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Original Article

An In-depth Examination of Pregnancy: Investigating Physiological Mechanisms and Pathological Factors

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Abstract:

Prospective mothers who are at risk of aortic problems face difficulties. AOD may indicate aortic disease in certain pregnant women. Refer them to a tertiary care facility for delivery treatment and pregnancy monitoring. Current medications must not cause birth defects or teratogenicity. In the second and third trimesters, several medications may induce foetal central nervous system toxicity. Pregnant women change medically and physically to help their child. All organs are affected by these post-conception changes. Extra oxygen is required during a normal pregnancy. This is due to a 15% rise in metabolic rate and a 20% increase in oxygen demand. Tidal volume has increased minute ventilation by 40-50%, but respiratory rate has risen. Hyperventilation by the mother raises arterial pO2, decreases pCO2, and lowers serum bicarbonate to 18-22 mmol/l. With early pregnancy insulin-secreting beta-cell hyperplasia, insulin sensitivity and secretion increase, followed by insulin resistance. Early experiences and exposures have long been researched in the developmental sciences to see how they impact later development in individuals and among people. They contend that healthy development does not begin at birth. Pregnant and non-pregnant women are both affected by ischemic heart disease. Hypertension, high cholesterol, high triglycerides, diabetes, obesity, smoking, and inactivity are all risk factors for ischemic heart disease. When the embryo implants outside the uterus, this is known as an ectopic pregnancy. Despite the fact that stomach pain and vaginal bleeding are frequent, only half of women experience them. The pain might be minor, severe, or unbearable. Ectopic pregnancies account for fewer than 2% of all pregnancies worldwide. Ectopic pregnancies may occur as a consequence of chlamydia infection, smoking, tubal ligation, infertility, or assisted reproductive technology.

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 12, 2023

Keywords: Ischemic heart disease, pregnancy, chlamydia infection, inflammatory disease, stomach discomfort, vaginal bleeding

1. Introduction:

When a woman is pregnant, the resulting embryos are implanted, either in the uterus or elsewhere in the body. Either delivery or a sudden abortion brings it to an end. To support the growing foetus, the mother's body goes through considerable changes that impact all organ systems during this time(Wastnedge et al. 2021)(de Seymour, Beck, and Conlon 2022). All medical personnel need to be aware of these changes that take place during pregnancy in order to provide the best care for both mother and foetus. Fortunately, aortic complications in young women are quite uncommon; in the overall female population under 45, the incidence is 0.4 per 100,000 person years (Thalmann et al. 2011). The circulatory system, particularly the aorta, is impacted by hemodynamic changes that occur during pregnancy. Heart disease accounted for 2.31 deaths per 100,000 live births in the UK between 2006 and 2008, making it the leading cause of maternal mortality. Aortic dissection was one of the leading causes of cardiac mortality, despite its modest frequency (“Saving Mothers’ Lives: Reviewing Maternal Deaths to Make Motherhood Safer: 2006–2008” 2011). Women who are contemplating pregnancy and are at risk of aortic issues face a difficult predicament. Furthermore, AOD may manifest as the initial symptom of aortic disease in certain pregnant women. Pregnant women who have a known aortopathy and are at high risk should be counseled about the hazards involved. For the aim of managing the birth and providing surveillance during pregnancy, they ought to be sent to a tertiary center (Van Hagen and Roos-Hesselink 2014).

The embryo is subject to an "all-or-nothing" law during the first two weeks of pregnancy, which means that a medicine might either cause embryonic mortality or have no effect at all on the course of the pregnancy. Cellular differentiation and organogenesis take place throughout the following eight weeks, or the "major and minor organogenesis period," which ends at the conclusion of the first trimester. Any medication administered at this time needs to be confirmed to have no teratogenic risk and not cause congenital abnormalities. The medications may cause fetal toxicity in the second and third trimesters, particularly in the central nervous system (Calina et al. 2019)(Neuberger 2022).

