PHARMACOLOGY

- Pharcodynamics :- What the drugs do to the body.
- This includes, physiological and biochemical effects of drugs and their mechanism of action at Macromolecular/ subcellular , organ/system levels.

Pharmacokinetics:- What the body does to the drug.

Process:-

1. Enter the body
2. Reach the site of action
3. Metabolism
4. Exit the body

- Pharmcokinetics as the basis of medication Action:- For medication to be therapeutically useful they must be taken into a clients body, must be absorbed and distributed to cells, tissues or specific organ and must alter its physiological functions.

- Absorpition:- Passage of medication molecules into the blood from its site of administration.
- Factors influencing absorption:-

1. Route of administration.
2. Ability of the drug to absorb
3. Blood flow to the area.

- Body surface area:- When the medication is in contact with large surface area it has a fast absorption rate.
- Eg: Majority of the medications are absorbed in the small bowel than in the stomach.

- Lipid solubility of medication:- Medications that are highly lipid soluble are absorbed easily. They rapidly cross the cell membrane because it made up of lipid layer.
- Administered with food or with out food.

- Distribution of drugs:- After the medication is absorbed it is distributed to tissues and organs and ultimately to its specific site of action. The rate and extend of distribution depend on the physical and chemical properties of medication and the physiology of the person taking the medication.

- 1 Circulation:- depends on the vascularity of the various tissues and organs.
- Membrane permeability:- to be distributed to an organ a medication must pass all of the biologic membrane , organ, or tissues.
- Some membrane may serve as barriers to the passage of medication.

- **The blood brain barrier allows only fat-soluble medications to pass into the brain and CSF. CNS infections require treatment with antibiotics injected to subarachnoid space in the spinal cord.**
- **Placenta is a nonselective barrier to medication. Fat and non-fat soluble agents cross the placenta.**

- Protein binding:- The degree to which medications bind to serum proteins affects its distribution . Most medications bind to this protein to some extend. When medications binds to protein it cannot exert any pharmacological action. The unbound or free medication is the active from. Older people and patients with liver disease have a decrease in albumin in the blood, so there is increase in medication activity or toxicity of both.

- Metabolism:- After the medication reaches the site of action it is metabolized into a active or less active or inactive form which is easily excreted. Biotransformation occurs under the influence of the enzymes that detoxify, degrade (Breakdown) and remove biologically active chemicals. Most biotransformation takes place in the liver.

- Excretion:- After the medication has been metabolized they exit the body through kidney, liver, bowel, lungs and exocrine glands.
- Gaseous and volatile compounds exit through lungs. Deep breathing and coughing help the post operative client to eliminate anesthetic gases more rapidly.

- Type medication action:-
- Therapeutic effects:- is the expected or predicted physiological response. A simple medicines may have many therapeutic effect
- Eg: Aspirin., Paracetamol.
- Side effects:- are the unintended second degree effects.

- **Adverse effects;- Severe response to medication.**
- **When a medication is prescribed the goal is a constant blood level within a safe therapeutic range. Repeated doses are required to achieve a constant therapeutic concentration of medication because a portion of a medication is always be execrated.**

- The highest serum concentration usually occurs just before the last of the medication is absorbed. After peaking the serum concentration falls progressively.

- Serum half life:- is the time it takes for excretion process to lower the serum concentration by half. To maintain a therapeutic plateau the cleint must receive regular fixed doses.

Drugs used in the Respiratory System.

- Drugs for Cough:- Cough is a protective reflex, its purpose is expulsion of respiratory secretions of foreign particles from air passages. It occurs due to stimulation of mechano or chemoreceptor in the lungs. Cough may be useful or useless . Non productive cough are useless and therefore it should be suppressed.

- The productive cough serves to drain the airway, therefore it should not be suppressed. Apart from specific treatment (antibiotic) it may be treated as a symptom with –
- Pharyngeal demulcents – Lozenges, Cough drops , Linctus containing syrup.

- Expectorants – These drugs increases bronchial secretions or decrease viscosity and facilitate its removal by coughing.
- Preparations available:- Sodium and potassium citrate- They increase bronchial secretion by salt action.
- Potassium iodide – Secreted by bronchial gland and irritant to the bronchial walls.

- Guaiacol- They directly increase bronchial secretions and mucosal ciliary action.

Mucolytics

Bromhexine – It produces thin copious bronchial secretion. It depolymerises mucopolysaccharides directly as well as by liberating lysosomal enzyme network of fibers in teneous sputum is broken.

