DOWNLOAD PDF PREGNANCY AND THE CARDIOVASCULAR SYSTEM

Chapter 1 : Blood Circulation & Pregnancy | Healthfully

Your body goes through many changes during pregnancy -- many that you can see and feel and many that you cannot. Your cardiovascular system, which goes through many changes during pregnancy, includes the heart, blood, veins and arteries.

A woman who wore a C cup bra prior to her pregnancy may need to buy an F cup or larger bra while nursing. 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. In February , Cheryl Cole told British Vogue that she hesitated to breastfeed because of the effect it might have on her breasts. As a result, healthy pregnancy patients in a supine position or prolonged standing can experience symptoms of hypotension. Erythropoietin , which stimulates red blood cell production, increases throughout pregnancy and reaches approximately percent of their pregnancy levels at term. Hypercoagulability[edit] A pregnant woman will also become hypercoagulable , leading to increased risk for developing blood clots and embolisms, such as deep vein thrombosis and pulmonary embolism. Women are times more likely to develop a clot during pregnancy and in the postpartum period than when they are not pregnant. In third world countries, the leading cause of maternal death is still hemorrhage. Plasma levels of pro-coagulantion factors increased markedly in pregnancy, including: Metabolic[edit] During pregnancy, both protein metabolism and carbohydrate metabolism are affected. One kilogram of extra protein is deposited, with half going to the fetus and placenta , and another half going to uterine contractile proteins, breast glandular tissue, plasma protein, and haemoglobin. An increased requirement for nutrients is given by fetal growth and fat deposition. Changes are caused by steroid hormones, lactogen, and cortisol. Maternal insulin resistance can lead to gestational diabetes. Increased liver metabolism is also seen, with increased gluconeogenesis to increase maternal glucose levels. The enlarging uterus, growing fetus, placenta , amniotic fluid , normal increase in body fat, and increase in water retention all contribute weight gain during pregnancy. The amount of weight gain can vary from 5 pounds 2. The use of Omega 3 fatty acids supports mental and visual development of infants. A pregnant woman may experience an increase in the size of the kidneys and ureter due to the increase blood volume and vasculature. Later in pregnancy, the woman might develop physiological hydronephrosis and hydroureter, which are normal. The increased GFR leads to increased urinary output, which the woman may experience as increased urinary frequency. Progesterone also causes decreased motility of the ureters, which can lead to stasis of the urine and hence an increased risk of urinary tract infection. Gastrointestinal[edit] Changes in the gastrointestinal GI system during pregnancy are caused by the enlarging uterus and hormonal changes of pregnancy. Anatomically, the intestine and stomach are pushed up from their original positions by the enlarging uterus. Elevated levels of progesterone and estrogen mediate most of the functional changes of the GI system during pregnancy. Progesterone causes smooth muscle relaxation which slows down GI motility and decreases lower esophageal sphincter LES tone. The resulting increase in intragastric pressure combined with lower LES tone leads to the gastroesophageal reflux commonly experienced during pregnancy. It begins between the 4 and 8 weeks of pregnancy and usually subsides by 14 to 16 weeks. The exact cause of nausea is not fully understood but it correlates with the rise in the levels of human chorionic gonadotropin , progesterone , and the resulting relaxation of smooth muscle of the stomach. Hyperemesis gravidarum , which is a severe form of nausea and vomiting of pregnancy can lead to nutritional deficiencies, weight loss, electrolytes imbalance and is one of the leading causes of hospitalization in the first trimester of pregnancy. It is associated with the narrowing of the colon as it gets pushed by the growing uterus found adjacent it leading to mechanical blockade. Reduced motility in the entire GI system as well as increased absorption of water during pregnancy are thought to be contributing factors. Although the exact mechanisms of these symptoms are not fully explained, it is thought that dietary cravings may arise from the thought that certain foods might help relieve nausea. Pica , which is the intense craving for unusual materials such as clay and ice has also been reported in pregnancy. Hemorrhoids arise as a result of constipation and venous congestion that are common in pregnancy. Gingival disease is thought to be related to gum softening and edema swelling from fluid collection that is mostly

