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Elucidate the physiological adaptations of the female to pregnancy

During the early stages of pregnancy the body, physiological adaptations occurs in the mother in order to allow her to sustain and protect her growing embryo or foetus. These physiological changes are entirely normal, and include behavioral (brain), cardiovascular (heart and blood vessel), hematologic (blood), metabolic, renal (kidney), posture, and respiratory (breathing) changes.

Some of the physiological adaptations that occur in the mother includes;

1. Hormonal changes

Pregnant women experience numerous adjustments in their endocrine system that help support the developing fetus. The fetal-placental unit secretes steroid hormones and proteins that alter the function of various maternal endocrine glands. Sometimes, the changes in certain hormone levels and their effects on their target organs can lead to gestational diabetes and gestational hypertension.

2. Fetal-placental unit

Levels of progesterone and estrogen rise continually throughout pregnancy, suppressing the hypothalamic axis and subsequently the menstrual cycle. The progesterone is first produced by the corpus luteum and then by the placenta in the second trimester. Women also experience increased human chorionic gonadotropin (β -hCG), which is produced by the placenta.

3. Cardiovascular System

As discussed above, during pregnancy progesterone levels increases. Progesterone acts to decrease systemic vascular resistance in pregnancy which leads to a decrease in diastolic blood pressure during the first and second trimester of pregnancy. In response to this the cardiac output increases by about 30-50%. An increase in blood pressure in pregnancy could be an indication of pre-eclampsia.

Pregnancy results in the activation of the renin-angiotensin system. This leads to an

increase in sodium levels and water retention. This means that the total blood volume increases.

4. Respiratory System

Anatomically, the growth of the foetus during pregnancy causes upward displacement of the diaphragm. This however, does not decrease the total lung capacity significantly since there is also an increase in the transverse and anterior-posterior diameters of the thorax.

In pregnancy a woman faces an increase in their metabolic rate which leads to an increased demand for oxygen. The tidal volume and the minute ventilation rate increases to help the mother meet the oxygen demands.

Many women experience hyperventilation during pregnancy. It is thought that the reason for this is the increased carbon dioxide production and the increased respiratory drive caused by progesterone. This hyperventilation results in a respiratory alkalosis with a compensated increase in renal bicarbonate excretion.

5. Gastrointestinal System

The growth of the uterus causes a number of anatomical changes related to the gastrointestinal tract. One of these would be the upward displacement of the stomach as the uterus grows. This would lead to an increase in the intra-gastric pressure which would predispose the mother to getting symptoms of reflux, along with symptoms such as nausea and vomiting. The appendix may also move to the right upper quadrant of the abdomen as the uterus enlarges.

The increase in progesterone during pregnancy results in smooth muscle relaxation. This would decrease gut motility. Although this allows for more time for nutrient absorption, it can lead to constipation. Increased progesterone also causes relaxation of the gallbladder so biliary tract stasis may occur. This predisposes the mother to getting gallstones.

6. Urinary System

Increased cardiac output during pregnancy causes an increase in renal plasma flow which increases the GFR by about 50-60%. This would mean that there is an increase in renal excretion. So in pregnancy the levels of urea and creatinine will be lower.

Progesterone affects the urinary collecting system causing relaxation of the ureter (resulting in hydroureter). There is also relaxation of the muscles of the bladder. Both of these changes causes urinary stasis which predisposes a woman to UTIs, commonly pyelonephritis.

7. Haematological Changes

In pregnancy there is an increase in fibrinogen and clotting factors in the blood and a decrease in fibrinolysis. Additionally, due to an increase in progesterone levels stasis of blood and venodilation occurs. All these factors increase the risk of thromboembolic disease in pregnancy. Warfarin can not be given to pregnant women to counteract this as it can cross the placenta and it is a teratogen. Low Molecular Weight Heparin (LMWH) is usually considered the anticoagulant of choice during pregnancy if it is necessary to give the mother anticoagulant drug.

During pregnancy the plasma volume increases significantly. However, the red cell mass does not increase by as much. This results in a physiological dilutional anemia.