Dose:- 8mg TID (Adult) 4mg BD (Children)

- **Antitussives – are drugs act on the CNS to raise the thresh hold of cough center or act peripherally in the respiratory tract to reduce tissuel impulses or both actions. They are used to control cough. They should be used only for dry unproductive cough or if the cough is tiring, disturbs sleep or hazardous. (hernia, piles, cardiac diseases and ocular surgeries.**

OPIOIDS.

- Codine:- is an opium alkaloid qualitatively similar to but less potent than morphine. It is more selective for cough center and is treated as the standard antissive. It suppress cough within 6 hours. At higher doses respiratory depression and drowsiness can occur.
- Dose:- 10- 30 Mg for adult.

- Pholcodine;- It has practically no analgesic or addicting property, but similar in efficacy as antitussues to codeine and is long acting. Act for 12 hours or more.
- Dose : 10 – 15 mg.

- Non- Opioids –
- Noscapine – is an opium alkaloid of the benzoisoquinoline it depresses cough, but has no narcotic , analgesic and dependence inducing properties.
- Side effects:- drowsiness, headache, nasal congestion, burning sensation in the eye, puritis skin eruptions, constipation, nausea.

- **Antihistamines – The relief of cough due to the sedative and anticholinergic actions.no expectorant action, may even reduce secretion by anticholenergic action. They have been specially promoted for cough in respiratory allergic states.**

- **Side effects-** drowsiness, sedation, dizziness, faintness, disturbed coordination, fatigue, confusion, hypotension, palpitation, bradycardia, tachycardia, anorexia weight gain, constipation, nausea, urinary frequency, dysuria, urinary retention, early periods, decreased libido, dry mouth nose and throat, thickening of bronchial secretions,

DRUGS USED IN BRONCHIAL ASTHMA.

- BA is characterized by hyper responsiveness of tracheo-bronchial smooth muscle to a variety of stimuli, resulting in narrowing of airway, often accompanied by increased secretion, mucosal edema and mucous plugging.

- Drugs used
- A. Sympathomimetics – Adrenaline, Ephedrine, Isoprenaline, Salbutamol, Terbutaline, Bambuterol, almeterol, Formoterol.
- B. Methylxanthines – Theophyline
- C. Anticholinergics – Atropine methonitrate, Ipratropium bromide.

- 2. leukkotrine Antagonists
- 3. Mast cell stabilizers – Sodium cromoglycate.
- 4. Corticosteroids – A. **Systemic – Hydrocortisone, Prednisolone.**
- **Inhalational-** Belcomethasone
- Budesonide, propionate, flunisolide.

- Sympathomimetics;- Adrenergic drugs cause bronchodilation through Beta receptor stimulation increased AMP(Adinosine Mono-Phosphate) formation in bronchial muscle cell leading to relaxation. In addition increased AMP in mast cells and other inflammatory cells decrease mediator cells.
- Eg; Adrenaline – an B1 B2 agonist causes prompt but shot lasting bronchodilation.

- Ephedrine – It has alpha, beta 1and 2 actions causes mild slowly developing bronchodilatation lasting 3 – 5 hours.
- Isoprenaline – Beta1 and 2 agonist causes prompt and marked bronchodilation lasting 1- 2 hours.

- Salbutamol – highly selective beta agonist.
- Therapeutic actions- In low doses, acts relatively selectively at bet2 adrenergic receptors to cause broncho and vascular dilatation.
- At higher doses beta 2 selectively is lost and the drugs acts at the B2 receptors to cause typical sympathomimetic cardiac effects.

- **Indications:- Relief and prevention of bronchospasm in patients with reversible obstructive airway disease.**
- **Treatment of acute attacks of bronchospasm.**
- **Prevention of exercise induced bronchospasam.**
- **Treatment of serious hyperkalemia in dialysis patients.**

- Available forms – Asthaline, Tab 2-4 mg. 4-8mg SR.
- Syrup- 2mg in 5ml.
- 100 – 200 micro-gram for inhalation.
- 0.25 – 0.5 me IM/SC.

- Pharmacokinetics:-
- Route Onset Peak duration
- Oral 30mts 2-2.5hr 4-8 hr.
- Inhalation 5mts 1.5-2hr 3-8hr

- Metabolism- Liver.
- Distribution – Crosses placenta, pass to breast milk.
- Excretion – Urine.

- Adverse effects:-
- CNS – Restlessness, anxiety, insomnia, tremor, drowsiness, irritability, weakness, vertigo, headache.
- CVS – Arrhythmias, tachycardia, palpitation.
- Derma – Sweating, pallor, flushing.
- GIT – Nausea, vomiting, heartburn, bad taste.
- Resp – Pul edema, cough, bronchospasm.

