PHYSIOLOGICAL CHANGES IN PREGNANCY

- PRESENTED BY
- MRS.THAMIZHELAKIA
- ASST.PROF
- ICON

DEFINITION:

Pregnancy

Carrying fetus or embryo I the womb of he mother. It begins at fertilization and ends at the delivery of fetus. Pregnancy lasts for 40weeks.

CHANGES IN REPRODUCTIVE ORGANS

- Vulva
- Vagina
- Uterus
- Isthmus
- Cervix
- Fallopian Tube
- Ovary

Vulva

- Oedematous
- More Vascular
- Superficial varicosities may appear specially in multiparae.
- Labia minora are pigmented and hypertrophy.
- perineum-enlarged increased vasculature, hypertrophy of perineal body and deposition of it.

Vagina

- Vaginal walls become hypertrophied, oedematous and more vascular.
- Increased blood supply of the venous plexus surrounding the walls
- The length of the anterior vaginal wall is increased. Normal length is 3-4 inches.
- Secretion becomes copious, thin and curdy white
- pH becomes acidic (3.5-6)

Chadwick sign is a bluish discoloration of the cervix, vagina, and labia resulting from increased blood flow. It can be observed as early as 6 to 8 weeks after conception, and its presence is an early **sign** of pregnancy.

Uterus

- Uterus increases five times from its normal size.
- In length from 6.5 to 32cm
- In depth from 2.5 to22cm
- In width from 4 to 24cm
- In weight from 50 to 1000gm
- In thickness of the walls from 1 to 0.5cm
- The capacity of the uterus accommodates a seven-pound or 500 to 1000ml of amniotic fluid and the fetal members.

- Changes occur in all the parts of uterus body, isthmus and cervix.
- Oestrogen and progesteron hormone is essential for increased vascularity and dilatation of blood vessels, hyperplasia and hypertrophy of muscle fibres, development of decidua.

CHANGES IN MUSCLE

Mechanism of uterine enlargement is due to stretching and hypertrophy of the muscle fibers, increase in elastic tissues, accumulation of fibrous tissues in external muscle fibers.

During pre pregnancy state it is solid and in term muscles are soft due to distension of growing fetus.

ARRANGEMENT OF THE MUSCLE FIBRES

1)Outer longitudinal – arranged over the fundus

(2) Inner circular – It is scanty and have sphincter like

(3) Intermediate – It is the thickest and strongest layer arranged in criss-cross fashion through which the blood vessels run.

VASCULAR SYSTEM

- Uterine artery diameter becomes double from 3mm to 7mm in term.
- Blood flow increases by eight fold at 20 weeks of pregnancy.
- Vasodilatation is mainly due to estradiol and progesterone.
- Veins become dilated and are valveless.
- Numerous lymphatic channels open up.
- Vascular changes are most pronounced at the placental site.

GROWTH OF UTERUS

SHAPE

- Non pregnant pyriform shape is maintained in early months.
- Becomes globular at 12 weeks.
- As the uterus enlarge, the shape once more
- pyriform or ovoid by 28 weeks.
- Changes to spherical beyond 36th week.

POSITION

- Normal anteverted positions exaggerated up to 8 weeks
- The enlarged uterus may lie on the bladder

afterwards, it becomes erect, the long axis of the uterus conforms more is a tendency of anteversion

- Primigravidae with good tone of the abdominal

muscles, it is held firmly against the maternal spine.

Braxton Hicks contractions are sporadic contractions and relaxation of the uterine muscle. Sometimes, they are referred to as prodromal or ‘false labor’ pains. It is believed they start around 6 weeks gestation but usually are not felt until the second or third trimester of the pregnancy.

ENDOMETRIUM

Endometrium during pregnancy is known as decidua. The increased structural and secreatory activity of the endometrium that is brought in response to progesterone, following the implantation is known as decidual reaction.

3 layers of decidua

1. Superficial compact layer- compact mass of decidual cells, glands ducts and dilated capillaries.
2. Intermediate spongy layer- it is dialated uterine glands, decidual cells and blood vessels.
3. Thin basal layer- basal portion of the glands and is opposed to uterine muscle.

ISTHMUS

- During the first trimester isthmus hypertrophies and elongates to about 3 times its original length.
- Becomes softer.
- Normal length of isthumus is 2cm

CERVIX

* Hypertrophy and hyperplasia of the elastic and connective tissues
* Vascularity is increased
* Softening of the cervix (Goodell's sign)
* A mucus plug, which is known as operculum is formed in the cervical canal. This mucus plug is expelled at the end of the pregnancy. On the onset of labor, the mucus is blood tinged, it is referred to as a 'bloody show'.

FALLOPIAN TUBE

- Total length is increased. Normal length is 10cm.
- Tube becomes congested, at term it attachment is lower end of the upper1/3rd of the uterus.
- Muscles undergo hypertrophy.

