

YU - Medicine

Passion Academic Team

The Urogenital System

Sheet# 10 - Physiology (Part 2)

Lec. Title : Pregnancy

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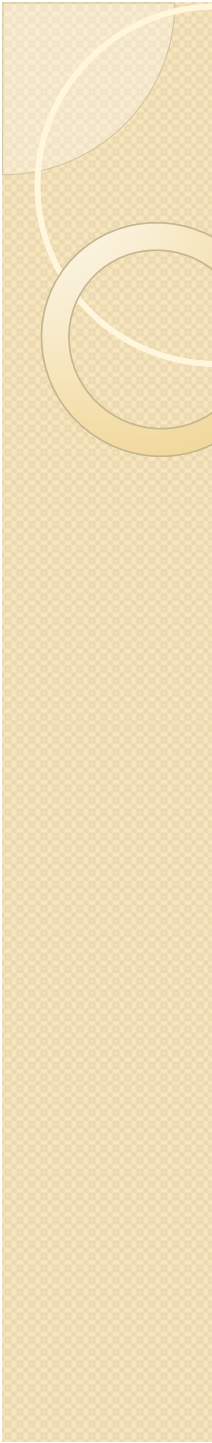


Response of the mother's body to pregnancy

تبدأ المحاضرة في غايتون من صفحة 1062 تشابتر 82 وهاد رابط الكتاب

<https://drive.google.com/file/d/1z24H-Rule1UNoippFdp8xVNzm0A6vdeP/view?usp=drivesdk>

دعواتكم ، كل الحب....

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- The **uterus** increases from about 50 grams to 1100 grams.
 - The **breasts** approximately **double** in size.
 - the **vagina enlarges** and the **introitus opens more widely**.
 - The various hormones can cause marked changes in a pregnant woman's appearance, sometimes resulting in the development of **edema, acne, and masculine or acromegalic** features.

Weight gain:

- The average weight gain during pregnancy is about **11 to 16 kg**, with most of this gain occurring during the last two trimesters, at first trimester the **HCG hormone cause nausea and loss of appetite**.
 - Fetus = 3.5 kg
 - Amniotic fluid, placenta, fetal membranes = 1 kg
 - Uterus = + 1.4 kg
 - Breasts = + 0.9 kg
 - Extra fluid in the blood and ECF = 2.3 kg
 - Fat accumulation = 1.4 - 6 kg .

Weight gain

- During pregnancy, a woman often has a greatly increased desire for food, as a result of:
 - removal of food substrates from the mother's blood by the fetus
 - Hormonal factors.(HCG reduction after the first trimester)
- The extra fluid is excreted in the urine during the first few days after birth—that is, after loss of the fluid-retaining hormones from the placenta.

Metabolism:

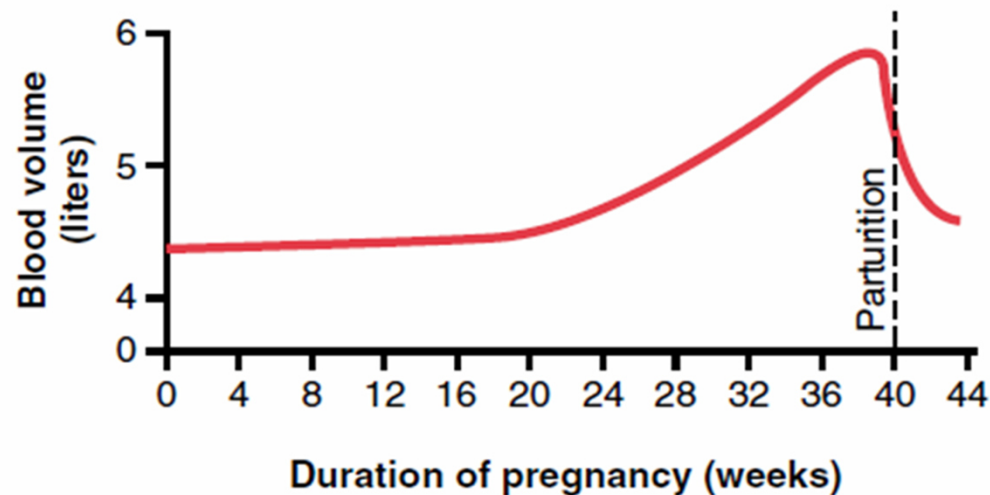
- Basal metabolic rate (**BMR**) in the latter half of pregnancy increases about **15%**. This is due to increased secretion of hormones, such as:
 - **thyroxine**
 - **adrenocortical hormones**
 - **sex hormones**
- **As a result, having a sensation of becoming overheated.**
- Greater amounts of energy are expended for muscle activity due to extra load carried.

Nutrition

- The greatest growth of the fetus occurs during the last trimester of pregnancy.
 - Its weight almost **doubles during the last 2 months** of pregnancy.
- The mother does not absorb sufficient *protein, calcium, phosphates, and iron* from her diet during the last months of pregnancy to supply these extra needs of the fetus.
 - However, the mother's body has already been storing these substances in the **placenta** and mostly in **the normal storage depots of the mother.**
- **Inappropriate intake of elements → maternal deficiencies** (especially **calcium, phosphates, iron, and the vitamins**).
- Examples:
 - Iron deficiency → causes *hypochromic anemia*.
 - Vitamin D deficiency → causes *poor calcium absorption*.
 - Vitamin K deficiency → causes *hemorrhage* (particularly brain hemorrhage) caused by the birth process. At the last month of gestation, give the mother vitamin K to prevent hemorrhage

Maternal circulatory system

- **Blood flow** through the placenta, and maternal **cardiac output *increase*** during pregnancy.
- The mother's **cardiac output *increases*** to **30-40% above normal** by **week 27**; then, for reasons unexplained, **it falls to a little above normal during the last 8 weeks of pregnancy**, despite the *high uterine blood flow*.
- **Reversible mild hypertrophy** may develop.
- Maternal **blood volume** increases during pregnancy by **30-50%** (from normal 5 L into 7.5 L).



