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COURSE ENDOCRINE AND REPRODUCTIVE PHYSIOLOGY

COURSE CODE PHS 204

Discuss lactation and gestation period in a normal female. Give details on physiology of pregnant normal woman

During pregnancy there is significant hypertrophy of the ductular-lobular-alveolar system, prominent lobules form and from mid-gestation alveolar cells differentiate to be capable of milk production. During pregnancy there is little milk secretion due to the high progesterone : oestrogen ratio which favours growth rather than secretion.

Lactation means synthesis, secretion and ejection of milk.

It involves two processes: A. Milk secretion B. Milk ejection

Preparation for Lactation

By the fifth or sixth month of pregnancy, the breasts are ready to produce milk. During the latter part of pregnancy, the woman's breasts enter into the lactogenesis I stage. This is when the breasts make colostrum, a thick, sometimes yellowish liquid.

At this stage, high levels of progesterone inhibit most milk production. It is not a medical concern if a pregnant woman leaks any colostrum before her baby's birth.

A) **MILK SECRETION** Synthesis of milk by alveolar epithelium and its passage through the duct system is called milk secretion. Milk secretion occurs in two phases: 1. Initiation of milk secretion or lactogenesis 2. Maintenance of milk secretion or galactopoiesis

Initiation of Milk Secretion or Lactogenesis Although small amount of milk secretion occurs at later months of pregnancy, a free flow of milk occurs only after the delivery of the child. The milk, which is secreted initially before parturition is called colostrum. Colostrum is lemon yellow in color and it is rich in protein (particularly globulins) and salts. But its sugar content is low. It contains almost all the components of milk except fat.

Role of hormones in lactogenesis

Prolactin is responsible for lactogenesis. During pregnancy, particularly in later months, large quantity of prolactin is secreted. But the activity of this hormone is suppressed by estrogen and progesterone secreted by placenta. Because of this, lactation is prevented during pregnancy. Immediately after the delivery of the baby and expulsion of placenta, there is sudden loss of estrogen and progesterone. Now, the prolactin is free to exert its action on breasts and to promote lactogenesis.

2. Maintenance of Milk Secretion or Galactopoiesis Galactopoiesis depends upon the hormones like growth hormone, thyroxine and cortisol, which are essential for continuous supply of glucose, amino acids, fatty acids, calcium and other substances necessary for the milk production (Fig. 87.1). Role of hypothalamus in galactopoiesis Galactopoiesis occurs till 7 to 9 months after delivery of child provided feeding the baby with mother's milk is continued till then. In fact, the milk production is continued only if feeding the baby is continued. Suckling of nipple by the baby is responsible for continuous milk production. When the baby suckles, the impulses from touch receptors around the nipple stimulate hypothalamus. It is suggested that hypothalamus releases some prolactin-releasing factors, which cause the prolactin secretion from anterior pituitary. Prolactin acts on glandular tissues and maintains the functional activity of breast for subsequent nursing.

B)MILK EJECTION Milk ejection is the discharge of milk from mammary gland. It depends upon suckling exerted by the baby and on contractile mechanism in breast, which expels milk from alveoli into the ducts. Milk ejection is a reflex phenomenon. It is called milk ejection reflex or milk let-down reflex. It is a neuroendocrine reflex.

EFFECT OF LACTATION ON MENSTRUAL CYCLE Woman who nurses her child regularly does not have menstrual cycle for about 24 to 30 weeks after delivery

GESTATION PERIOD

Gestation period refers to the pregnancy period. The average gestation period is about 280 days or 40 weeks from the date of last menstrual period (LMP). The actual duration of human pregnancy is 266 days. If the pregnancy ends before 28th week, it is referred as miscarriage. If the pregnancy ends before 37th week, then it is considered as premature labor.

CHANGES IN PHYSIOLOGICAL SYSTEMS

1. **Blood** The blood volume increases by about 20% or about 1 L. This increase is mainly because of increase in plasma volume. It causes hemodilution. Because of great demand for iron by the fetus, the mother usually develops anemia. It can be rectified by proper prenatal care and iron replacement.
2. **Cardiovascular System** Cardiac output Generally, cardiac output increases by about 30% in the first trimester. After the 3rd month, cardiac output starts decreasing and reaches almost the normal level in the later stages of pregnancy. Blood pressure Arterial blood pressure remains unchanged during the first trimester. During the second trimester, there is a slight decrease in blood pressure. It is due to the diversion of blood to uterine sinuses. And, hypertension develops if proper prenatal care is not taken.

Pre-eclampsia

Pre-eclampsia is the hypertensive disorder of pregnancy. It is otherwise known as toxemia of pregnancy. About 3% to 4% of the pregnant women suffer from this. It usually occurs during last trimester of pregnancy.

Cause for hypertension 1. Release of vasoconstrictor substances from placenta

2. Hypersecretion of adrenal hormones and other hormones, which cause vasoconstriction

3. Development of autoimmune processes induced by the presence of placenta or fetus.

Decreased blood flow to kidney and thickening of glomerular capillary membrane, leading to reduction in GFR and urinary outpump occur as a result of hypertension

Eclampsia

Eclampsia is the serious condition of pre-eclampsia characterized by severe vascular spasm, dangerous hypertension and convulsive muscular contractions almost like seizures. It occurs just before, during or immediately after delivery. It leads to death, if timely treatment is not given.

Features of eclampsia

1. Spasm of blood vessels

2. Very severe hypertension

3. Renal failure

4. Liver failure

5. Heart failure

6. Convulsions.

3. Respiratory System Overall activity of respiratory system increases slightly. Tidal volume, pulmonary ventilation and oxygen utilization are increased.

4. Excretory System Renal blood flow and GFR increase resulting in increase in urine formation. It is because of increase in fluid intake and the increased excretory products from fetus. The urine becomes diluted with the specific gravity of 1,025. In the first trimester, the frequency of micturition increases because of the pressure exerted by the uterus on bladder.

5. Digestive System During the initial stages of pregnancy, the morning sickness occurs in mother. It involves nausea, vomiting and giddiness. This is because of the hormonal imbalance. The motility of GI tract decreases by progesterone and constipation is common. Indigestion and hypochlorhydria (decrease in the amount of hydrochloric acid in gastric juice) also occur.

6. Endocrine System i. Anterior pituitary During pregnancy, the size of anterior pituitary increases by about 50%. And secretion of corticotropin, thyrotropin

and prolactin increases. However, the secretion of FSH and LH decreases very much. It is because of negative feedback control by estrogen and progesterone, which are continuously secreted from corpus luteum initially and placenta later on. ii. Adrenal cortex There is moderate increase in secretion of cortisol, which helps in the mobilization of amino acids

from the mother's tissues to the fetus. Aldosterone secretion also increases. It reaches the maximum at the end of pregnancy. Along with estrogen and progesterone, aldosterone is responsible for the retention of water and sodium. iii. Thyroid gland The size and the secretory activity of thyroid gland increase during pregnancy. The increased secretion of thyroxine helps in the preparation of mammary glands for lactation. It is also responsible for increase in basal metabolic rate. iv. Parathyroid glands Parathyroid glands also show an increase in the size and secretory activity. Parathormone is responsible for maintenance of calcium level in mother's blood in spite of loss of large amount of calcium to fetus.

7. Nervous System There is general excitement of nervous system during pregnancy. It leads to the psychological imbalance such as change in the moods, excitement or depression in the early stages of pregnancy. During the later months of pregnancy, the woman becomes very much excited because of anticipation of delivery of the baby, labor pain, etc