PAEDIATRIC AND GERIATRIC PHARMACOLOGY
SUNALI MEHTA

Pediatric, the elderly and pregnant women are termed as vulnerable groups in pharmacology and the reason being that these groups react differently to the drugs.

Drug sensitivity in
Young children : due to organ immaturity
Elderly : organ system degeneration
Pregnant women: change in the body to compensate for the growing fetus.

Pediatrics:
All patients under the age of 16

A. Pharmacokinetics:
Absorption
Slowed gastric emptying
Reduced gastric acidity
Poor peripheral tissue perfusion
Decreased skeletal muscle mass.

Distribution:
Higher water/fat ratio
Lipid membranes more permeable especially blood brain barrier
Protein binding will be reduced.

Metabolism:
Reduced in neonates
Takes 3 years for the child's liver to develop into an adult's liver and have the same amount of enzymes
Older children may have relatively greater liver activity

Excretion:
Neonates diminished Glomerulus filtration and tubular excretion hence reduced clearance of drugs
Older children same as adults.

B. Pharmacodynamics:
Some drugs will have a reduced effect in neonates e.g. digoxin
Others may have an increased effect in neonates e.g. CNS depressants.

C. Doses in Neonates and children:
Calculations earlier were based on age and weight but these were not very accurate hence now calculations are based on the BSA.

Age : Young’s rule
(Childs age / (childs age + 12)) x adult dose = pediatric dose

Body weight : Clarke’s bodyweight rule:
Pediatric dose = (childs weight/68) x adult dose

BSA : Clarkes BSA rule:

Pediatric dose = ( surface area of child (m2)/ 1.73 ) x adult dose.

Pediatric clinical management:
Assessment
Planning
Implementation
Evaluation.
Elderly:

Adverse reactions can occur in the elderly mainly because:
1. Polypharmacy
2. Altered pharmacokinetics: absorption is slower; distribution is altered i.e. reduced protein binding, reduced blood flow to the organs, increased proportion of fat and reduced proportion of water. Elimination of the drug is reduced; GFR and Tubular excretion is reduced, liver metabolism reduced
3. Altered pharmacodynamics: prolonged activity of the drug, less sensitivity to some drugs
4. Disease
5. Homeostatic mechanisms.
6. Compliance: Biological effects of aging, social circumstances of the elderly, problems caused by the health team, consequences of non-compliance and possible solution.
7. Psychosocial factors
8. Use of OTC drugs.

Pregnancy:

Altered Pharmacokinetics:
Absorption: Slowed GI motility as a result of which more drug can be absorbed. Interference with the activity of the drug like early morning sickness

Distribution: increased plasma volume causing haemodilution leading to reduced concentration of drugs. More acidic drugs available since there is a decrease in the concentration of albumin. Lower levels of basic drugs since there is an increase in the concentration of α–acidglycoproteins.

Metabolism and elimination: Renal elimination remains unaltered. Accelerated clearance of drugs in the 3rd trimester, liver metabolism may be enhanced by progesterone and hence there is enhanced clearance of drugs.
Key point:

Take drugs only if necessary as they may cross the placenta and affect the fetus.

Type of effect may vary depending on the drug, dosage, duration and the time of exposure during pregnancy.
First 8 weeks : major organ development : congenital malformations or early miscarriage.
Later in pregnancy : Growth retardation, prematurity, affect labor

Teratogen are agents which may cause malformation in a fetus.

Drugs most likely to cross the placenta are small and lipid soluble.

Drugs may affect the infants via breast milk:
Some drugs affect milk production for e.g. oestrogen
The drug might enter the milk in high enough quantity to affect the infant.
Factors that affect amount of drug into the milk is maternal blood concentration, extent of transfer, volume of breast milk consumed, percentage of the drug absorbed by the infants gut.