Effect of pregnancy to increase the mother's blood volume.

- The cause of the increased volume is due to **aldosterone and estrogens**, and to **increased fluid retention by the kidneys**.
- In addition, **the bone marrow becomes increasingly active** and **produces extra red blood cells** to go with the excess fluid volume. Therefore, at the time of the birth of the baby, the mother has about 1 to 2 liters of extra blood in her circulatory system
- one fourth of this amount is normally lost through **bleeding** during delivery of the baby, thereby allowing a considerable safety factor for the mother.... 1 unit of blood will be lost
- In some cases, Increase in plasma volume is **relatively higher** than increase in RBCs volume → **decrease hematocrit** → ***physiologic anemia of pregnancy***.
- Decreased **blood pressure** is observed due to the **vasodilatory effects of progesterone**.
- **When lying in a supine position** → uterus presses on the inferior vena cava → ↓ blood return to the right atrium → **hypotension**.

احكي للست نامي على مخدة عالية لحتى ضغطها ما ينزل فجأة و أعطيتها حديد و B12 مشان
تصنيع خلايا الدم الحمراء يكون تمام ونتجنب الانيميا

Maternal respiration increases during pregnancy.

- The total amount of oxygen used by the mother shortly before birth of the baby is about **20 % above normal** and a large amount of carbon dioxide is formed.
 - **Increased minute ventilation.**
- Expanded uterus presses on the diaphragm* → total excursion of the diaphragm is decreased → **difficult breathing** → **rapid breathing** (increased RR to maintain extra ventilation).

* Partly compensated by progesterone-induced ligament relaxation in the thoracic cavity.

Maternal kidney function

- Slight increase in the rate of urine formation.
- Increased production of salt and water retaining hormones (especially **steroid hormones** by the placenta and adrenal cortex) → increases renal tubules' **reabsorptive capacity for sodium, chloride, and water**
- The **renal blood flow** and **glomerular filtration rate** increase up to 50 % during normal pregnancy **due to renal vasodilation** (probably due to increased levels of nitric oxide or the ovarian hormone relaxin).
- **Uterus presses on pelvic veins** → **varicose veins** and **swelling in the lower legs and ankles**.
 - This is also caused by **fluid retention and increased blood volume**.
- **Placenta** → releases **progesterone** and **relaxin** → loosening of ligaments around the sacroiliac joint and the symphysis pubis in **preparation for parturition**.

Gastrointestinal system

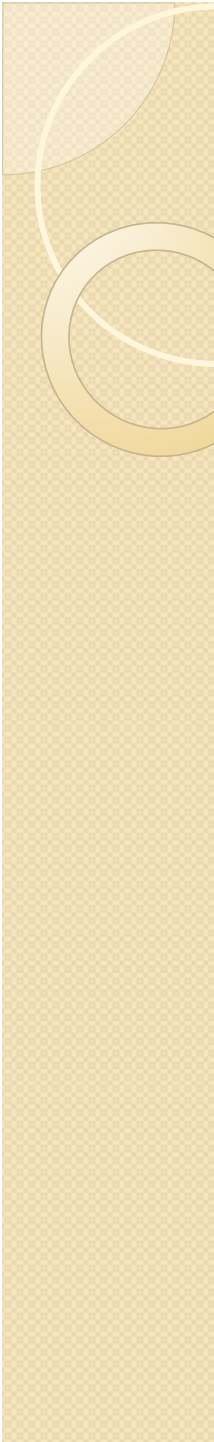
- Hormonal changes affect the GI tract by:
 1. **Smooth muscle relaxation**
 2. **Decreased peristalsis**
 - Constipation and bloating
 3. **Relaxation of lower esophageal sphincter**
 - Gastric reflux and heartburn
 4. **Morning sickness** (action of HCG)
 5. **Changes in taste perception:**

Change in taste perception is due to the **effect of an increase in the threshold of the tastebuds** so they aren't stimulated as easily. **Other buds thresholds are lowered** making them easily stimulated. Those with lowered thresholds **dominate**.



The nervous system

- Release of estrogen and progesterone during pregnancy may cause:
 - Irritability
 - Anxiety
 - Depression
 - Mental fogginess
 - Decreased ability to concentrate
 - Fatigue and sleep deprivation / insomnia

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- **Breasts** develop under the **effect of estrogen** and progesterone.
 - Estrogen also stimulates the production of **prolactin** in the anterior pituitary.
 - However, the high levels of progesterone **inhibit the effects of prolactin until the baby is born.**

Blood coagulation

- **Estrogen** promotes blood clotting by:
 - increasing plasma fibrinogen and the activity of coagulation factors.
 - inhibiting the activity of antithrombin III
- ***Increased risk of venous thromboembolism***
- ***Some women are given heparin during pregnancy to combat the increased risk of venous thromboembolism. (not warfarin, it's contraindicated for pregnant women due to its effect on fetus skeletal system development. Can even cause a miscarriage.)***
- ***Aspirin (NSAIDS) can be given to pregnant women. But only during the second trimester. If given during the third, it will effect the delivery, not the fetus. If given during the first, it will effect the fetal development.***