Pregnancy-related endocrinopathies typically result in difficulties for both the mother and the fetus. It's critical to receive the right care in order to prevent them. Due to changes in the baseline for common biochemical measurements brought on by physiological changes during pregnancy, as well as the overlap of symptoms that occur during a normal pregnancy and those suggesting specific endocrine diseases, the initial diagnosis of many of them is frequently challenging(Nelson-Piercy 2020). Pregnancy-related hyperemesis gravid arum symptoms include sadness, irritability, weakness, tiredness, nausea, and vomiting. It results from a pregnant woman's body producing more human chorionic gonadotropin hormone (hCG). The first trimester of pregnancy is when hCG induces the production of progesterone and the estrogens estradiol and free estriol, which are essential for the growth and maintenance of

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 12, 2023

pregnancy(Nelson-Piercy 2020). The placenta secretes these hormones as well as human placental lactogen (hPL) during a typical pregnancy. The placental lactogen hormone has a direct impact on metabolism; as a result, the mother experiences headaches, nausea, and exhaustion while consuming more amino acids to "build" the baby's tissues (Arora and Lakshmi 2021).

1.1. Issues of Concern

During pregnancy, a woman's body experiences considerable changes in all of her organ systems. Due to these changes, a pregnant woman's physiology differs from that of a non-pregnant woman. Furthermore, anomalies throughout pregnancy may result in extra challenges for the mother and foetus. With the maternal mortality rate in the United States reaching nearly 18 deaths per 100,000 live births in 2009, a sharp increase from the 7.2 deaths per 100,000 in 1987, it is more crucial than ever for medical staff to understand the typical changes that follow pregnancy and identify changes that go outside typical pregnancy symptoms (Pishko and Marshall 2022)(Mehedintu et al. 2021). Pregnancy is a distinct and intricate physiological process that can be exciting and joyful, but it can also raise a number of problems and worries. During the first trimester of pregnancy, many women experience nausea and vomiting. Even while severe morning sickness (hyperemesis gravid arum) is usually not hazardous, it might cause dehydration and call for medical treatment. Gestational diabetes is a condition that some pregnant women experience. It necessitates cautious management because it might have an impact on both the mother and the infant. High blood pressure and harm to other organ systems are two characteristics of the potentially dangerous illness known as preeclampsia. It often happens in the second part of pregnancy and might cause issues for the mother and the unborn child. A fertilized egg can implant outside the uterus, frequently in the fallopian tube, leading to an ectopic pregnancy. Due to the risk of rupture and life-threatening internal bleeding, this is a medical emergency. Certain fetal anomalies can be found via routine prenatal tests and ultrasounds. For pregnant parents, it might be difficult to comprehend the ramifications and come to wise judgments (Lambonmung, Acheampong, and Langkulsen 2023)(Braunthal and Brateanu 2019)(Chilaka and Konje 2021).

The moment a sperm fertilises an egg, the embryogenesis process begins. The fertilised egg is divided into multiple blastocysts, which are then created. The blastocyst then starts to integrate with the mother's endometrium. After implantation, the uterine stroma starts to decasualize to create room for the embryo. This decidua appears to protect against immunological responses and assists in embryo survival. Additionally, following implantation, the hormone human chorionic gonadotropin (hCG) begins to be secreted, allowing for the continuation of pregnancy. The ectoderm, mesoderm, and endoderm—three distinct germ layers—then begin to grow within the blastocyst. An embryo is presently being formed from the blastocyst. During a process known as organogenesis, the majority of the primary organ systems develop in the embryo(Chilaka and Konje 2021)(D. I. Cudalba et al. 2021)(Ribeiro, Andrade, and Nunes 2022).

2. Physiological changes:

Significant physiological and anatomical changes occur in the pregnant mother in order to support and care for the developing foetus. Each human organ system is affected by these

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 12, 2023

changes, which begin after conception (Lockitch 1997). It will be easier to discern between healthy modifications and usual ones if you are aware of the physiological changes that occur often throughout pregnancy.

