

Drug Therapy In Pediatric & Geriatric Age Groups

- Neonate \Rightarrow 1st month
- Infant \Rightarrow Day zero to 1 year
- toddler \Rightarrow 1 year to 2 years

- Geriatric \Rightarrow 65 yrs \uparrow

Objectives

- a. Discuss the principles of prescribing in pediatric and geriatric age groups. *⇒ don't write them a prescription like the Adult, especially the dose*
- b. Discuss the **pharmacokinetic** and **pharmacodynamics** differences in pediatric, geriatric and adult age groups. *There is always a difference when you get older and older*
- c. Describe how the **efficacies** of drugs vary according to age.
- d. Describe different pediatric dosage forms & compliance in children.
- e. Discuss important adverse drug reactions occurring in geriatric & pediatric age groups.

What is different from normal adult prescribing?

Why Children cannot be regarded as miniature adults in terms of drug response, due to differences in body constitution, drug absorption and elimination, and sensitivity to adverse reactions. *?*



Pediatric Group – Pharmacokinetics

Absorption:

- Gastro-intestinal absorption is slower in infancy, but absorption from intramuscular injection is faster. *PH is different and the construction of the stomach and intestines is not completed yet!*
- Infant skin is thin and percutaneous absorption can cause systemic toxicity. *High blood supply.* *dose ⇒ Be careful*

Distribution:

- Lower volume of distribution of fat-soluble drugs (e.g. diazepam) in infants. *Because % of fat in the body is low.*
- Plasma protein binding of drugs is reduced in neonates. *The body is not fully formed yet*
- Blood-brain barrier is more permeable in neonates and young children, leading to an increased risk of CNS adverse effects. *Why the young children are more vulnerable to CNS ADR's?*

Metabolism:

- At birth, the hepatic microsomal enzyme system is relatively immature.
- Drugs administered to the mother can induce neonatal enzyme activity (e.g. barbiturates).

نبتہ ہی بالغ
→

↳ By Breast feeding
through the Milk.

Excretion:

- All renal mechanisms (filtration, secretion and reabsorption) are reduced in neonates. ^{Ex:} ⇒ # of Nephrons are less, Not fully formed kidney.

- Subsequently, during toddlerhood, it exceeds adult values, often necessitating larger doses per kilogram. E.g. the dose per kilogram of digoxin is much higher in toddlers than in adults.

→ 1-2 years

↳ give it higher, why? the excretion is higher than adults.

PHARMACODYNAMICS

- Apparently paradoxical effects of some drugs (e.g. hyperkinesia with phenobarbitone, sedation of hyperactive children with amphetamine) are as yet unexplained.
Q) → on drug that has,
For Adult ← sedative
→ Awakening of CNS

- Augmented responses to warfarin in prepubertal patients occur at similar plasma concentrations as in adults, implying a pharmacodynamic mechanism.
ما قبل البلوغ

*بالنسبة لـ Warfarine
Adult - لماذا؟
why?*

PEDIATRIC DRUG DOSAGE

- Most drugs approved for use in children have recommended pediatric doses, generally stated as milligrams per kilogram.
- Calculations of pediatric dosage:
 - Surface area based (Young's formula): $Dose = Adult\ Dose \times \frac{Age(years)}{Age+12}$
 - Body weight based (Clark's rule): $Dose = Adult\ Dose \times \frac{Weight(kg)}{70}$
Most pediatric physicians go w/ this law



ADVERSE EFFECTS ?

- With a few notable exceptions, drugs in children generally have a similar adverse effect profile to those in adults.

Remember: They have thin skin

Some specific ADR examples are;

Some ointment/lotions have corticosteroids in 'em, so you have to be careful on how much you put on the babies skin!

- chronic corticosteroid use, including high-dose inhaled corticosteroids, to inhibit growth
- Tetracyclines are deposited in growing bone and teeth, causing staining and occasionally dental hypoplasia → Teeth takes color. Inhibiting bone growth
- Fluoroquinolone antibacterial drugs may damage growing cartilage
- Dystonias with metoclopramide occur more frequently in children and young adults than in older adults
- Valproate hepatotoxicity is increased in young children

Involuntary repeated contraction in muscles all

PEDIATRIC DOSAGE FORMS & COMPLIANCE

- Children under the age of five years may have difficulty in swallowing even small tablets, and hence oral preparations which taste pleasant are often necessary to improve compliance. (Elixirs & Suspensions)
↳ That's why there is a syrup. *الطاعة للطبيب*
- Pressurized aerosols (e.g. salbutamol inhaler) in children over the age of ten years, as coordinated deep inspiration is required. Nebulizers may be used.
↳ Inhaler Device
- Children find intravenous infusions uncomfortable and restrictive. Rectal administration is a convenient alternative (e.g. metronidazole to treat anaerobic infections). Rectal diazepam is particularly valuable in the treatment of status epilepticus. Rectal administration should also be considered if the child is vomiting.
↳ may be afraid

Ⓢ All the following are Inclusion of Rectal Administration, except?

