NAME: AJANI AMINAT PRECIOUS
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QUESTION: Elucidate the Physiological adaptations of the female to pregnancy

Maternal physiological changes in pregnancy are the adaptations during pregnancy that a woman's body undergoes to accommodate the growing embryo or fetus. These physiologic changes are entirely normal, and include behavioral (brain), cardiovascular (heart and blood vessel), hematologic (blood), metabolic, renal (kidney), posture, and respiratory (breathing) changes. Increases in blood sugar, breathing, and cardiac output are all expected changes that allow a pregnant woman's body to facilitate the proper growth and development of the embryo or fetus during the pregnancy. The pregnant woman and the placenta also produce many other hormones that have a broad range of effects during the pregnancy.

A woman's body undergoes many transformations during the nine months of pregnancy. Some of these physical changes are visible, such as an expanding belly and weight gain, while others are well known, such as an enlarged uterus, morning sickness and backaches. However, a few bodily changes may be unexpected and catch some women by surprise.

After implantation, the uterine endometrium is called the decidua. The placenta, which is partly formed from the decidua and partly from outer layers of the embryo, connects the developing embryo to the uterine wall to allow nutrient uptake, waste elimination, and gas exchange via the mother's blood supply.

The umbilical cord connects the embryo or fetus to the placenta. The developing embryo undergoes tremendous growth and changes during the process of fetal development.

Most pregnant women experience a number of symptoms that can signify pregnancy. The symptoms include nausea and vomiting, excessive tiredness and fatigue, cravings for certain foods that are not normally sought out, and frequent urination, particularly during the night. A number of early medical signs are associated with pregnancy. These signs typically appear, if at all, within the first few weeks after conception. Not all of these signs are universally present, nor are all of them diagnostic by themselves; taken together, however, they may make a presumptive diagnosis of pregnancy.

These signs include:

1.The presence of human chorionic gonadotropin (hCG) in the blood and urine.

2.Missed menstrual period.

3.Implantation bleeding (occurs at implantation of the embryo in the uterus during the third or fourth week after last menstrual period).

4.Increased basal body temperature sustained for over 2 weeks after ovulation.

5.Chadwick's sign (darkening of the cervix, vagina, and vulva).

6.Goodell's sign (softening of the vaginal portion of the cervix).

7.Hegar's sign (softening of the uterus isthmus).
Pigmentation of the linea alba (called linea nigra), which is darkening of the skin in a midline of the abdomen. This darkening is caused by hyperpigmentation resulting from hormonal changes, usually appearing around the middle of pregnancy.

HORMONAL CHANGES

Pregnant women experience adjustments in their endocrine system. Levels of progesterone and estrogens rise continuously throughout pregnancy to suppress the hypothalamic axis and, subsequently, the menstrual cycle. Estrogen produced by the placenta is associated with fetal well being. Women also experience an increase in human chorionic gonadotropin (β-hCG), which is produced by the placenta and maintains progesterone production by the corpus luteum.

The increase in progesterone production primarily functions to relax smooth muscles. Prolactin levels increase due to maternal pituitary gland enlargement that mediate a change in the structure of the mammary gland from ductal to lobular-alveolar.

Parathyroid hormone increases and leads to increased calcium uptake in the gut and reabsorption by the kidney. Adrenal hormones such as cortisol and aldosterone also increase. Human placental lactogen (HPL) is produced by the placenta, stimulating lipolysis and fatty acid metabolism by the woman and conserving blood glucose for use by the fetus. It can also decrease maternal tissue sensitivity to insulin and result in gestational diabetes.

WEIGHT CHANGES

One of the most noticeable alterations in pregnancy is the gain in weight. The enlarging uterus, the growing fetus, the placenta and liquor amnii, and the acquisition of fat and water retention, all contribute to weight gain. The weight gain varies and can be anywhere from five pounds (2.3 kg) to over 100 pounds (45 kg). In the U.S., the doctor-recommended weight gain range is 25 pounds (11 kg) to 35 pounds (16 kg), less if the woman is overweight, more (up to 40 pounds 18 kg) if the woman is underweight.

A woman's breasts grow during pregnancy, usually one to two cup sizes, but possibly larger. A woman who wore a C cup bra prior to her pregnancy may need to buy an F cup or larger bra while nursing. A women's torso also grows and her bra band size may increase one or two sizes.

Once the baby is born (about 50 to 73 hours after birth), the mother will experience her breasts filling with milk, at which point changes in the breast happen very quickly. Once lactation begins, the woman's breasts swell significantly and can feel achy, lumpy, and heavy (engorgement). Her breasts may increase again in size. Individual breast size can vary daily or for longer periods depending on how much the infant nurses from each breast.

CIRCULATORY CHANGES

Plasma and blood volume slowly increase by 40–50% over the course of the pregnancy (due to increased aldosterone) to accommodate the changes, resulting in an increase in heart rate (15 beats/min more than usual), stroke volume, and cardiac output. Cardiac output increases by about 50%, primarily during the first trimester.

The systemic vascular resistance also drops due to the smooth muscle relaxation and overall vasodilation caused by elevated progesterone, leading to a fall in blood pressure. Diastolic blood pressure consequently decreases between 12–26 weeks, and increases again to pre-pregnancy levels by 36 weeks.

Edema (swelling) of the feet is common during pregnancy, partly because the enlarging uterus compresses veins and lymphatic drainage from the legs.

A pregnant woman will also become hypercoagulable, leading to increased risk for developing blood clots and embolisms due to increased liver production of coagulation factors. Women are at highest risk for developing clots (thrombi) during the weeks following labor. Clots usually develop in the left leg or the left iliac venous system because the left iliac vein is crossed by the right iliac artery. The increased flow in the right iliac artery after birth compresses the left iliac vein leading to an increased risk for thrombosis (clotting) that is exacerbated by a lack of ambulation (walking) following delivery. Both underlying thrombophilia and caesarean section can further increase these risks.