observed in pregnancy. The mechanism and reason for the gingival changes are poorly understood. Immune tolerance in pregnancy The fetus inside a pregnant woman may be viewed as an unusually successful allograft , since it genetically differs from the woman. Such changes increase their risk for musculoskeletal disorders and fall injuries. Musculoskeletal disorders include lower-back pain, leg cramps, and hip pain. Additionally, two-thirds of falls are associated with walking on slippery floors, rushing, or carrying an object. However, some factors that may contribute to these injuries include deviations from normal posture , balance , and gait. The pelvis tilts and the back arches to help keep balance. These muscles are less able to contract and keep the lower back in proper alignment. The pregnant woman has a different pattern of gait. The step lengthens as the pregnancy progresses, due to weight gain and changes in posture. The influences of increased hormones such as estrogen and relaxin initiate the remodeling of soft tissues, cartilage and ligaments. Certain skeletal joints such as the pubic symphysis and sacroiliac widen or have increased laxity. The change in COM requires pregnant mothers to adjust their bodies to maintain balance. Lumbar lordosis[edit] To positionally compensate the additional load due to the pregnancy, pregnant mothers often extend their lower backs. As the fetal load increases, women tend to arch their lower backs, specifically in the lumbar region of their vertebral column to maintain postural stability and balance. The arching of the lumbar region is known as lumbar lordosis , which recovers the center of mass into a stable position by reducing hip torque. According to a study conducted by Whitcome, et al. Postpartum, the angle of the lordosis declines and can reach the angle prior to pregnancy. Unfortunately, while lumbar lordosis reduces hip torque, it also exacerbates spinal shearing load, [31] which may be the cause for the common lower back pain experienced by pregnant women. It turns out that there are sex differences in the lumbar vertebral column of human males and females, which ultimately helps mitigate some of the discomfort due to the fetal load in females. There are 5 vertebrae in the lumbar region for both males and females. When a female arches her lower back, such as during fetal loading, having an extra dorsally wedged vertebra lessens the shearing force. This lumbar sexual dimorphism in humans suggests high natural selection pressures have been acting to improve maternal performance in posture and locomotion during pregnancy. Currently there are 2 nearly complete australopith lumbar segments; one has three dorsally wedged vertebrae in the lumbar region while the other has two. An explanation for these findings is that the first one is a female, while the latter is a male. This sort of evidence supports the notion that natural selection has played a dimorphic role in designing the anatomy of the vertebral lumbar region.

Chapter 2 : Maternal Adaptations in Pregnancy - Endocrine System - TeachMePhysiology

CARDIOVASCULAR ADAPTATIONS DURING NORMAL PREGNANCY. A variety of changes in the cardiovascular system occur during normal pregnancy, including increases in cardiac output, arterial compliance, and extracellular fluid volume and decreases in blood pressure (BP) and total peripheral resistance. 1 Mean BP gradually falls during pregnancy, with the largest decrease in BP typically occurring at

These adaptations allow her to support and protect the foetus. In this article, we will take a systems based approach to discuss the different changes which occur during pregnancy. Endocrine System During pregnancy a woman experiences a change in her endocrine system. Increase in oestrogen levels results in an increase in hepatic production of thyroid binding globulin TBG. As a result, more free T3 and T4 bind to the TBG, this causes more thyroid stimulating hormone to be released from the anterior pituitary gland. Therefore, the free T3 and T4 levels remain unchanged â€" but the total T3 and T4 levels rise. Hence, increasing T3 and T4 levels in the mother ensures that there is a constant supply of thryoxin to the foetus early in pregnancy. This ensures that there is a continuous supply of glucose for the foetus. The mother switches to an alternative source of energy which is provided by lipids. The increase in lipolysis means that there is an increase in free fatty acids in the plasma which provide substrate for maternal metabolism. Cardiovascular System As discussed above, during pregnancy progesterone levels increases. An increase in blood pressure in pregnancy could be an indication of pre-eclapmsia. 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. 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. The appendix may also move to the right upper quadrant of the abdomen as the uterus enlarges. This would decrease gut motility. This predisposes the mother to getting gallstones. This would mean that there is an increase in renal excretion. Additionally, due to an increase in progesterone levels stasis of blood and venodilation occurs. 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. Fasting plasma glucose level of 5. Risk factors for developing GDM include age, high BMI before pregnancy, family history of type 2 diabetes and smoking. Non drug treatment for GDM include changing diet and physical activity. Insulin can be given as treatment when lifestyle measures do not help to maintain blood sugar levels. Other agents such as metformin can also be offered. GDM poses a risk to the mother and the baby. Two main risks to the baby are macrosomia in unmanaged GDM which can lead to complications during birth as the baby is bigger in size or intrauterine growth retardation in managed GDM. Although most women recover from GDM after pregnancy there is a chance that in some GDM will recur in future pregnancies. Further information on gestational diabetes is available here.

Chapter 3 : HON Mother & Child Glossary, Respiratory System Changes During Pregnancy

The cardiovascular system undergoes important adaptations during pregnancy to accommodate for fetal requirements. This causes a hemodynamic burden on patients with underlying heart disease, and is associated with significant morbidity and mortality.

