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DEPARTMENT: NURSING

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TITLE: Pregnancy

QUESTION: Elucidate the Psychological adaptations of the female to pregnancy.

DEFINITION:

Pregnancy, also known as gestation, is the time during which one or more offspring develops inside a woman. A multiple pregnancy involves more than one offspring, such as with twins.

INTRODUCTION:

 Pregnancy is a unique period in a woman's lifetime. A number of anatomic, physiologic, biochemical and psychological changes take place. These changes may easily be misinterpreted by physicians who lack experience in regards to pregnancy effects on a woman's body. It is important that physicians caring for women understand the implications of these physiological changes in order to avoid any diagnostic errors and errors of management.

 During pregnancy, a woman’s body changes in many ways due to the effect of hormones. These changes can sometimes be uncomfortable, but most of the time they are normal and enable her to nourish and protect the fetus, prepare her body for labor, and develop her breasts for the production of milk.

 We need to remember that nature does not waste energy or effort. In that respect all the physiological changes that happen during pregnancy, happen for a purpose. Pregnancy is always associated with changes in psychological functioning of pregnant women. It is usually associated with ambivalence, frequent mood changes, varying from anxiety, fatigue, exhaustion, sleepiness, depressive reactions to excitement etc.

**Changes in the uterus, cervix and vagina:**

The uterus

After conception, the uterus provides a nutritive and protective environment in which the fetus will grow and develop. It increases from the size of a small pear in its non-pregnant state to accommodate a full-term baby at 40 weeks of gestation. The tissues from which the uterus is made continue to grow for the first 20 weeks, and it increases in weight from about 50 to 1,000 gm. (grams). After this time, it doesn’t get any heavier, but it stretches to accommodate the growing baby, placenta and amniotic fluid. By the time the pregnancy has reached full term, the uterus will have increased to about five times its normal size:

In height (top to bottom) from 7.5 to 30 cm

In width (side to side) from 5 to 23 cm

In depth (front to back) from 2.5 to 20 cm.

What causes these changes?

At 12 weeks’ gestation (near the end of the first trimester, i.e. three-month period), the **fundus** (upper margin of the body of the uterus) may be palpated (felt) through the abdomen above the pubic bone (symphysis pubis). The size of the uterus usually reaches its peak at about 36 weeks’ gestation



**Diagram of height of the uterus at various weeks of pregnancy.**

The cervix:

The cervix remains 2.5 cm long throughout pregnancy. In late pregnancy, softening of the cervix occurs in response to increasing painless contractions of its muscular walls.

The vagina:

The vagina also becomes more elastic towards the end of pregnancy. These changes enable it to dilate during the second stage of labor, as the baby passes down the birth canal.

**Changes in oestrogen and progesterone**:

Oestrogen and progesterone are also the chief hormones throughout pregnancy. A woman will produce more oestrogen during one pregnancy than throughout her entire life when not pregnant. During pregnancy, oestrogen promotes maternal blood flow within the uterus and the placenta.

A pregnant woman’s progesterone levels are also very high. Among other effects, high levels of progesterone cause some internal structures to increase in size, including the uterus, enabling it to accommodate a full-term baby. It has other effects on the blood vessels and joints, which we will discuss later in this study session.

**Skin Changes:**

 A number of changes take place in the skin of pregnant women. Mechanical stretching of the skin over the abdomen and breasts can lead to striae. The increased levels of estrogen and progesterone have also been implicated. Usually striae remain permanently with some change in color. Prevention may be achieved with moisturizing creams, especially those containing lanolin and other oily substances. It should be realized, however, that striae may develop despite any preventative measures.

Vascular spider nevi and palmar erythema happen also during pregnancy. There is no clear explanation for these changes, but they most likely represent the result of vasodilatation that happens in the skin during pregnancy. Chloasma and other pigmented lesions can happen as a result of increased melanocyte-stimulating hormone activity which in turn is a result of increased estrogen and progesterone levels. These lesions usually begin at about five to six months gestation. One way that these lesions may be prevented is by the use of screening agents and avoidance of direct sunlight. Skin pruritus affects a number of women and it may be related to increased retention of bile salts in the skin secondary to estrogen effects. Scratching of the skin can then lead to infected excoriations. Local measures with anti-pruritic creams and lotions usually are sufficient.