Hematological alterations:

The plasma volume gradually rises throughout a typical pregnancy (Rodger et al. 2015). Because the increase of plasma volume outpaces the rise in red blood cell mass, haemoglobin concentration, hematocrit, and red blood cell count all drop. Despite this haemodilution, there is frequently no change in mean corpuscular volume (MCV) or mean corpuscular haemoglobin concentration (MCHC). Due to the growth of the foetus, certain enzymes, and haemoglobin formation, iron requirements increase two to three times during pregnancy. When compared to vitamin B12, the demand for folate has grown by a factor of 10 to twenty. A physiologically induced hypercoagulable condition brought on by pregnancy-related alterations to the coagulation system is required to maintain hemostasis following birth (Ramsay 2011).

2.1. Heart alterations:

The cardiovascular system experiences considerable changes during pregnancy that begin early in the process. The cardiac output has already grown by 20% by the eighth week of pregnancy. It is most likely peripheral vasodilatation that is the main event. Endothelium-dependent mechanisms facilitate this, such as nitric oxide generation, which is stimulated by estradiol and may also be mediated by vasodilatory prostaglandins (PGI2). Peripheral vasodilation reduces systemic vascular resistance by 25–30%; during pregnancy, cardiac output increases by around 40% to make up for this reduction. In addition to an increase in heart rate, this is primarily achieved by increasing the stroke volume. The 20th to 28th weeks of pregnancy are when the heart output reaches its maximum. There is scarcely any decrease at term.

Labour is associated with further increases in cardiac output, 15% in the first stage and 50% in the second. Uterine contractions cause a 300-500 ml auto-transfusion of blood to return to circulation, and the sympathetic nervous system's enhanced sensitivity to pain and anxiety also causes blood pressure and heart rate to rise (Tkachenko, Shchekochikhin, and Schrier 2014).

Although it increases greater during contractions, cardiac output increases in between.

2.2. Renal anatomical and functional changes:

Renal plasma flow and glomerular filtration rate (GFR) rise 40–65% and 50–85%, respectively, in response to renal vasodilatation as compared to non-pregnant values. Furthermore, a rise in GFR results from a decrease in glomeruli's oncotic pressure brought on by the increase in plasma volume (Cheung and Lafayette 2013). Even in the presence of a considerable increase in renal plasma flow, glomerular hydrostatic pressure remains constant, limiting the development of glomerular hypertension, since there is a reduction in blood vessel resistance in both the renal afferent and efferent arterioles. There is commonly a prevalence of hydronephrosis on the right side due to anatomical problems that lead the right ureter to cross the iliac and ovarian arteries at an angle before entering the pelvis. Pregnant women who have bacteriuria without any symptoms are at risk of developing pyelonephritis due to urinary stasis in the dilated collecting system (Rasmussen and Nielsen 1988). One to ten grammes of glucose are excreted daily by

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 12, 2023

90% of pregnant moms with normal blood sugar levels. Protein excretion as well as fractional protein excretion of up to 300 mg/day can increase when GFR and glomerular capillary permeability to albumin both increases. Throughout healthy pregnancies, the total protein level of urine does not increase over the upper normal range. Additionally, a rise in uric acid excretion is brought on by an increase in GFR and/or decreased tubular reabsorption (Cheung and Lafayette 2013).

2.3. Changes in respiration:

During a normal pregnancy, the requirement for oxygen increases substantially. A 15% increase in metabolic rate and a 20% increase in oxygen demand are the causes of this. In contrast to a rise in respiratory rate, the minute ventilation has increased by 40–50%, mostly as a result of an increase in tidal volume. As a result of the mother's hyperventilation, arterial pO2 increases and arterial pCO2 decreases, and serum bicarbonate drops to 18–22 mmol/l. Pregnancy may also be accompanied with a subjective feeling of dyspnea in addition to hypoxia. This physiological condition, which can manifest at any stage of pregnancy but is most common in the third trimester, can start at any time. Dyspnea typically happens when speaking or at rest and, oddly, becomes better with modest exertion.

