

INTRODUCTION Pregnancy is a unique period in a woman's lifetime. A number of anatomic, physiologic, biochemical and psychological changes take place.

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 happen 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. The decreasing motility and increase in volume, combined with changes in the bile's composition.

CARDIOVASCULAR CHANGES Of all changes that happen in pregnancy, the single most important is the one 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 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 PGE2 and PGI2 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 autoregulated. 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.

Cardiocirculatory Changes During Labor and Delivery

During labor significant hemodynamic changes take place. These changes can in part be explained by the effect of the uterine contractions, which may cause a significant increase of 300 to 500 ml in central blood volume, and in part by the effect of pain and anxiety on the cardiovascular system. It is important to note here that in the lateral position, cardiac output between contractions is higher than in the supine position and the increase during contractions is smaller. The effect of uterine contractions during labor on the heart rate is variable. Some investigators have reported an increase in the heart rate and others have reported a decline in the heart rate.

MUSCULAR SKELETAL AND NEUROLOGIC SYMPTOMS A number of women may experience backache in the upper back, which is secondary to muscle tension from increasing breast size. A woman's breasts grow during pregnancy, usually 1 to 2 cup sizes [citation needed] 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. [6] A woman's torso also grows and her bra band size may increase one or two sizes. [7][8] An average of 80% of women wear the wrong bra size, [9] and mothers who are preparing to nurse can benefit from a professional bra fitting from a lactation consultant. [8] Once the baby is born up to about 50 鈥?73 hours after birth, the mother will experience her breasts filling with milk (sometimes referred to as 鈥? he milk coming in 鈥?). 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.[7][8] A regular pattern of nursing is generally established after 8 到 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

and discomfort. Most women, however, experience low back pain secondary to muscular fatigue and strain that is caused by the changes in body balance from the growing uterus. Several patients also may experience pressure on nerve roots that in turn may lead to muscular spasms and pelvic joint pains secondary to bone ligament relaxation from the sex hormones. The changes that happen on the ligaments and the cartilage of the pelvic bones secondary to the sex hormones may also lead some women to present with gait alterations. Finally, a number of women may experience paresthesias (numbness and tingling of fingers and toes). A number of theories are suggested for the explanation of these symptoms. The fingers and upper extremities are affected if lordotic posture is extreme; the head and neck are flexed, putting strain on the brachial nerves and causing tingling of hands and arms. Toes and lower extremities are affected if gravid uterus presses on femoral veins and nerves supplying lower extremities, thus interfering with circulation and causing paresthesias. Edema may cause pressure and tingling of hands or feet, especially in hands when rising in the morning. Sometimes excessive edema of the hands may lead to carpal tunnel syndrome. Finally, Vitamin B deficiency, hypoglycemia and hyperventilation have been suggested as causes of these symptoms.

CHANGES IN THE REPRODUCTIVE SYSTEM Rhythmic tightenings of the uterus occur as part of preparatory changes for labor. These are called Braxton-Hicks contractions and since the advent of ultrasound, can be seen as early as eight to nine weeks. As the pregnancy advances these contractions become more frequent and they are more likely to be felt by the patient. Usually they happen every 5 to 20 minutes and sometimes they may last as long as 30 minutes.

PHYSIOLOGICAL RESPIRATORY CHANGES Anatomic Changes Mucosal edema and hyperemia secondary to capillary engorgement are common findings in the nasopharynx and the tracheal bronchial tract. In fact the majority of pregnant women have redness and swelling of the lungs that at times can produce changes in the voice. Changes also occur in chest circumference (6 to 7 cm.), vertical diameter (4 to 5 cm.), and the substernal angle (from 70 to 105 degrees). The increase in chest circumference compensates for the elevation of the diaphragm, so that essentially there is no change in the overall volume of the thoracic cavity. Pulmonary Ventilation During normal pregnancy the patients are in a state of hyperventilation. The arterial CO₂ declines and the maternal arterial blood pH remains unchanged by compensatory increase in renal excretion of bicarbonate, which decreases to 21 mEq/L from 27 mEq/L. This hyperventilation of pregnancy seems to be related to the direct action of progesterone on the respiratory center. This effect with the lowering of the CO₂ in the blood facilitates removal of CO₂ from fetal cells and produces a CO₂ tension in the fetus similar to what will be found in the newborn.