- Terbutaline:- In low doses, it acts relatively selectively, at B2 adrenergic receptors to cause broncho dilation and relax the pregnant uterus.
- Pharmacokinetics-
- Route onset peak duration
- Sc 5-15mts 30-60mt 1.5-4hrs.
- Oral 30mts 2-3hrs 4-8hrs.

- Available forms- Tab 2.5 -5mg. Inj 1mg/ml.
- Adverse effects –
- CNS- restlessness, apprehension, anxiety, fear, drowsiness, irritability, weakness, headache.
- CVS – Arrhythmias, palpitations, changes in BP.
- Resp- Cough, Bronchospasm.

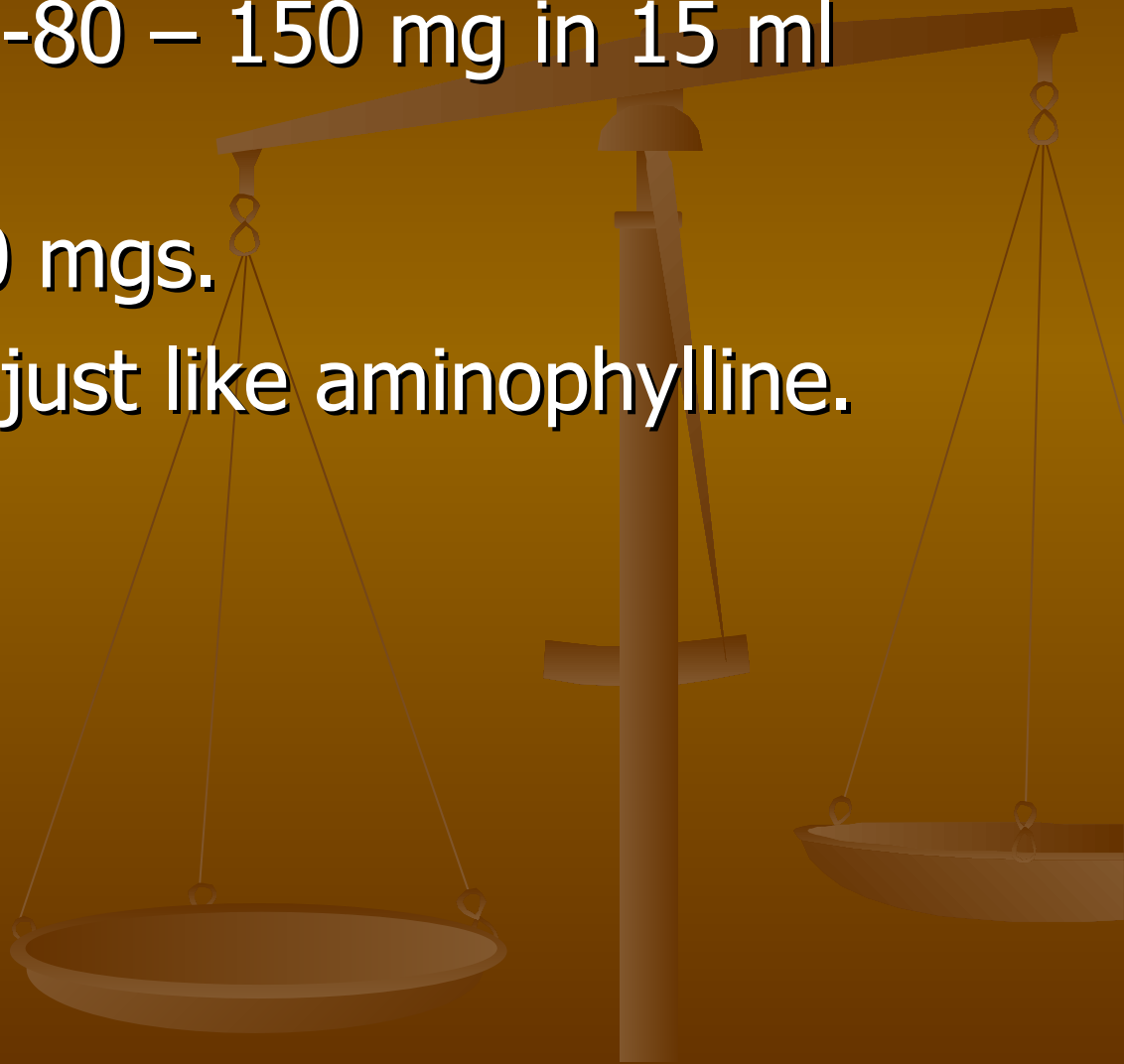
- Methylxanthines
- Aminophylline – Relaxes bronchial smooth muscles causing bronchodilatation and increasing vital capacity, which has been impaired by bronchospasm and air- trapping.