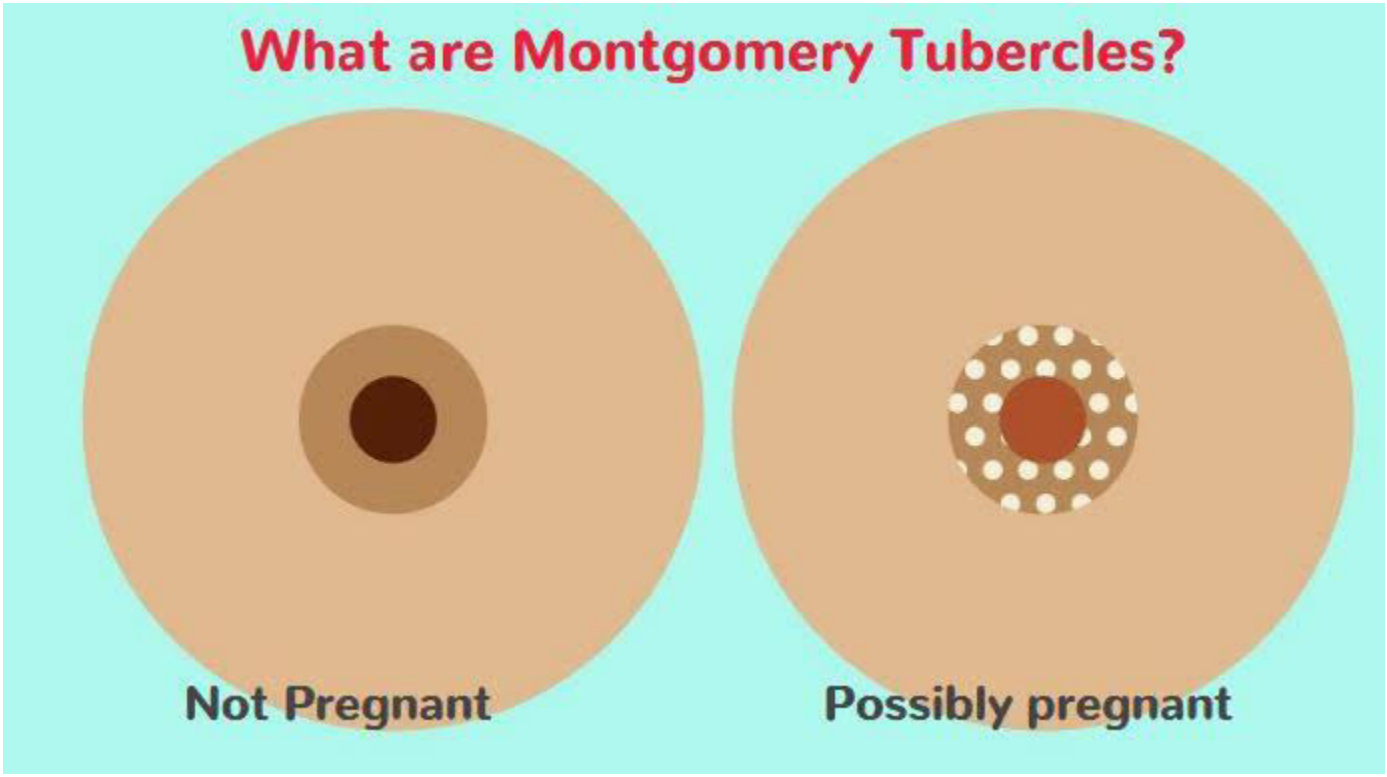
OVARIES

- Growth and function of the corpus luteum reaches its maximum at 8th week by FSH, which prevents ovulation and mensuration.
- Hormones-oestrogen and progesterone secreted by the corpus luteum maintain the environment for the growing ovum until 10to12 weeks of pregnancy.
- Afterwards placenta, is capable of producing adequate amounts of progesterone and oestrogen.
- Inhibit ripening of the follicles

BREAST CHANGES

In early pregnancy- The breast may feel full or tingle, increase in size as pregnancy progresses. The Montgomery tubercules (the sebaceous glands of the areola), the vessels on the surface of the breast may become visible due to increased circulation.

By second trimester- the breast begin to produce colostrum. This is precusor of breast milk. It is thin, watery, yellowish secretion that thickens as pregnancy progress.


What are Montgomery Tubercles?
Not Pregnant
Possibly pregnant

CUTANEOUS CHANGES

Linea nigra- a dark line runs between umbilicus to the symphysis pubis and may extend as high as the sternum.

Mask of pregnancy (chloasma)- hyper pigmentation in face and forehead.

It gradually begins from 16th week of pregnancy.

Striae gravidarum – this is due to action of adreno corticosteriods. This occurs in maximum stretching area like abdomen, thighs and breasts.

Sweat glands- activity of the sweat glands during pregnancy is increased due to increased vascularity, tends to sweat profusely.

Palmar erythema- pinkish red, diffuse mollting blotches in the Palmar surface of the hand is about 60 percentage in white women.

Hirsutism- fine hair growth over the face, disappears after the delivery.

Circulatory system

A.) Blood volume

- blood volume increases gradually by 30 to 50 percent (1500 ml to 3 units) this results in decrease in hemoglobin.
- Blood count is interpreted as in anemia because hemoglobin falls 10.5 gm per 100ml.
- Increased blood volume compensates for hypertropied vascular system of enlarged uterus. It improves placental performance.