**Changes in the Gastrointestinal System:**

 Nausea and vomiting are the most frequent complaints involving the gastrointestinal system and usually happen in early pregnancy while heartburn happens primarily in late pregnancy. The gums become hyperemic and edematous during pregnancy and tend to bleed. The muscular wall of the esophagus is relaxed and this may cause reflux, which in turn can lead to esophagitis and heartburn. The stomach and the intestines have decreased motility presumably due to the effect of progesterone on smooth muscle contractility. This causes an increase in the time that it takes for the stomach to empty. Reduced gastric secretion has also been documented and it could account for the improvement of peptic ulcers sometimes observed in pregnancy. Decreased motility of the large intestine may lead to constipation. The liver is affected significantly by pregnancy.

Cholestatic jaundice is considered to be the result of estrogen effect on elimination of bilirubin by the liver. The effect of estrogens also, is to increase protein synthesis in the liver, which leads to increased production of fibrinogen and binding proteins. The liver enzymes are usually unaffected with the exception of alkaline phosphatase, which is increased at approximately two fold to four fold that is a result of a placental production. Pregnancy increases the size and decreases the motility of the gall bladder.

**Cardiovascular Changes:**

The most important change in pregnancy is the change involving the cardiovascular system.

Adequate cardiovascular adaptation secures good placental development and thus appropriate fetal growth. In brief, the cardiovascular changes involve a substantial change in the blood volume, cardiac output, heart rate, systemic arterial blood pressure, systemic vascular resistance, oxygen consumption and alterations in regional blood flow of various organ systems.

**Blood Volume:**

Significant increases in the blood volume start taking place in the first trimester and continue until the mid-third trimester, at approximately the 32nd to the 34th week. Beyond this point in estuation, the blood volume plateaus. This pattern was established with studies that kept the patients in the left-lateral position to avoid vena cava compression. However, studies that kept the patient in the supine position had controversial results indicating a decline in the blood volume after 34 to 36 weeks. The average absolute increase in blood volume during pregnancy is about 1600 ml and in terms of percent change one should expect a 40 to 50 percent increase above pre-pregnancy levels. The increase in the blood volume is achieved by a combination of increases in the plasma volume and the RBC mass. The calculated plasma volume expansion is approximately 1300 ml and the volume of the RBC increases about 400 ml. This discordance in the change between the cellular elements of the blood and the liquid portion leads to the so called "physiologic anemia of pregnancy". The mechanisms leading to hypervolemia in pregnancy are still not entirely understood and seem to be multifactorial. Increased estrogen levels in pregnancy cause increased production of renin from the kidneys, the uterus and the liver and thus cause elevated renin plasma levels. The increase in renin, which stimulates aldosterone secretion, is associated with sodium retention and an increase in total body water.

The increase in blood volume with pregnancy appears to serve the essential physiologic needs of both the mother and fetus. It ensures adequate supplies required for normal fetal growth and oxygenation even under circumstances that affect the maternal cardiac output (inferior vena cava compression). This increased blood volume also helps normal pregnant women to withstand hemorrhage equal to the volume of blood added to the circulation during the course of the normal pregnancy without any signs of decompensating.

**Cardiac Output:**

It has been well established since the beginning of this century that the cardiac output increases an average of 50 percent during pregnancy. It is generally accepted that cardiac output begins to rise during the first trimester, probably around the tenth week of pregnancy and continues to rise up until the 24th week of gestation. Once it reaches the peak it stays rather stable. That was the case in most if not all of the studies that evaluated women in a left-lateral tilt while studies that placed women in the supine position have shown a rather false reduction in cardiac output which was primarily mediated by inferior vena cava compression.