Rules of prescribing for Pediatric populations

- Calculate the doses for prescribed drugs based on weight of the patients.
- Ensure proper instructions to the ^{→ Usually parents} care giver, including when the child vomits the given medication after consumption.
- Ensure that all medicines are strictly out of reach of children at all times. ^{→ misuse + abuse}
- Avoid prolonged treatment with drugs that have delayed complications (Steroids).
- Use antibiotics sparingly and only when required. <sup>@ don't give an antibiotic right away!
because too much of them will cause resistance!</sup>
- Medications affecting the CNS need to be extensively reviewed and routinely monitored to ensure minimal growth disturbances.

Older patients are not slowed
down adults!!!!

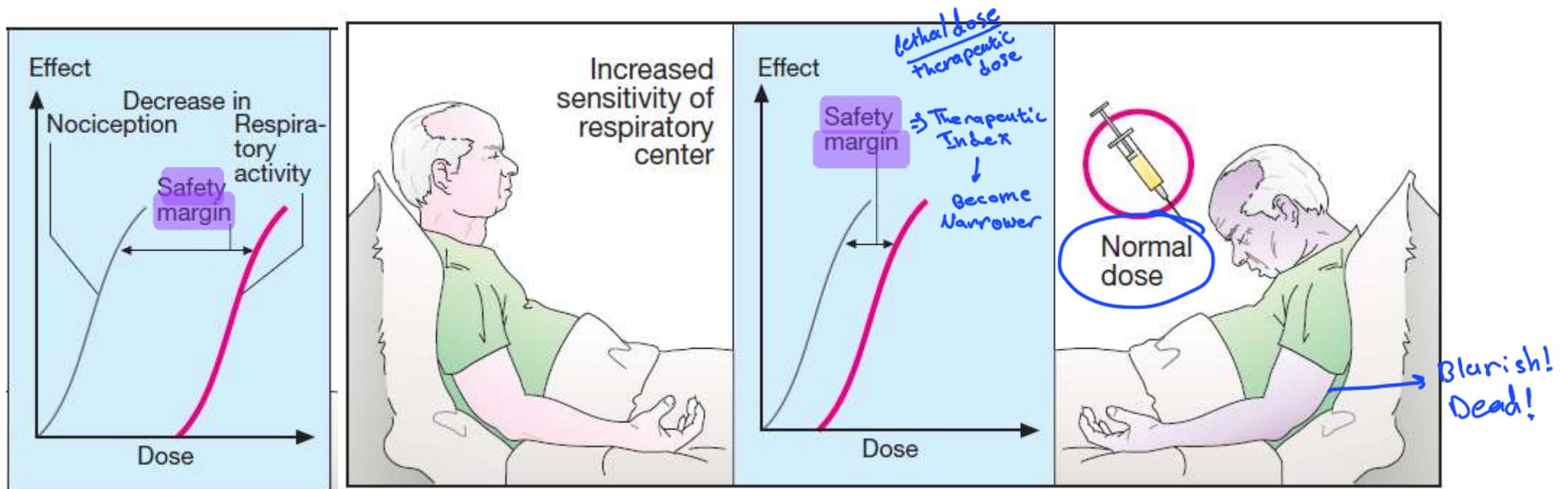


Geriatric Group - Pharmacokinetics

- **Absorption:** Little evidence of any major alteration in drug absorption with age. However, conditions associated with age may alter rate at which some drugs are absorbed. (Diabetic gastroparesis, laxative abuse)
وقتہ طویل پافشاء دستویا دیکھا! دستہ بہتہ مع ۱
*پرستاج لہا یا خذہ! کد م پھر کد
خی لہ آئی و ما پھرچ اکا لہ یا خذہ ہالط*
- **Distribution:** Elderly have reduced lean body mass, reduced body water.
- **Metabolism:** Capacity of liver to metabolize drugs does not appear to decline consistently with age for all drugs.
- **Elimination:** Kidney is major organ for clearance of drugs from body, age-related decline of renal functional capacity is important.

Pharmacodynamics

- Geriatric patients believed to be much more "sensitive" to action of many drugs, implying a change in pharmacodynamic interaction of drugs with their receptors. BUT, most of these are a result of changing Pharmacokinetics!



B. Adverse drug effect: increased sensitivity

Rules of prescribing for the elderly

- Think about the necessity for drugs. ②
- Avoid drugs with negligible or doubtful benefits. ④
- Think about the dose. ⑥
- Think about drug formulation. ⑤
- Assume any new symptoms may be due to drug side-effects. ⑧
- Take a careful drug history. ①
- Use fixed combinations of drugs rarely. ⑦
- Check Compliance. ⑨
- Think before adding a new drug to the regimen. ③
- Stopping is as important as Starting. ⑩

pre take \Rightarrow 1-7
Post take \Rightarrow 8-10

Geriatric Prescribing - ADRs

ADRs and Age

- Incidence of ADR increases with age
- Elderly receive more medicines *poly pharmacy.*
- Incidence of ADR increases the more prescribed medicines taken
- For patients aged > 50 yrs
 - ADR rates – 5% for 1 or 2 medicines
 - Increased to 20% when >5 medicines

Most frequent drug classes causing ADRs

- Cardiovascular active agents
- Analgesics (opioid mainly)
- Antibiotics
- Hypoglycemic agents
- Psychotropic agents *- old Age w/ chronic disease? they need Anti-depressants. - studies showed more improvement w/ the*
- Anticoagulants

THANK YOU