- Indications- Symptomatic relief or prevention of B- asthma and reversible bronchospasm associated with chronic bronchitis and emphysema.
- Sid-effects – Peptic ulcer, gastritis, rectal or colonic irritation.
- Preparations available – Tab- 100-200mg.
- Inj 250 in 10 ml, suppositories – 250 – 500mg.

- Pharmacokinetics –
- Route onset peak duration
- Oral 1-6 hrs 4-6 hrs 6-8 hrs
- Metabolism – Liver
- Distribution – cross placenta, passes into B milk.
- Execration - urine.
- IV – 100-200 Ml 5%dext/DNS
- IV bolus- should be given very slowly.

- Theophylline – Relaxes bronchial smooth muscle causing bronchodilation and increasing vital capacity that has been impaired by bronchospasm and air-trapping. Actions may be mediated by inhibiting phosphodiesterase, which increases the concentration of cyclic adenosine monophosphatein concentrations that may be higher than those reached clinically. It also inhibits the release of slow reacting substance of anaphylaxis and histamine.

- Available forms:-80 – 150 mg in 15 ml (syrup).
- Tab – 100 – 300 mgs.
- Adverse effects just like aminophylline.



MAST CELL STABILIZERS.

- Sodium Cromoglycate – is a synthetic chromine derivative which inhibits degranulation of mast cells by trigger stimuli. Release of mediators of asthmas like histamine interlukins etc, from mast as well as other inflammatory cells are prevented. Long term treatment decreases the the cellular inflammatory response, bronchial hyperactivity and decreased. Bronchospasm induced by allergens , irritants, cold air and exercise may be prevented.

- Pharmacokinetics- It is not absorbed orally. It is administered as aerosol through metered dose inhaler delivering 1mg per dose. 2puffs*4times a day.
- Uses – Bronchial asthma – used as a long term prophylactic in patients not adequately controlled by inhaled bronchodilators, frequency and severity of asthmatic attack is reduced and lung function is improved.

- Allergic rhinitis as nasal spray.
- Allergic conjunctivitis.
- Fintal inhaler – 1mg metered dose aerosol. 2 puffs 4 times a day.
- Fintal nasal spray and eye drops.
- Adverse effects – bronchospasm, throat irritation, arthralgia, rashes and dysuria.

- Ketotifen – It is an antihistaminic with some chromoglycate like action, stimulation of immunogenic and inflammatory cells and mediator release is inhibited. It is not a bronchodilator but produces sedation.
- After 6 -12 weeks of use it reduces resp. symptoms in 50-60% of patients with Br.A.

- Other indications – Atopic dermatitis, rhinitis, conjunctivitis.
- Dose – 1-2 mg Bd. Children – 0.5mg Bd.
- Adverse effects- sedation, dry mouth, dizziness, nausea weight gain.

- Corticosteroids.
- These are not bronchodilators. They reduce bronchial hyperactivity, mucosal edema and suppress inflammatory response to Ag: SB reactions or other tiger stimuli.

- Coricosteroids provides more complete and sustained symptomatic relief than bronchodilators. However long term systemic steroid therapy has its own adverse effects.

- Side- effects:- facial hair in females (Hirsutism), Gyenacomastica, buffalo hump, moon face, edema, weight gain, easy bruising, growth retardation HTN, DM.

- Inhailed steroids – They have high topical low systemic activity.
- Drugs available:- Fluticasone (Flouase, Flovent)
- Budesonide(Entocort, Pulmicort, Rinocort)
- Belcomethassone (Beconse, Vanceril)
- All these have similar properties.

- Action:- Suppress bronchial inflammation.
- Increase peak expiratory flow rate
- Decrease the need for rescue b2 agonist inhalations
- Prevent episodes of acute asthma.
- Dose- 100-200ug Bd. Go up to 400 ug QID. Beyond this there is no further bnenefit.

- Patient consideration- Instruct the patient to rinse the mouth after each dose to prevent oral candidacies.
- Explain the side-effects of inhaled steroids. They are –
- Oral candidacies, Irritation and burning of the nasal mucosa. Hoarness and dry mouth.

- Systemic steroid therapy –
- Indications – Severe Chronic Asthma- Not controlled by bronchodilators and inhaled steroids. When there are frequent recurrences of increasing severity.
- Dose – Prednesolone 20 – 60 Mg OD for 1-2 week, when there is good control taper it down and finally try shifting into inhald steroids.

- Status Asmatics/Acute Asthma/ Exacerbation
- Asthma attack not responding to intensive bronchodilator therapy – start with IV glucocorticoid which generally act within 6-24 hrs, then shift to oral therapy and then discontinue.