Cardiac output is a product of stroke volume and pulse rate. The rise in cardiac output early in pregnancy is disproportionately greater than the increase in heart rate, and therefore is attributable to augmentation in stroke volume. As pregnancy advances, heart rate increases and becomes a more predominant factor in increasing cardiac output. At the late stages of pregnancy, the stroke volume declines to normal, non-pregnant values.

##### **Changes in cardiac output during pregnancy**

|  |  |
| --- | --- |
| Woman’s condition | Cardiac output (liters per minute) |
| non-pregnant, resting | 2.5 |
| end of 1st trimester | 5 |
| end of 2nd trimester | 6 |
| full-term | 7 |

**Heart Rate during Normal Pregnancy:**

The baseline heart rate increases by about 10 to 20 beats per minute. This increase starts early in pregnancy and gradually continues to go upward with the highest values achieved at term. Some investigators, however, suggested that the total increase happens early in pregnancy and remains so throughout the remainder of gestation.

 In twin gestations, the rise of the heart rate is more pronounced and it can reach as much as 40 percent above the non-pregnant state. A change also from the supine position to the lateral position may cause the heart rate to drop slightly.

**Pregnancy-related changes in posture and joint:**

A pregnant woman’s entire posture changes as the baby gets bigger. Her abdomen transforms from flat or concave (dished) to very convex (bulging outwards), increasing the curvature of her back. The weight of the fetus, the enlarged uterus, the placenta and the amniotic fluid (the bag of waters surrounding the baby), together with the increasing curvature of her back, puts a large strain on the woman’s bones and muscles. As a result, many pregnant women get back pain. Too much standing in one place or leaning forward can cause back pain, and so can hard physical work. Most kinds of back pain are normal in pregnancy, but it can also be a warning sign of a kidney infection. In addition, progesterone causes a loosening of ligaments and joints throughout the body. Pregnant women may be at greater risk of sprains and strains because the ligaments are looser, and because their posture has changed.

**The Heart:**

A number of changes happen to the heart and are unique to pregnancy. Increasing intra-abdominal contents displace the heart upward with some forward rotation. As a result the anterior posterior diameter and the cardiothoracic ratio are increased. The overall dimensions of the heart are increased during pregnancy as a result of increased diastolic heart volume without any change in the ventricular wall thickness. Systolic ejection murmurs are common in pregnancy while diastolic murmurs are less frequent. The systolic murmurs are usually the result of the hyper dynamic circulation.

**Changes in body weight during pregnancy:**

Continuing weight increase in pregnancy is considered to be one favorable indication of maternal adaptation and fetal growth. However, routine weighing of the mother during pregnancy is not now thought to be necessary, because it does not correlate well with pregnancy outcomes. For example, there can be a slight loss of weight during early pregnancy if the woman experiences much nausea and vomiting (often called ‘**morning sickness**’). The expected increase in weight of a healthy woman in an average pregnancy, where there is a single baby, is as follows:

* About 2.0 kg in total in the first 20 weeks
* Then approximately 0.5 kg per week until full term at 40 weeks
* A total of 9 -12 kg during the pregnancy.

A woman who is pregnant with more than one baby will have a higher weight gain than a woman with only one fetus. She will also require a higher calorie diet. A lack of significant weight gain may not be a cause for concern in some women, but it could be an indication that the fetus is not growing properly. Doctors and midwives may refer to this as intrauterine growth restriction (IUGR) of the fetus.

**Blood Pressure:**

A slight decrease in the systolic arterial blood pressure and a significant decrease in the diastolic pressure have been observed to occur in normal pregnancy. This decrease becomes evident in the late first trimester and continues throughout most of the second trimester. The lowest values are noted in mid pregnancy and there after the blood pressure returns toward non-pregnant levels before term. The degree of change in the blood pressure parameters has been found to be affected by parity, smoking, preexisting hypertension, maternal age and ethnic background. In the typical normal pregnancy the mean arterial pressure (diastolic plus 1/3 of the difference between systolic and diastolic) is less than 85 mm of mercury. Studies have found that when the mean arterial blood pressure in the mid second trimester is higher than 90 mm of mercury, there is increased perinatal mortality and morbidity.