The Effect of Caffeine on an Unborn Baby During pregnancy, your body undergoes many changes, and changes to your circulatory system are no exception. Your maternal body adapts to the needs of your baby, since your blood provides all of the nutrients and oxygen your baby will need throughout the pregnancy. Sometimes the changing circulatory system may cause discomfort or complications for you during the pregnancy, but things usually return to normal shortly after the birth of your baby. Fetal and Maternal Circulation The presence of your fetus has a huge impact on your circulation during pregnancy. All of the your blood circulates through the placenta, which is attached to the inside wall of your uterus. Oxygenated blood enters your placenta from your arteries and is sent via the umbilical cord vein to your baby. The fetus extracts the nutrients and oxygen it needs from your blood and then sends the deoxygenated blood back to your placenta through the two umbilical arteries in the umbilical cord. This deoxygenated blood then circulates back into your cardiovascular system and is transported via your veins back to your lungs for oxygenation. Maternal Changes During pregnancy, your total cardiac output and blood volume increases 30 to 50 percent, according to the Merck Manuals. The peak occurs around week 24 and then starts dropping at about week 30 of pregnancy. When labor begins, these things ratchet up again and then drop quickly during delivery when blood is lost as a result of birth. Your heart rate rises to about 90 beats per minute. Blood pressure typically drops in the second trimester, but rises again during the third trimester. The composition of your blood also changes, creating a higher ratio of plasma to red blood cells than in non-pregnant women. Discomfort Some of the changes in your blood circulation during pregnancy may cause you discomfort. Swelling is common, especially in the legs and feet, due to the increased blood volume and the pressure on your veins in these lower extremities. Lower blood pressure and higher blood volume may also contribute to fatigue and headaches during pregnancy. You may also develop hemorrhoids as a consequence of restricted blood flow to the lower half of your body. Complications If your circulatory system does not operate properly during pregnancy, complications can result. Intrauterine growth restriction, or IUGR, is a condition in which the fetus does not grow properly and can be a result of poor circulation or defects in your placenta or umbilical cord. Health threats to you may include pre-eclampsia, a dangerous rise in blood pressure accompanied by protein in your urine. You may also develop anemia as increased red blood cells use up available stores. Maintaining regular prenatal care will help you remain healthy throughout your pregnancy. Since standing and sitting can cause more buildup of blood in your lower extremities, avoid prolonged standing and sit with your feet up.

Chapter 4 : Physiological changes in pregnancy

Serial assessment of the cardiovascular system in normal pregnancy: role of arterial compliance and pulsatile arterial load. Circulation. ;

Cardiovascular contraindications to pregnancy Short Notes Abstract: Pregnancy is associated with several hemodynamic changes. As term advances there is increase in heart rate and cardiac output while the peripheral resistance falls in pregnancy. Blood volume also increases in pregnancy and there is a sudden increase in blood volume after delivery when the placenta separates and pushes the blood from the maternal aspect back into circulation. Some of the important cardiovascular contraindications to pregnancy are: Severe pulmonary hypertension Severe cyanotic congenital heart disease Marfan syndrome with dilated aorta In severe pulmonary hypertension, the demand for increase in cardiac output with pregnancy cannot be met and the individual may develop low cardiac output state and right heart failure. Severe mitral stenosis in pregnancy has a high risk of development of pulmonary edema. Pulmonary edema can also occur soon after delivery at the time of placental separation due to the extra volume load from release of blood stored in the maternal aspect of the placenta. Other severe obstructive valvular lesions are also poorly tolerated in pregnancy because the obstructions make the cardiac output rather fixed, preventing the progressive rise in cardiac output needed in pregnancy. Cyanotic heart diseases with significant systemic desaturation are also poorly tolerated in pregnancy. In Eisenmenger syndrome there is dual risk of pulmonary vascular obstruction limiting the rise in cardiac output and the systemic desaturation due to the right to left shunt. Risk of rupture is highest during parturition due to the increased intrathoracic pressure while straining for labour. You may also wish to read: Search your topic here Topics by categories Privacy Policy and Disclaimer We do not intentionally collect and distribute personal data automatically from our website visitors. Those who submit comments have to give their email ids, which are not displayed or distributed to any third party. Blog subscription is managed using a Jetpack plugin. This site is not meant for any medical advice. Please contact your physician for medical advice. We do not endorse any products or services shown as ads. Ads are chosen by Google depending on your browsing pattern and contents of the page. Google will show only non-personalized ads to our users in the EEA as per the settings chosen by us. Users who consider that data likely to be collected by Google is unacceptable, kindly do not continue on this site. Subscribe to Blog via Email Enter your email address to subscribe to this blog and receive notifications of new posts by email.

Chapter 5 : Heart conditions and pregnancy: Know the risks - Mayo Clinic

The pregnancy-induced changes in the cardiovascular system develop primarily to meet the increased metabolic demands of the mother and racedaydvl.come the increased workload of the heart during gestation and labour, the healthy woman has no impairment of cardiac reserve.

