

**King Saud University Medical City**  
**Department of Obstetrics & Gynecology**  
**Course 482**

**PHYSIOLOGICAL CHANGES IN**  
**PREGNANCY**

# PHYSIOLOGICAL CHANGES IN PREGNANCY

- *Volume Homeostasis*
- **1. The factors contributing to fluid retention are:**
  - Sodium retention
  - Resetting of osmostat
  - Decrease in thirst threshold
  - Decrease in plasma oncotic pressure
- **2. Consequences of fluid retention are**
  - ☛ Haemoglobin concentration falls
  - Haematocrit falls
  - Serum albumin concentration falls
  - Stroke volume increases
  - Renal blood flow increases

- ***Haematological Changes***

- **Decreases in:**

- **Red cell count**

- **Haemoglobin concentration**

- **Haematocrit**

- **Plasma folate concentration**

- **Increases in:**

- **White cell count**

- **Erythrocyte sedimentation rate**

- **Fibrinogen**

# ***CARDIOVASCULAR SYSTEM***

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- **Normal changes in heart sounds during pregnancy:**
- Increased loudness of both s1 and s2
- Increased splitting of mitral and tricuspid components of s1
- No constant changes in s2
- Loud s3 by 20 weeks' gestation
- <5% with s4
- >95% develop systolic murmur which disappears after delivery
- 20% have a transient diastolic murmur
- 10% develop continuous murmurs due to increased mammary blood flow

- **Cardiovascular Changes**

- Heart rate increases (10-20%)

- Stroke volume increases (10%)

- Cardiac output increases (30-50%)

- Mean arterial pressure decreases (10%)

- Peripheral resistance decreases (35%)

- **REPRODUCTIVE ORGANS**

- **The Uterus**

- **The Cervix**

- **BREASTS AND LACTATION**

# • *THE URINARY TRACT AND RENAL FUNCTION*

- Renal changes
- Blood flow increases (60-75%)
- Glomerular filtration increases (50%)
- Clearance of most substances is enhanced
- Plasma creatinine, urea and urate are reduced
- Glycosuria is normal

# ENDOCRINE GLANDS

## 1. Pituitary gland

- FSH and LH ↓
- ACTH, Thyrotrophin, melanocyte hormone and prolactin ↑
- Prolactin level ↑ until the 30<sup>th</sup> week of pregnancy then more slowly to term.

## 2. Adrenal gland

Total corticosteroids ↑ progressively to term. This will ↑ the tendency of pregnant women to develop abdominal strine, glycosuria and hypertension



### **3. Thyroid gland**

- **Enlarges during pregnancy, occasionally to twice its normal size. This is mainly due to colloid deposition caused by a lower plasma level of iodine, consequent on the increased ability of the kidneys to excrete during pregnancy.**
- **Oestrogen stimulates or increased secretion of thyroxin in binding globulin.**
- **Both T3 and T4 levels rise. This rise will not indicate hyperthyroidism**

# GENETAL TRACT CHANGES

## 1. UTERUS

**A. Uterine muscles grow to 15 times than pre-pregnancy length.**

- **Uterine weight increases from 50 g before pregnancy to 950 g at term.**

- **In the early weeks of pregnancy the growth is by hyperplasia and more partially by hypertrophy of the muscle fibers.**

# **GENITAL TRACT CHANGES (CON'T.)**

- **By 20 weeks growth ceases and the uterus expands by distension.**
- **The uterine blood vessels also undergo hypertrophy and become increasingly coiled in the first half of pregnancy but no further growth after that.**
- **The lower uterine segment is that part of the lower uterus and upper cervix lying between the line of attachment of the peritoneum of the utero vesical pouch superiorly and the histological internal os inferiorly.**

## **B. THE CERVIX**

Becomes softer and swollen in pregnancy, with the result that columnar epithelium lining the cervical canal becomes exposed to the vaginal secretions.

Prostaglandins act on the collagen fibres, especially in the last week of pregnancy. At the same time collagenase is released from leucocytes, which also helps in breaking down collagen. The cervix becomes softer and more easily dilatable the so called ripening of the cervix.

## **C. VAGINA**

The vaginal mucosa becomes thicker, the vaginal muscle hypertrophies.

There is alteration in the composition of the connective tissue, with the result that the vagina dilates more easily to accommodate the fetus during parturition.

Oestrogen → desquamation of the superficial vaginal mucosal cells with ↑ in vaginal discharge when pathogenesis enters the vagina (candida, trichomonas) they will flourish rapidly.

# Alimentary System Changes:

The mouth and the gum become spongy because of intracellular fluid retention (prophylactic effect).

The lower oesophageal sphincter is relaxed which may permit regurgitation of gastric contents and cause heart burn.

Gastric secretion is reduced and food remains longer in the stomach.

The intestinal musculature is relaxed with lower motility → greater absorption and constipation.

# RENAL SYSTEM

**The smooth muscle of the renal pelvis and ureters relaxes, causing their dilatation. This increase the capacity of the renal pelvis and ureters from 12 ml to 75 ml and ↑ the chances of urinary infection.**

**Urinary tract infection is more common in pregnancy. The muscles of the internal urethral sphincter relax and this together with the pressure of the uterus →degree of incontinence**

- **The renal blood flow increases to the 16<sup>th</sup> week of pregnancy and the levels off.**
- **GFT increases by 60% in early pregnancy and remains at the new level until the last 4 weeks of pregnancy when it falls.**
- **Tubular reabsorption is unaltered.**
- **Clearance of many solutes ↑**
- **Up to 300 mg of protein may be excreted in 24 hours.**
- **↑ GFT + progesterone effect → loss of Na.**

# IMMUNE SYSTEM CHANGES

- HCG → ↓ immune response to pregnancy
- IgG, IgA and IgM ↓ from 10<sup>th</sup> week of pregnancy reaching their lowest level at 30 weeks and remain so till the end of pregnancy → ↑ risk of infection in pregnant women.



# WEIGHT GAIN IN PREGNANCY

- Healthy women will gain around 12 kg of which 9 kg is gained in the last 20 weeks.
- The elements of weight gain:
  - Fetus                    3300 gm
  - Placenta                    600 gm
  - Uterus                    900 gm
  - Breasts                    400 gm
  - Blood                    1200
  - Fat Deposited            2500
  - Fluid                    2600