

**NAME: ALIVIDE DEBORAH SEWANU**

**MATRIC NUMBER: 18/mhs02/040**

**DEPARTMENT: NURSING**

**COURSE CODE: PHS212**

**TOPIC: PHYSIOLOGICAL ADAPTATIONS OF THE FEMALE TO PREGNANCY**

Maternal physiological changes in pregnancy are also 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. Some of the changes include: Hormonal, Breast Size, Cardiovascular, Immune Tolerance, Respiratory etc.

● **HORMONAL**

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 .

### **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 ( $\beta$ -hCG), which is produced by the placenta.

### **Pancreatic Insulin**

The placenta also produces human placental lactogen (hPL), which stimulates maternal lipolysis and fatty acid metabolism. As a result, this conserves blood glucose for use by the fetus. It can also decrease maternal tissue sensitivity to insulin, resulting in gestational diabetes .

### **Pituitary gland**

The pituitary gland grows by about one-third as a result of hyperplasia of the lactotrophs in response to the high plasma estrogen. Prolactin, which is produced by the lactotrophs increases progressively throughout pregnancy. Prolactin mediates a change in the structure of the breast mammary gland from ductal to lobular-alveolar and stimulates milk production.

## **Parathyroid**

Fetal skeletal formation and then later lactation challenges the maternal body to maintain their calcium levels. The fetal skeleton requires approximately 30 grams of calcium by the end of pregnancy. The mother's body adapts by increasing parathyroid hormone, leading to an increase in calcium uptake within the gut as well as increased calcium reabsorption by the kidneys. Maternal total serum calcium decreases due to maternal hypoalbuminemia, but the ionized calcium levels are maintained.

## **Adrenal glands**

Total cortisol increases to three times of non-pregnant levels by the third trimester. The increased estrogen in pregnancy leads to increase corticosteroid-binding globulin production and in response the adrenal gland produces more cortisol. The net effect is an increase of free cortisol. This contributes to insulin resistance of pregnancy and possibly striae. Despite the increase in cortisol, the pregnant mom does not exhibit Cushing syndrome or symptoms of high cortisol. One theory is that high progesterone levels act as an antagonist to the cortisol.

### ● **BREAST SIZE**

A woman's breasts grow during pregnancy, usually 1 to 2 cup sizes and potentially several cup sizes. 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 woman's torso also grows and her bra band size may increase one or two sizes. An average of 80% of women wear the wrong bra size, and mothers who are preparing to nurse can benefit from a professional bra fitting from a lactation consultant. Once the baby is born up to about 50–73 hours after birth, the mother will experience her breasts filling with milk (sometimes referred to as “the milk coming in”). Once lactation begins, the woman's breasts swell significantly and can feel achy, lumpy and heavy (which is referred to as engorgement). Her breasts may increase in size again by an additional 1 or 2 cup sizes, but individual breast size may vary depending on how much the infant nurses from each breast. A regular pattern of nursing is generally established after 8–12 weeks, and a woman's breasts will usually reduce in size,

but may remain about 1 cup size larger than prior to her pregnancy. Changes in breast size during pregnancy may be related to the sex of the infant, as mothers of female infants have greater changes in breast size than mothers of male infants.

## ● **CARDIOVASCULAR**

The heart adapts to the increased cardiac demand that occurs during pregnancy in many ways.

- Cardiac output (Lit./Min.): 6.26
- Stroke Volume (Ml.): 75
- Heart Rate (Per min.): 85
- Blood Pressure: Unaffected

Cardiac output increases throughout early pregnancy, and peaks in the third trimester, usually to 30-50% above baseline. Estrogen mediates this rise in cardiac output by increasing the pre-load and stroke volume, mainly via a higher overall blood volume (which increases by 40–50%). The heart rate increases, but generally not above 100 beats/minute. Total systematic vascular resistance decreases by 20% secondary to the vasodilatory effect of progesterone. Overall, the systolic and diastolic blood pressure drops 10–15 mm Hg in the first trimester and then returns to baseline in the second half of pregnancy. All of these cardiovascular adaptations can lead to common complaints, such as palpitations, decreased exercise tolerance, and dizziness.

## ● **IMMUNE TOLERANCE**

Immune tolerance in pregnancy or maternal immune tolerance is the immune tolerance shown towards the fetus and placenta during pregnancy. This tolerance counters the immune response that would normally result in the rejection of something foreign in the body, as can happen in cases of spontaneous abortion. It is studied within the field of reproductive immunology.

## ● **RESPIRATORY**

There are many physiologic changes that occur during pregnancy that influence respiratory status and function. Progesterone has noticeable effects on respiratory physiology, increasing minute volume (the amount of air breathed in and out of the lungs in 1 minute) by 40% in the first trimester via an increase in tidal volume alone, as the respiratory rate does not change during pregnancy. As a result, carbon dioxide levels in the blood decrease and

the pH of the blood becomes more alkaline (i.e. the pH is higher and more basic). This causes the maternal kidneys to excrete bicarbonate to compensate for this change in pH. The combined effect of the decreased serum concentrations of both carbon dioxide and bicarbonate leads to a slight overall increase in blood pH (to 7.44 compared to 7.40 in the non-pregnant state) . If an arterial blood gas (ABG) specimen is drawn on a pregnant person, it would therefore reveal respiratory alkalosis (from the decrease in serum carbon dioxide mediated by the lungs) with a compensatory metabolic acidosis (from the decrease in serum bicarbonate mediated by the kidneys).

As the uterus and fetus continue to enlarge over time, the diaphragm progressively becomes more upwardly displaced. This causes less space to be available for lung expansion in the chest cavity, and leads to a decrease in excitatory reserve volume and residual volume. This culminates in a 20% decrease in functional residual capacity (FRC) during the course of the pregnancy.

Oxygen consumption increases by 20% to 40% during pregnancy, as the oxygen demand of the growing fetus, placenta, and increased metabolic activity of the maternal organs all increase the pregnant person's overall oxygen requirements. This increase in oxygen consumption paired with the decrease in FRC can potentially mean that pregnant people with pre-existing and/or comorbid asthma, pneumonia, or other respiratory issues may be more prone to disease exacerbation and respiratory decompensation during pregnancy.