Hormonal changes during pregnancy The hormonal and physiological changes that come with pregnancy are unique. Pregnant women experience sudden and dramatic increases in estrogen and progesterone. They also experience changes in the amount and function of a number of other hormones. A woman will produce more estrogen during one pregnancy than throughout her entire life when not pregnant. The increase in estrogen during pregnancy enables the uterus and placenta to: Estrogen levels increase steadily during pregnancy and reach their peak in the third trimester. The rapid increase in estrogen levels during the first trimester may cause some of the nausea associated with pregnancy. During the second trimester , it plays a major role in the milk duct development that enlarges the breasts. Progesterone levels also are extraordinarily high during pregnancy. The changes in progesterone cause a laxity or loosening of ligaments and joints throughout the body. In addition, high levels of progesterone cause internal structures to increase in size, such as the ureters. The ureters connect the kidneys with the maternal bladder. Progesterone is also important for transforming the uterus from the size of a small pear â€" in its non-pregnant state â€" to a uterus that can accommodate a full-term baby. Pregnancy hormones and exercise injuries While these hormones are absolutely critical for a successful pregnancy, they also can make exercise more difficult. Because the ligaments are looser, pregnant women may be at greater risk for sprains and strains of the ankle or knee. However, no studies have documented an increased rate in injury during pregnancy. Her breasts are larger. Her abdomen transforms from flat or concave to very convex, increasing the curvature of her back. The combined effect shifts the center of gravity forward and may lead to changes in her sense of balance. Weight gain, fluid retention, and physical activity Weight gain in pregnant women increases the workload on the body from any physical activity. This additional weight and gravity slow down the circulation of blood and bodily fluids, particularly in the lower limbs. As a result, pregnant women retain fluids and experience swelling of the face and limbs. This water weight adds another limitation on exercise. Learn about natural treatments for swollen hands. Many women begin to notice slight swelling during the second trimester. It often continues into the third trimester. This increase in fluid retention is responsible for a significant amount of weight gain women experience during pregnancy. Tips for easing swelling include: This even applies to the seasoned, elite, or professional athlete. Round ligament strain, increased size of the uterus, and pelvic instability from laxity of the ligaments may lead to increased discomfort during exercise. For fun, take a photograph of yourself from the side profile early in your pregnancy, using your best posture. Take another photo near your due date and compare these side profiles. Pregnancy can dramatically alter how a woman experiences the world through sight, taste, and smell. Vision changes Some women experience vision changes during pregnancy, characterized by increased nearsightedness. Most women return to prepregnancy vision after giving birth. Common changes during pregnancy include blurriness and discomfort with contact lenses. Pregnant women often experience an increase in intraocular pressure. Women with preeclampsia or gestational diabetes may be at an elevated risk of rare eye problems, such as retinal detachment or vision loss. Taste and smell changes Most women experience changes in their sense of taste during pregnancy. They typically prefer saltier foods and sweeter foods than non-pregnant women. They also have a higher threshold for strong sour, salty, and sweet tastes. Dysgeusia, a decrease in the ability to taste, is most commonly experienced during the first trimester of pregnancy. Certain taste preferences may vary by trimester. Although many women experience a dulled sense of taste for a short period of time postpartum, they typically regain full taste capability after pregnancy. Some women also experience a metallic taste in the mouth during pregnancy. This can aggravate nausea and may indicate a nutrient imbalance. Learn more about impaired taste. At times, pregnant women also report changes in their sense of smell. Many describe a heightened awareness and sensitivity to a variety of odors. Nevertheless, the vast majority of pregnant women report a perceived increase in their own sensitivity to