B.) cardiac output

- Cardiac output incrreases about 30 percent during the 1st and 2nd trimester to accommodate the hypervolemia.
- Changes in output results in changes in heart rate. It usually increases by 10 beats per min.

C.) blood pressure

- Normally, patient BP does not changes.
- during mid trimester, BP can change and cause fainting.
- In late pregnancy, hypotension may occur in 10% of women in unsupported supine position. This is termed as supine hypotension syndrome.

- The pressure of the gravid uterus compresses the vena cava, reducing the venous return.
- Cardiac output is reduced by 25-30 percent and the blood pressure may fall 10-15%.
- BP increases only by life style modification in today's life.
- Advised to do breathing exercise regularly.

D.) WBC

WBC count increases during pregnancy upto 5000-12000/ml in last trimester.

Counts as high as 25000-30000/ml indicates abnormality in pregnancy for both mother and fetus.

E.) Clotting factor

There are marked increase in fibrinogen and factors. Factors VII, IX, X and XII increases but for a lesser amount.

Regional distribution of the blood flow

Uterine blood flow is increased by50ml in non-pregnancy stage to 750ml in term.

Pulmonary blood flow is increased by 2500ml/min. Normal is 6000ml/min.

Renal blood flow is increased by 400ml/min at 16^{th} week and remains same till term. Normal is 800ml/min.

CHANGES IN RESPIRATORY SYSTEM

- Shape of the chest and circumference increases in pregnancy by 6cm.
- Progressive increase in oxygen consumption, which is caused by the increased metabolic needs of the mother and fetus.
- Total lung capacity is reduced 4-5% by the elevation of the diaphram.
- A state of hyperventilation occurs during pregnancy leading to increase tidal volume 35-50%

CHANGES IN BODY TEMPERATURE

* A slight increase in body temperature in early pregnancy.
* The temperature returns to normal at 16th week of gestation.
* The mother may feel warmer or experience ‘hot flashes’ caused by increased hormonal level and basal metabolic rate.

CHANGES IN URINARY SYSTEM

kidney

- Dilatation of the ureter, renal pelvis and calyces occurs. The kidneys enlarge in length by 1 cm.
- **Renal plasma flow is increased by 50-75%, maximum** by the 16 weeks and is maintained until 34 weeks. Thereafter it falls by 25%.
- **Glomerular filtration rate (GFR) is increased by 50%** all throughout the pregnancy.

- Bladder is displaced and moved upward and fllatened in the anterior posterior diameter.
- During pregnancy protein level more than 500mg/h is lost, hypertension is suspected.

Changes in GI system

a. **Oral cavity:**

Salivation increases due to difficulty n swallowing, if ph is decreased then it prones to tooth decay.

b. **GI motility:**

GI motility is decreased in pregnancy due to progesterone. Trasmit time of food may be slower so, water absorption decreased leading to constipation.

c. **Gallblader:**

Gallblader function is also altered during pregnancy. Bile become thick and stasis leads to gallstone.

d. Liver

No apparent changes in liver. Some of enzymes decrease like albumin/globulin ratio normally in pregnancy.

Changes in endocrine gland

Thyroid gland increase in size due to iodine metabolism return to normal in postnatal period.

Para thyroid increase in size slightly to meet the calcium need of the fetus.

Posterior pituitary gland near to end of term, secrets oxytocin which severe to initiate labor.

Anterior pituitary gland will begin to secrete prolactin, which stimulates production of breast milk.

Adrenal cortex thickens due to the secretion of ACTH as result of progestrone.

Placenta produces large amount of estrogen and progesterone by 10 to 12th weeks of pregnancy. It maintains the uterine activity and maternal changes in the body.

Changes in body weight during pregnancy

Reproductive weight gain : 6 kg

Fetus – 3.3 kg, placenta –0.6 kg and liquor – 0.8 kg uterus – 0.9 kg and breast -0.4 kg, accumulation of the fat and protein 3.5kg

Net maternal weight gain: 6 kg

Increases in blood volume – 1.3 kg Increases in extracellular fluid – 1.2 kg

- There is a weight los in early pregnancy due to nausea and vomiting.
- Gains 2-4kg in first trimester
- Gains upto 5kg or more in 2^{nd} ans 3^{rd} trimester.
- Upto totally 11kg weight gain is composed (breast, blood, uterine tissue)

Metabolic changes in pregnancy

Water metabolism: there is a tendency to water retention secondary to sodium retention.

Protein metabolism: there is a tendency to nitrogen retention for fetal and maternal tissues formation.

Carbohydrate metabolism:

- ✓ Pregnancy is potentially diabetogenic.
- ✓ Alimentary glucosuria occurs in early pregnancy.
- ✓ Renal glucosuria occurs in middle of pregnancy.

Fat metabolism: There is increase in plasma lipids with tendency to acidosis.

Mineral metabolism: There is increase in demand for iron, calcium, phosphate and magnesium.