrome characterized by increased responsiveness(hyperresponsiveness) of the tracheobronchial tree to a variety of stimuli resulting in airway obstruction. The obstruction is due to inflammation, mucosal edema and mucus production, which varies in severity either spontaneously or as a result of treatment.

Inflammation leads to obstruction from mucosal edema, reducing airway diameter, and contraction of bronchial smooth muscles.

It results in recurrent episodes of wheezing, breathlessness, chest tightness, coughing especially at night or early morning

Risk Factors

- Can begin at any age
- Family history of asthma
- Allergy(strongest factor)
- Chronic exposure to allergens(grass,weed pollens,dust,animals)

Etiology of asthma

Asthma can occur as a result of :

-Factors that predispose to the development of asthma
-Factors that trigger asthma symptoms
-Interaction between genetic and environmental factors often a complex one

Host Factors

-Genetics: multiple genes
-A tendency to produce elevated IgE levels (atopy)
-Airway hyper-responsiveness
-Obesity: a recognized risk factor
-Male sex: asthma is twice as common in boys than girls < 14 yrs
-Relative smaller airways in boys
-Atopy and IgE sensitization higher in boys

Environmental Factors

-Allergens
-Indoor e.g. house dust mites, furred animals, cockroach
-Outdoor: pollen, fungi, molds
-Infections: (mainly viral) RSV in childhood confers a higher risk for later asthma
-Some viruses are protective? Non-allergic pathway

-Tobacco smoke (prenatal and postnatal)
-Pollution (outdoor –poor lung function)
-Diet (cow milk protein vs. exclusive breastfeeding)

Mechanisms of Asthma

Airway inflammation is a constant feature, this affects all airways although more prominent in medium-sized bronchi.

Inflammatory (immune)cells present mainly activated mast cells, eosinophils, T lymphocytes, NK cells, Macrophages, and neutrophils.

Airway smooth muscle cells, endothelial cells, fibroblasts.
Airway nerves: cholinergic .
Inflammatory mediators such as histamine, leukotrienes, PG D2, cytokines (IL4, IL5, etc)

Signs and symptoms

History

Patients present with a history of;

- Breathlessness,
- History of wheeze (recurrent attacks)
- Disturbing night time cough
- Cough or wheeze after exercise or exposure to allergens
- Persistent colds
- Relief by asthma treatment
- History of exercise-induced broncho-constriction

Physical examination shows:

Mild attack characterized by wheezing, pulse less than 100/min, BP normal, RR less than 20/ min. Moderate characterized by wheezing with cough, sweating, pulse 100–120, RR 20–30/min, and BP is normal.

Severe characterized by cyanosis, pulse 120/min, RR 30/min, pulsus paradoxicus, respiratory distress in an upright position, and may have a silent chest.

Chronic which is a mild attack all the time.
Status asthmaticus whereby a moderate or severe attack not responding to conventional therapy or it persists for more than 12 hours.

Diagnostic investigations

Chest x-ray: Posterior Anterior, erect.
Peak expiratory flow rate (PEFR)
Forced expiratory volume in the first second (FEV1)
Maximal mid-expiratory flow rate (MMEFR)

PETR, FEV1, and MMEFR are all decreased in acute asthmatic attack.

Treatment of asthma

Mild asthma

Subcutaneous adrenaline 1:1000 0.5ml STAT, repeat after 20–30 minutes if there is no response (up to a total of 3 doses).

If there is a response, discharge on salbutamol 4mg TDS for 1 week OR theophylline 200–250mg BD or TDS.

Inhaled medium acting B2 agonist such as albuterol, terbutaline, dibuterol, and metaproterenol.

Moderate asthma

Adrenaline as above up to 3 doses of salbutamol and ipratropium bromide nebulization every 20 minutes till response or patient gets tremors. If no response, IV aminophylline 6mg/kg slowly over 15 minutes, and then 0.9/mg/ kg/hour.

If there is a good response, discharge on salbutamol 4mg TDS for 1 week OR theophylline.

If no response, treat as severe asthma. Oral and inhaled corticosteroid or anti leukotriene, or inhaled theophylline. An inhaled B-agonist should be added to any of these as needed.

Severe asthma

Give oxygen 3–5 L/min if cyanosed
IV aminophylline 0.9mg/kg/hour in normal saline drip after a loading dose if not already given. IV hydrocortisone 200mg STAT or methylprednisolone 1g IV STAT or dexamethasone 2–4mg IV/IM STAT.

Oral prednisone 10–15mg TDS on admission, tail off in 7–10 days.

Inhaled corticosteroid. Or long-acting inhaled B-agonist, or anti leukotriene, or theophylline.

Give amoxicillin or cotrimoxazole or tetracycline.

Chronic asthma

Salbutamol 4mg TDS orally or salbutamol inhaler or steroid inhaler.

If poor response then prescribe oral theophylline 100–200mg TDS.

Status asthmaticus

Treat as severe asthma