odors. Hormonal changes, which begin in the first trimester, will lead to many physiological changes throughout the body. Pregnancy hormones that affect skin pigmentation often darken the areola. As the breasts grow, pregnant women may experience tenderness or sensitivity and notice that the veins are darker and the nipples protrude more than before pregnancy. Some women may develop stretch marks on the breasts, particularly if they undergo rapid growth. Many women will also notice an increase in the size of the nipple and areola. Small bumps on the areolas often appear. This substance is also known as colostrum. Some women may notice small lumps in the breast tissue, which can be caused by blocked milk ducts. Cervical changes The cervix , or the entry to the uterus, undergoes physical changes during pregnancy and labor. In many women, the tissue of the cervix thickens and becomes firm and glandular. Up to a few weeks before giving birth, the cervix may soften and dilate slightly from the pressure of the growing baby. In early pregnancy, the cervix produces a thick mucus plug to seal off the uterus. The plug is often expelled in late pregnancy or during delivery. This is also called bloody show. Mucous streaked with a small amount of blood is common as the uterus prepares for labor. Prior to delivery, the cervix dilates significantly, softens, and thins, allowing the baby to pass through the birth canal. Learn more about the stages of labor and how they affect the cervix. Changes in the hair, skin, and nails Many women will experience changes in the physical appearance of their skin during pregnancy. Although most are temporary, some â€” such as stretch marks â€” can result in permanent changes. In addition, women who experience some of these skin changes during pregnancy are more likely to experience them again in future pregnancies or even while taking hormonal contraceptives. Hair and nail changes Many women experience changes in hair and nail growth during pregnancy. Hormone changes can sometimes cause excessive hair shedding or hair loss. This is especially true in women with a family history of female alopecia. But many women experience hair growth and thickening during pregnancy and may even notice hair growth in unwanted places. Hair growth on the face, arms, legs, or back can occur. Most changes in hair growth return to normal after the baby is born. Many women also experience faster nail growth during pregnancy. Eating well and taking prenatal vitamins adds to the growth hormones of pregnancy. Although some may find the change desirable, many may notice increased nail brittleness , breakage, grooves, or keratosis. Healthy dietary changes to increase nail strength can help prevent breakage without the use of chemical nail products. This consists of a darkening in skin tone on body parts such as the areolas, genitals, scars, and the linea alba a dark line down the middle of the abdomen. In addition, up to 70 percent of pregnant women experience a darkening of skin on the face. In most cases, melasma resolves after pregnancy. Stretch marks Stretch marks striae gravidarum are perhaps the most well-known skin change of pregnancy. Up to 90 percent of women develop stretch marks by the third trimester of pregnancy, often on the breasts and abdomen. Although the pinkish-purple stretch marks may never fully disappear, they often fade to the color of surrounding skin and shrink in size postpartum. Stretch marks can itch, so do apply creams to soften and reduce the urge to scratch and possibly damage the skin. Mole and freckle changes The hyperpigmentation caused by changes in hormones during pregnancy can cause changes in the color of moles and freckles. Some darkening of moles, freckles, and birthmarks can be harmless. Pregnancy hormones can also cause the appearance of dark patches of skin that are often unpreventable. Although most skin pigmentation changes will fade or disappear after pregnancy, some changes in mole or freckle color may be permanent. Pregnancy-specific rashes and boils Small percentages of women may experience skin conditions that are specific to pregnancy, such as PUPPP pruritic urticarial papules and plaques of pregnancy and folliculitis. Most conditions involve pustules and red bumps along the abdomen, legs, arms, or back. Although most rashes are harmless and resolve quickly postpartum, some skin conditions may be associated with premature delivery or problems for the baby. These include intrahepatic cholestasis and pemphigoid gestationis. The following are common during pregnancy: Most of this increase results from a more efficiently performing heart, which ejects more blood at each beat. Heart rate may increase up to 15 to 20 percent during pregnancy. Blood volume increases progressively during pregnancy until the last month.

Chapter 6 : The Effects of Pregnancy on the Cardiovascular System | racedaydvl.com

The cardiovascular system undergoes important adaptations during pregnancy to accommodate for fetal requirements. This causes a hemodynamic burden on patients with underlying heart disease, and is.

Received Aug 31; Accepted Mar 4. This article has been cited by other articles in PMC. Abstract Physiological changes occur in pregnancy to nurture the developing foetus and prepare the mother for labour and delivery. Some of these changes influence normal biochemical values while others may mimic symptoms of medical disease. It is important to differentiate between normal physiological changes and disease pathology. This review highlights the important changes that take place during normal pregnancy. These changes begin after conception and affect every organ system in the body. It is important to understand the normal physiological changes occurring in pregnancy as this will help differentiate from adaptations that are abnormal. Plasma volume increases progressively throughout normal pregnancy. Because the expansion in plasma volume is greater than the increase in red blood cell mass, there is a fall in haemoglobin concentration, haematocrit and red blood cell count. Despite this haemodilution, there is usually no change in mean corpuscular volume MCV or mean corpuscular haemoglobin concentration MCHC. The platelet count tends to fall progressively during normal pregnancy, although it usually remains within normal limits. Pregnancy causes a two- to three-fold increase in the requirement for iron, not only for haemoglobin synthesis but also for for the foetus and the production of certain enzymes. There is a to fold increase in folate requirements and a two-fold increase in the requirement for vitamin B Changes in the coagulation system during pregnancy produce a physiological hypercoagulable state in preparation for haemostasis following delivery. Concentrations of endogenous anticoagulants such as antithrombin and protein S decrease. Thus pregnancy alters the balance within the coagulation system in favour of clotting, predisposing the pregnant and postpartum woman to venous thrombosis. This increased risk is present from the first trimester and for at least 12 weeks following delivery. In vitro tests of coagulation [activated partial thromboplastin time APTT , prothrombin time PT and thrombin time TT] remain normal in the absence of anticoagulants or a coagulopathy. Venous stasis in the lower limbs is associated with venodilation and decreased flow, which is more marked on the left. This is due to compression of the left iliac vein by the left iliac artery and the ovarian artery. On the right, the iliac artery does not cross the vein. The primary event is probably peripheral vasodilatation. This is mediated by endothelium-dependent factors, including nitric oxide synthesis, upregulated by oestradiol and possibly vasodilatory prostaglandins PGI2. This is achieved predominantly via an increase in stroke volume, but also to a lesser extent, an increase in heart rate. There is a minimal fall at term. An increase in stroke volume is possible due to the early increase in ventricular wall muscle mass and end-diastolic volume but not end-diastolic pressure seen in pregnancy. The heart is physiologically dilated and myocardial contractility is increased. Although stroke volume declines towards term, the increase in maternal heart rate 10â€”20 bpm is maintained, thus preserving the increased cardiac output. Blood pressure decreases in the first and second trimesters but increases to non-pregnant levels in the third trimester There is a profound effect of maternal position towards term upon the haemodynamic profile of both the mother and foetus. In the supine position, pressure of the gravid uterus on the inferior vena cava IVC causes a reduction in venous return to the heart and a consequent fall in stroke volume and cardiac output. Pregnant women should therefore be nursed in the left or right lateral position wherever possible. If the woman has to be kept on her back, the pelvis should be rotated so that the uterus drops to the side and off the IVC, and cardiac output and uteroplacental blood flow are optimised. Reduced cardiac output is associated with a reduction in uterine blood flow and therefore in placental perfusion, which could compromise the foetus. Although both blood volume and stroke volume increase in pregnancy, pulmonary capillary wedge pressure and central venous pressure do not increase significantly. Pulmonary vascular resistance PVR , like systemic vascular resistance SVR , decreases significantly in normal pregnancy. Pulmonary oedema will be precipitated if there is either an increase in cardiac pre-load such as infusion of fluids or increased pulmonary capillary permeability such as in pre-eclampsia or both. Cardiac output is increased between contractions but more so during contractions.