2.4. Endocrine alterations:

The liver produces more thyroxin-binding globulin (TBG) than usual, which causes the levels of tri-iodothyronine (T3) and thyroxin (T4) to increase. Serum free T4 (fT4) and free T3 (fT3) levels are rarely clinically relevant, even slight changes. However, there is a little decline in free T3 and T4 levels and a narrowing of the normal ranges throughout the second and third trimesters of pregnancy(Glinoer 1997). Pregnancy is associated with a relative iodine deficiency. The causes of this include increased iodine excretion in the urine and active iodine transfer from the mother to the foeto-placental unit. The World Health Organisation recommends increasing iodine intake during pregnancy from 100 to 150–200 mg/day. If iodine intake is maintained during pregnancy, the thyroid gland's size does not change; as a result, goitre should constantly be assessed. Low iodine individuals have a 25% larger thyroid gland.

Glucose utilization:

Due to the alterations in glucose metabolism brought on by pregnancy, which causes diabetes, the mother's nutritional requirements are maintained while glucose may be transferred to the foetus to assist development(Angueira et al. 2015). The hyperplasia of insulin-secreting pancreatic beta-cells during early pregnancy leads to increased insulin sensitivity and production, which is thereafter followed by the emergence of insulin resistance(Butte 2000).

Maternal insulin resistance first appears in the second trimester and peaks in the third. This is brought on by an increase in the hormones that are known to promote diabetes, such as growth hormone, progesterone, cortisol, and placental lactogen in humans. These hormones interfere with insulin receptor signaling, which lowers insulin sensitivity in peripheral tissues including skeletal muscle and adipocytes (Newbern and Freemark 2011). By allowing the pregnant woman to use fat more preferentially as fuel, lipolysis—which is triggered by insulin resistance and relative hypoglycemia—conserves the fetus's availability to glucose and amino acids and lessens

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 12, 2023

protein catabolism. While glucose, amino acids, and ketones may be delivered to the developing foetus, large fats cannot cross the placenta. When a woman's endocrine pancreas is not functioning properly, she develops gestational diabetes because she cannot manage the insulin resistance that comes with pregnancy(Morente et al. 2021)(Sotelo 2019)(Lima et al. 2021).

3. Fetal Development:

More and more evidence points to the prenatal stage as being crucial to an offspring's growth and health throughout infancy and adulthood. For a significant portion of their history, the developmental sciences have placed a strong emphasis on the formative influence that prior experiences and exposures can have on later stages of development, both within and across individuals. They have also long held that neither health nor development begin at birth (Emerson and Cantlon 2015). These go into the mother's bloodstream and play a vital role in keeping the mother from getting her period. Given that the first seven days of the new life have already passed in the tube and that the time interval between ovulation and menstruation is roughly fourteen days, it is clear that the implanting trophoblastic has only seven days to produce enough hormones to prevent the mother from menstruating and, consequently, slough off the fetal life. The hormones that are circulating in the mother serve as the foundation for the chemical tests that allow us to identify pregnancy. The zygote, which is now known as the embryo, quickly grows increasingly sophisticated after this second week of pregnancy (G. and F. 2015). Ten weeks in, spontaneous movement that is unaffected by stimulus is seen. Thumb-sucking has been noted by the eleventh week, and X-rays of the fetus at this point clearly display the skeleton. The fetus, which is already 3Vz inches in size, will have finished developing its brain structure after twelve weeks, but development will still undoubtedly occur (Figure 1).

