Drug Therapy During Pregnancy

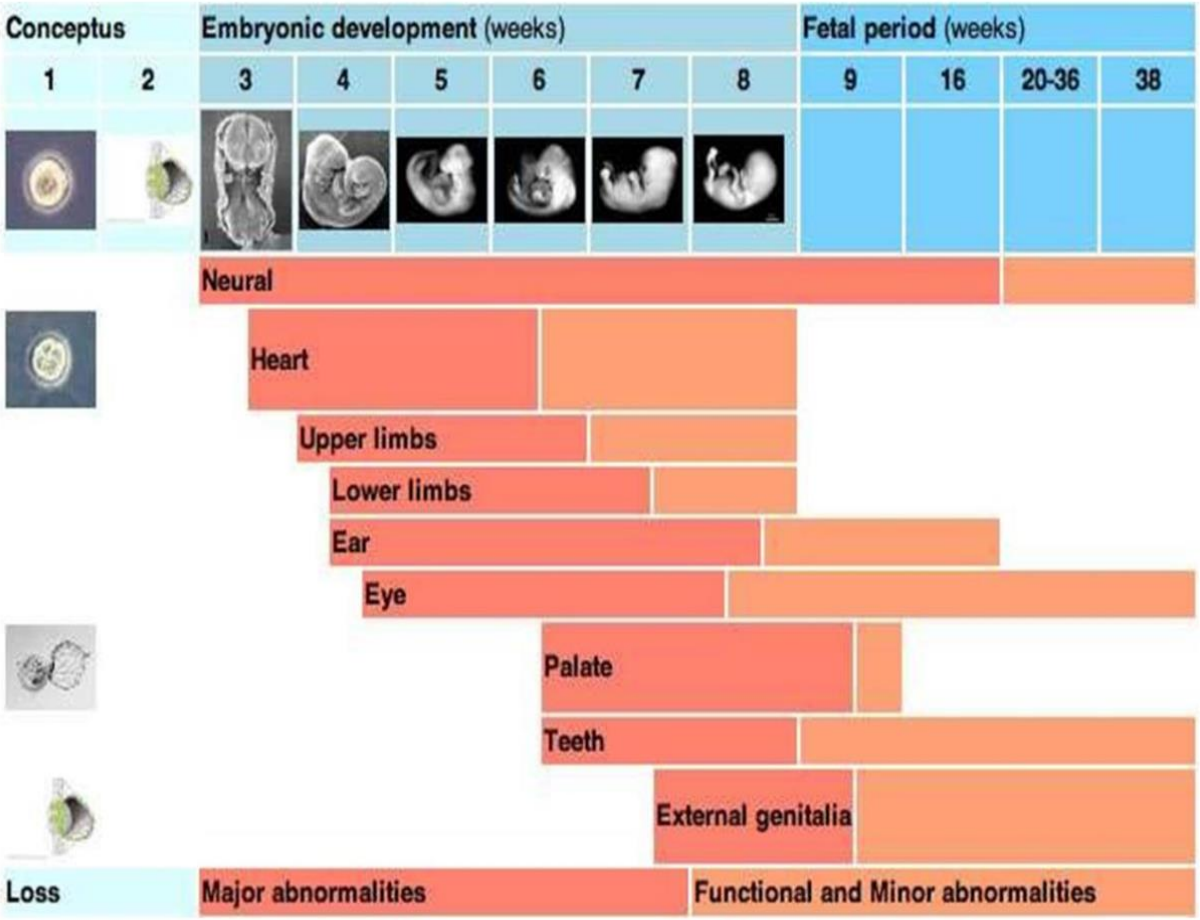
pregnant females usually use one or more medications during pregnancy, some of these drugs are used to treat pregnancy-related conditions, such as *nausea, constipation, and vomiting*. While other are used to treat chronic disorders, such as hypertension, diabetes, and epilepsy. Others are used for the management of invasive conditions such as infectious diseases. In this regard the fetus will exposed to most of drugs taken by the mother.
Therefore, pregnant patients, as in all other patients follow the concept of the *benefits of treatment must balance the risks*. So it is important to understand drug effects during gestational life. Chronic asthma is more dangerous to fetus than the drugs used for treatment.
The factors that contribute to the safety or potential harm of drug therapy during pregnancy can be broadly include:

I-Drug properties:

Include the drug's dosage, chemical reactions and interactions with concurrently administered drugs.