Following delivery there is an immediate rise in cardiac output due to relief of the inferior vena cava obstruction and contraction of the uterus, which empties blood into the systemic circulation. Transfer of fluid from the extravascular space increases venous return and stroke volume further. Those women with cardiovascular compromise are therefore most at risk of pulmorary oedema during the second stage of labour and the immediate postpartum period. Cardiac output has nearly returned to normal pre-pregnancy values two weeks after delivery, although some pathological changes e. The above physiological changes lead to changes on cardiovascular examination that may be misinterpreted as pathological by those unfamiliar with pregnancy. The murmur may be loud and audible all over the precordium, with the first heart sound loud and possibly sometimes a third heart sound. There may be ectopic beats and peripheral oedema. Normal findings on ECG in pregnancy that may partly relate to changes in the position of the heart include: Adaptive changes in renal vasculature The primary adaptive mechanism in pregnancy is a marked fall in systemic vascular resistance SVR occurring by week six of gestation. The fall in SVR is combined with increased renal blood flow and this is in contrast to other states of arterial under-filling, such as cirrhosis, sepsis or arterio-venous fistulas. Serum concentrations of relaxin, already elevated in the luteal phase of the menstrual cycle, rise after conception to a peak at the end of the first trimester and fall to an intermediate value throughout the second and third trimester. Relaxin stimulates the formation of endothelin, which in turn mediates vasodilation of renal arteries via nitric oxide NO synthesis. In addition, the increase in plasma volume causes decreased oncotic pressure in the glomeruli, with a subsequent rise in GFR. As the GFR rises, both serum creatinine and urea concentrations decrease to mean values of about The increased renal blood flow leads to an increase in renal size of 1â€”1. The kidney, pelvis and calyceal systems dilate due to mechanical compressive forces on the ureters. Progesterone, which reduces ureteral tone, peristalsis and contraction pressure, mediates these anatomical changes. Urinary stasis in the dilated collecting system predisposes pregnant women with asymptomatic bacteriuria to pyelonephritis. As in the non-pregnant state, glucose is freely filtered in the glomerulus. During pregnancy, the reabsorption of glucose in the proximal and collecting tubule is less effective, with variable excretion. In normal pregnancies the total protein concentration in urine does not increase above the upper normal limit. This results in a non-osmotic release of AVP from the hypothalamus. These changes lead to sodium and water retention in the kidneys and create a hypervolaemic, hypoosmolar state characteristic of pregnancy. The increase in plasma volume plays a critical role in maintaining circulating blood volume, blood pressure and uteroplacental perfusion during pregnancy. In addition to the increased renin production by the kidneys, ovaries and uteroplacental unit produce an inactive precursor protein of renin in early pregnancy. Plasma levels of aldosterone correlate well with those of oestrogens and rise progressively during pregnancy. The increase in aldosterone is responsible for the increase in plasma volume during pregnancy. The rise in GFR also increases distal sodium delivery, allowing excretion of excess sodium. Progesterone has antikaliuretic effects and therefore excretion of potassium is kept constant throughout pregnancy due to changes in tubular reabsorption, and total body potassium increases during pregnancy. AVP mediates an increase in water reabsorption via aquaporin 2 channels in the collecting duct. The threshold for hypothalamic secretion of AVP and the threshold for thirst is reset to a lower plasma osmolality level, creating the hypo-osmolar state characteristic of pregnancy. These changes are mediated by human chorionic gonadotropin hCG and relaxin. These changes enhance the metabolic clearance of vasopressin and regulate the levels of active AVP. In conditions of increased placental production of vasopressinase, such as pre-eclampsia or twin pregnancies, a transient diabetes insipidus may develop. The levels of natriuretic peptides are higher in pregnant women with chronic hypertension and pre-eclampsia. A mild fully compensated respiratory alkalosis is therefore normal in pregnancy arterial pH 7. Reference ranges for respiratory function in pregnancy Normal values.