**Systemic Vascular Resistance:**

Normal pregnancy is associated with a significant fall in systemic vascular resistance. As a result, the diastolic blood pressure drops as well as the systolic. However, the diastolic blood pressure drops more than the systolic leading to a widening of the pulse pressure. The mechanism for this change is not entirely clear. It has been speculated, however, that a significant portion of this decline is caused by the development of a low resistance circulation in the pregnant uterus. Estrogens, Prolactin, circulating prostaglandins PGE and PGI may be responsible for the vasodilatation that can cause a drop in the peripheral resistance. In addition, the profound dilatation of the skin vessels as a result of the increased maternal body heat dissipation may contribute to the drop in the systemic vascular resistance.

**Blood Flow Changes in Various Organ Systems during Pregnancy:**

The most profound changes in regional blood flow occur in the uterus with a 5 to 10 fold increase. This change starts early in pregnancy and continues until almost term. Approximately 20% of the maternal cardiac output perfuses the uterine vessels (placental and nonplacental). The kidneys also demonstrate substantial increase of the regional blood flow as much as 30 to 80 percent and at the same time a 50 percent increase in glomerular filtration rate is noted. The regional blood flow in the extremities also increases and more so in the hands than the legs. As it was mentioned previously, there is a significant dilatation in the skin vessels which leads to an increase in the regional blood flow. These changes in the skin vessels may cause warm skin, clammy hands, vascular spiders, and palm erythema. The liver circulation is not affected very much and the same is true for the brain blood flow which is auto regulated. The blood flow to the breast is increased during pregnancy to prepare the breast for lactation. The effect of pregnancy on coronary blood flow is still unknown. It is safe, however, to speculate that an increase may happen since augmentation of cardiac function is present during pregnancy.

DIAGRAM:



SUMMARY:

1. Oestrogen and progesterone are the chief pregnancy hormones.
2. High levels of progesterone cause some internal structures to increase in size, including the uterus which changes from the size of a small pear in its non-pregnant state to five times its normal size at full term.
3. The expected increase in weight of the mother in an average pregnancy is 9-12 kg.
4. A higher circulating blood volume is required to provide extra blood flow through the placenta to the fetus, and the mother also produces more red blood cells.
5. The increase in blood volume exceeds the increase in red blood cells, so they are diluted in the much larger volume of blood plasma, causing physiological anemia. This is one reason why iron supplementation is so important in pregnancy.
6. Lower blood pressure is particularly common in early pregnancy because progesterone causes a slight relaxation in the blood vessels. This can cause dizziness and perhaps even a brief loss of consciousness.
7. A reduction in blood flow back to the heart may lead to oedema — swelling due to fluid collecting in the legs and feet.
8. During pregnancy, many women get short of breath because the growing baby crowds the mother’s lungs and she has less room to breathe. She may also experience indigestion as her stomach is pushed higher.
9. During pregnancy, the muscles in the walls of the gastrointestinal system relax slightly, and the rate at which food moves along the gut is slowed down. This maximizes the absorption of nutrients into the mother’s blood, which is good for the fetus, but the mother may also experience nausea or constipation.
10. Needing to urinate often is normal, especially in the first and last months of pregnancy, because the growing uterus presses against the bladder. At night, the bladder fills more quickly as fluid (oedema) that collected in the legs during the day is re-absorbed.
11. Changes in the woman’s hormones, and mechanical stretching of her growing abdomen and breasts, can cause stretch marks in the skin of these areas during pregnancy. Other skin changes may include brown pigmentation and increased sweating.
12. In the second trimester, the breasts begin to produce colostrum — a yellowish secretion that thickens as pregnancy progresses. It is rich in proteins and maternal antibodies, and should always be fed to newborn babies.