II- Fetal gestational age:

During the gestational time, the fetus being at greatest risk from drug-induced congenital defects during the first trimester of pregnancy. While there is increase in circulation of drugs and their absorption at the last trimester where the absorbed drug pass to the fetus.
Therefore, the sensitivity of fetus to drug is dependent upon developmental stage that classified into three stages;



1–pre-implantation stage First 2 weeks of gestation;

❑ **Teratogenesis is unlikely to occur during this stage, the fetus.**

During this stage the drug acts in an all-or-none response, i.e., the administered dose if high enough may kill the fetus otherwise the fetus will recover when sublethal dose used.

2- Embryonic stage (organogenesis 3-8 weeks)

❑ **Gross malformations and anatomic defect produced by exposure to teratogens during this period, or spontaneous abortion.**

3 - Fetal Stage; from 9 weeks until full term:

❑ **During this stage drugs may alter growth and function of normally formed fetal organs and tissues result in organ dysfunction rather than gross malformations.**

The FDA classifies drugs according to their safety for use during pregnancy. This system of drug classification is based primarily on animal studies and limited human studies.

TABLE 3-1 Pregnancy Safety Categories

Category	Description
Category A	Studies indicate no risk to human fetus.
Category B	Studies indicate no risk to animal fetus; information for humans is not available.
Category C	Adverse effects reported in animal fetus; information for humans is not available.
Category D	Possible fetal risk in humans reported; however, consideration of potential benefit vs. risk may, in selected cases, warrant use of these drugs in pregnant women.
Category X	Fetal abnormalities reported and positive evidence of fetal risk in humans available from animal and/or human studies. These drugs should not be used in pregnant women.

III- Maternal pharmacokinetic changes:

Any change in mother's physiology that impacts drug disposition (pharmacokinetic characteristics) which affect the amount of drug to which the fetus may be exposed.

- Cardiovascular (CVS); there is increase cardiac output (COP), Heart rate, and plasma volume specially during3rd trimester.

- Renal blood flow is doubled, causing a large increase in glomerular filtration rate (GFR). and dose adjustment is required to maintain therapeutic level in plasma.

- Maternal hepatic metabolism increased during pregnancy.

- Tone and motility of GIT decrease in pregnancy, causing intestinal transit time to increase, and prolong the time for drugs to be absorbed, so reduction in dosage might be needed.

Drug therapy during breast-feeding

The breast milk has acidic PH, which enhance accumulation of basic drugs by (ion trapping). However, It is a minor route of drug excretion and the primary drug characteristics that appear in breast milk include; lipid solubility, low molecular weight, protein binding, half life, plasma concentration.

❖ **Instructions to Minimize Risk to Infants**

1-Dosing immediately *after breast-feeding*

2-Take drugs that have short half-life

3-Using the lowest effective dosage for the shortest possible time.

Age Group	Classification
< 37 weeks	Premature infant
37-40 weeks	Full term infant
Birth to 1 month	Neonate or Newborn
1 month to 1 year	Infant
1 year to 12 years	Children
12 years to 16 years	Adolescents

Pediatric Pharmacokinetics &Drug Response:

Absorption;

- **Skin is thin and permeable (faster topical absorption).**
- **Stomach lacks acid to kill bacteria with low gastric emptying.**
- **Lungs have weaker mucus barriers.**
- **Intramuscular absorption faster and irregular.**

Examples for drugs having a unique side effects in pediatrics;

Chloramphenicol →gray baby syndrome

Sulfonamides → Kernicterus

Aspirin → Reye' s syndrome

Glucocorticoids → Growth suppression

Phenothiazine → sudden infant death

Medication Calculation

Abbreviations

- **PRN.....As needed**
- **qam. ..... Every morning**
- **qpm. ..... Every night**
- **q6h..... Every six hours**
- **STAT..... Immediately**
- **BID ..... Two times a day**
- **TID ..... Three times a day**
- **QID..... Four times a day**
- **hs. ..... At bed time**
- **qod.. ..... Every other day**

- **PO ..... Oral (by mouth)**
- **AC ..... Before meal**
- **PC ..... After meal**
- **GT(gutt)..... Drop**
- **Sol. ..... Solution**
- **Tab. ..... Tablet**
- **Cap. ..... Capsule**