Chapter 7 : Maternal physiological changes in pregnancy - Wikipedia

A patient with a diseased heart is especially at risk for cardiac decompensation 28 to 35 weeks of pregnancy when the blood volume and cardiac load are at their peak; also, during labor and immediately after delivery when rapid hemodynamic changes occur.

Sign up now Heart conditions and pregnancy: Know the risks Pregnancy stresses your heart and circulatory system, but many women who have heart conditions deliver healthy babies. Know the risks â€" and how to help prevent complications. How does pregnancy affect the heart? Pregnancy stresses your heart and circulatory system. During pregnancy, your blood volume increases by 30 to 50 percent to nourish your growing baby, your heart pumps more blood each minute and your heart rate increases. It takes several weeks after delivery for the stresses on the heart to return to the levels they were before you became pregnant. What are the risks? The risks depend on the nature and severity of your heart condition. Minor abnormalities in heart rhythm are common during pregnancy. Having an artificial heart valve or scarring or malformation of your heart or valves can increase your risk of complications during pregnancy. In addition, artificial or abnormal valves carry an increased risk of a potentially life-threatening infection of the lining of the heart endocarditis and heart valves. Mechanical artificial heart valves also pose serious risks during pregnancy due to the need to adjust use of blood thinners, the potential for life-threatening clotting thrombosis of heart valves. Taking blood thinners can also put your developing baby at risk. As blood volume increases, congestive heart failure can worsen. Congenital heart defect If you were born with a heart problem, your baby has a greater risk of developing some type of heart defect, too. You might also be at risk for heart problems occurring during pregnancy and of premature birth. Do some heart conditions cause more complications than others do? Certain heart conditions, especially narrowing of the mitral valve or aortic valve, can pose life-threatening risks for mother or baby. Depending on the circumstances, some heart conditions require major treatments â€" such as heart surgery â€" before you try to conceive. Medication you take during pregnancy can affect your baby. Often the benefits outweigh the risks, however. If you need medication to control your heart condition, your health care provider will prescribe the safest medication at the most appropriate dose. Take the medication exactly as prescribed. How should I prepare for pregnancy? You might also want to check in with other members of your health care team, such as your family doctor. Depending on the circumstances, your health care provider might adjust the dosage or make a substitution and explain the risks involved. What can I expect during prenatal visits? Your weight and blood pressure will likely be checked at every visit, and you might need frequent blood and urine tests. How often you see your cardiologist during your pregnancy will depend on the severity of your heart condition. Your health care provider might use certain tests to evaluate your heart function, including: This is a type of ultrasound that uses sound waves to produce images of your heart and the structures within your heart. How can I make sure my baby is OK? Your baby might need monitoring or treatment after delivery as well. How can I prevent complications? Taking good care of yourself is the best way to take care of your baby. Keep your prenatal appointments. Visit your health care provider regularly throughout your pregnancy. Take your medication as prescribed. Your health care provider will prescribe the safest medication at the most appropriate dose. Get plenty of rest. Take a daily nap, if you can, and avoid strenuous physical activities. Monitor your weight gain. Gaining too much weight places additional stress on your heart. Ask questions about your progress. Find out what to expect during labor and delivery. Avoid smoking, alcohol, caffeine and illegal drugs. What signs or symptoms should I report to my health care provider? Contact your health care provider if you have any signs or symptoms that concern you, particularly: Difficulty breathing Shortness of breath with exertion or at rest Heart palpitations, rapid heart rate or irregular pulse Chest pain A bloody cough or coughing at night What about labor and delivery? Your health care provider might recommend delivering your baby at a medical center that specializes in high-risk pregnancies. If there are concerns about your heart or circulation or you need to have certain specialists present during labor, your labor might be induced. Specialized equipment might be used to monitor you during labor. Your heart rate and rhythm might require monitoring throughout labor and delivery. Instead of lying flat on your

back, you might be asked to lie on your side and draw one of your knees toward your chest. To reduce stress from pain, your doctor might recommend that you receive medication through a catheter to your spine epidural or an injection into your spine spinal block to manage your pain. If you deliver vaginally, your health care provider might limit your pushing by using forceps or a vacuum extractor to help deliver your baby. If you develop an obstetrical problem that leads to a C-section, special precautions will be taken to monitor your heart function during the delivery. Your doctor might recommend scheduling a date to induce labor under controlled conditions if you have certain forms of a severe cardiac disease during pregnancy. Will I be able to breast-feed my baby? Breast-feeding is encouraged for most women who have heart conditions, even those who take medication. Discuss possible treatment adjustments with your health care provider ahead of time. If you have a congenital heart problem that greatly increases your risk of endocarditis, your doctor will probably discuss the risk of mastitis while breast-feeding. This fairly common infection could pose a special risk in your situation. Pumping and feeding breast milk might be recommended in some circumstances.

Chapter 8 : Cardiovascular Diseases during Pregnancy (Management of)

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.

Cardiovascular System Changes During Pregnancy The pregnancy-induced changes in the cardiovascular system develop primarily to meet the increased metabolic demands of the mother and foetus. Despite the increased workload of the heart during gestation and labour, the healthy woman has no impairment of cardiac reserve. Blood Volume increases progressively from weeks gestation pregnancy and reaches a maximum at approximately weeks with little change thereafter. The increased blood volume serves two purposes. First, it facilitates maternal and fetal exchanges of respiratory gases, nutrients and metabolites. Second, it reduces the impact of maternal blood loss at delivery. Leukocyte counts are variable during gestation, but usually remain within the upper limits of normal. Marked elevations, however, develop during and after delivery. The number of platelets also rises, yet not above the upper limits of normal. Combined with a decrease in fibrinolytic activity, these changes tend to prevent excessive bleeding at delivery. Thus, pregnancy is a relatively hypercoagulable state, but during pregnancy neither clotting or bleeding times are abnormal. Cardiac Output increases to a similar degree as the blood volume. During labor , further increases are seen with pain in response to increased catecholamine secretion; this increase can be blunted with the institution of labour analgesia. The heart is enlarged by both chamber dilation and hypertrophy. Upward displacement of the diaphragm by the enlarging uterus causes the heart to shift to the left and anteriorly. Systemic arterial pressure is never increased during normal gestation. In fact, by midpregnancy, a slight decrease in diastolic pressure can be recognized. Pulmonary arterial pressure also maintains a constant level. However, vascular tone is more dependent upon sympathetic control than in the nonpregnant state, so that hypotension develops more readily and more markedly consequent to sympathetic blockade following spinal or extradural anaesthesia. Central venous and brachial venous pressures remain unchanged during pregnancy, but femoral venous pressure is progressively increased due to mechanical factors. See also hypertension in pregnancy and pre-eclampsia Aortocaval Compression. From mid-pregnancy, the enlarged uterus compresses both the inferior vena cava and the lower aorta when the patient lies supine on the back. The information in this page is presented in summarised form and has been taken from the following source s:

Chapter 9 : Changes in the urinary system during pregnancy - Kensington Midwives

Pregnancy stresses your heart and circulatory system. During pregnancy, your blood volume increases by 30 to 50 percent to nourish your growing baby, your heart pumps more blood each minute and your heart rate increases.

Obstetricians monitor changes in your cardiovascular system during prenatal visits. Your cardiovascular system, which goes through many changes during pregnancy, includes the heart, blood, veins and arteries. It is responsible for transporting nutrients, metabolic wastes, hormones and gases to and from all the cells of the body and must go through some changes to support your needs as well as those of your growing baby. Video of the Day Blood Volume Starting when you are about six weeks pregnant, your blood volume begins to increase and continues to do so until about 32 weeks gestation. This is necessary in order to facilitate the exchange of respiratory gases and nutrients between you and the baby. This increase in blood volume also minimizes the impact of blood loss during delivery. The amount of increase in blood volume is dependent on your size, number of pregnancies and deliveries and the number of fetuses you are carrying. Blood Components The actual composition of your blood will also change during pregnancy. You will experience an increase of about 40 to 50 percent in blood plasma. Additionally, your red blood cell concentration will increase by about 20 to 30 percent. Because your plasma increases more so than your red blood cells it is necessary to supplement with iron and folic acid in order to maintain the ideal levels of hemoglobin. Heart Changes The size of the heart as well as its position also changes with pregnancy. Because of the expanding uterus, the diaphragm is pushed upwards which in turns pushes the heart further up in the chest cavity. The actual size of your heart increases by about 12 percent during pregnancy. Cardiac Output Cardiac output is the amount of blood pumped out by the heart in one minute. Similar to blood volume, there is a 30 to 40 percent increase in cardiac output during pregnancy. This increase in cardiac output can be traced to the increase in heart rate among pregnant women as well as the increase in heart size. Blood Pressure In a normal pregnancy, your blood pressure will remain about the same as your non-pregnant state during the first trimester. It will then most likely drop during mid-pregnancy and return to your normal values during the final months of gestation. If you had high blood pressure before pregnancy, you are most likely going to have high blood pressure during pregnancy. Physicians get concerned when your blood pressure greatly increases above your normal levels in the second or third trimester. It also notes that a woman who suffers from high blood pressure during pregnancy may be at an increased risk for cardiovascular disease later in life.