Conversions

➢ **For solid dose**

- **1Kg= 1000 gm → 1 gm= 1000 mg →1 mg = 1000mcg→1mcg = 1000 nang**

➢ **For liquid dose 1 L= 1000 ml**

For Conversions from big units to small X 1000
& from small to big units divide / 1000
e.g; 1000 ml to 1L = 1000/1000= 1L
1gm to mg = 1 X 1000 = 1000mg

➢ **Oral drugs are ;**

o Solid (*tablet, capsule, SL, buccal, effervescent,* ..) measured by weight measures gm, mg, mcg,...
o Liquid (*solution, suspension, elixir, emulsion*,...) measured by volume measures mainly millilitres.
✓ ***First step in calculation is to make sure that the strength of drug ordered and the available are of same measures*.**

Calculation of oral doses

o The following formula used to calculate the dose that must be given to patient;
o The given dose =ordered or the desired dose Available or (on hand) dose X Quantity (Q) of drug that contain the available dose.

Example:
The doctor ordered (1gm) of P.O amoxicillin dose to be given BID . The drug available as capsule and each cap contains 500 mg of amoxicillin. Calculate how many capsule you have to give to the patient each time.
1X1000= 1000 mg the ordered dose

1000mg X 1Capsul= 2Cap
500mg

Example:
A client ordered 60 mg of PO. amoxicillin given TID. The drug available as a suspension contain 125mg of amoxicillin / 5ml. How many millilitres (mls) you have to give to the client?

$$\text{Dose given} = \frac{60\text{mg}}{125\text{ mg}} \times 5\text{ml}$$

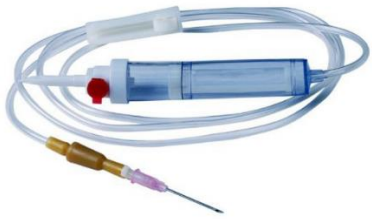
$$\text{Dose given} = \frac{300\ \cancel{\text{mg}}.\ \text{ml}}{125\ \cancel{\text{mg}}} = 2.4\text{ ml TID}$$

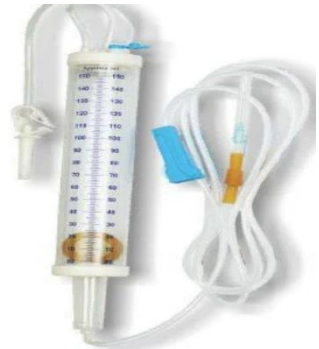
Often you have to check the dose of drug that based on patient's body weight
➢ Multiply the prescribed or ordered dose by the Kg of patient's body weight.

e.g :
ordered dose 5mg/kg
patient body weight = 60 Kg
ordered dose for the patient = 5mg/kg * 60 Kg
= 300 mg
❖ Check the concentration of available drug when given as percent
e.g. 10%W/V = 10gm / 100 ml

Example:
The physician ordered a dose 1.5 g/Kg of mannitol to be given by IV infusion over 1hr for a client weighing (70 Kg). The available strength of drug is 20% W/V. How many millilitres you have to give to the client?
20% W/V = 20gm /100ml
70 kg X 1.5 gm/ Kg = 105 gm ordered dose
The given dose = $\frac{105\text{g X } 100}{20\text{ g}}$ ml =525 ml

Calculation of IV flow rate (drop/ minute)
drop factor(df): is the Number of drops/ 1ml
1 ml = 60 drop when Microdrop used for administration of IV fluids.
1 ml = 15 drop when Macrodrop used for administration of IV fluids.
1 ml = 10 drop when Blood infusion set used for administration of IV fluids.





Flow rate (drop/minute) = $\frac{\text{Volume X df}}{\text{Time (minute)}}$

Example:

The doctor orders to give 500 ml of normal saline solution over (2.5) hour. Calculate how many drop / minute should be given (flow rate)?

$$\frac{500 \text{ ml} \times 15 \text{ drop/ml}}{2.5 \times 60 \text{ (minute)}} = 50 \text{ drop/minute}$$

Example:

The doctor orders to give 100 ml of paracetamol solution over (1 hour) duration. Calculate how many drops / minute should be given (flow rate) to the patient?

$$\frac{\textbf{Volume X df}}{\textbf{Time (minute)}} \Rightarrow \frac{\textbf{100ml X 10 drop/ml}}{\textbf{1 X 60 minute}} = 16 \text{ drop/minute}$$