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 12, 2023

1st Trimester	Month	Weeks
	0	0 - 4
	1	5 - 8
	2	9 - 12
	3	13
2nd Trimester	**Month**	**Weeks**
	3	14 - 17
	4	18 - 21
	5	22 - 25
	6	26 - 27
3rd Trimester	**Month**	**Weeks**
	6	28 - 30
	7	31 - 34
	8	35 - 38
	9	39 - 42

Fig 1: Fetal developmental stages in all three trimester

By this point, contemporary electrocardiographic methods have also made it feasible to detect the fetal heart through the mother. This incident, long regarded as significant in the legal field, indicates that the mother feels the movements of the fetus before the baby does. Therefore, quickening is not a fetal accomplishment but rather phenomena that mothers see. It is arbitrary and depends on the mother's fat and level of expertise. The fetal heart will also be audible with a basic stethoscope at some point between the sixteenth and twenty week, in addition to the sophisticated EKG (S. A. Ali, Pathak, and Mandal 2023) (Sarathi 2022).

4. Pathological Conditions in Pregnancy

Although pregnancy is a normal process, several possible issues and pathological diseases can develop. These can include a number of genetic and chromosomal problems in the fetus as well as gestational diabetes, preeclampsia, ectopic pregnancy, and other conditions. Pregnancy-related pathological problems are illnesses or difficulties that may develop when a woman is pregnant. These conditions may have an impact on the mother's health, the health of the growing fetus, or both (Marshall et al. 2022)(Ragan, Grant, and Wilkes 2023)(Neculcea et al. 2021). Pregnancy-related or pregnancy-related health issues are referred to as complications. Obstetric labor difficulties are problems that mostly occur during childbirth, whereas puerperal diseases are

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 12, 2023

issues that predominantly arise after childbirth. Even though some prenatal issues get better or go away completely after delivery, others can have long-term repercussions, cause morbidity, or even result in maternal or fetal death in the most extreme circumstances. In the US, 1.6% of mothers experience severe difficulties during pregnancy, delivery, or the puerperium, while this number is 1.5% in Canada. In the puerperium, or first few weeks after giving birth, 87% to 94% of women report having at least one health issue. 31% of women experience long-term health issues (continuing six months after delivery). Globally, problems related to pregnancy, delivery, and the puerperium caused 230,600 fatalities in 2016, down from 377,000 fatalities in 1990. Maternal hemorrhage, postpartum infections, including sepsis, hypertensive disorders of pregnancy, obstructed labor, and unsafe abortions are the most frequent causes of maternal death (Ribeiro, Andrade, and Nunes 2022)(Jouanne et al. 2021)(Zechiu et al. 2022).

Pregnancy complications can occasionally result from unusually severe manifestations of the symptoms and discomforts of pregnancy, which often do not considerably interfere with everyday activities or represent any harm to the health of the person giving birth or the fetus. For instance, hyperemesis gravid arum is a severe form of morning sickness, which occasionally needs medical attention to prevent electrolyte imbalances from extreme vomiting. Morning sickness is a pretty frequent moderate symptom of pregnancy that often goes away in the second trimester (Langley-Evans, Pearce, and Ellis 2022)(D. Cudalba et al. 2022).

4.1. Gestational diabetes

Gestational diabetes occurs when a pregnant woman with no history of diabetes develops high blood sugar levels. This issue is caused by a variety of risk factors, both non-modifiable and modifiable. Family history of diabetes, advanced maternal age, and ethnicity are all non-modifiable risk factors. Obesity in mothers is one of the risk factors that may be changed. During pregnancy, there is a greater need for insulin, which causes the pancreatic beta cells to produce more insulin. Increased maternal calorie consumption, weight gain, and prolactin and growth hormone synthesis all contribute to the heightened need (D. S. Ali et al. 2020)(Blomberg et al. 2023)(S. Ali et al. 2023). Gestational diabetes increases the likelihood of developing pre-eclampsia, needing a cesarean section, premature labor, polyhydramnios, macrosomia, shoulder dystocia, fetal hypoglycemia, and hyperbilirubinemia, among other maternal and fetal problems. How effectively gestational diabetes is managed throughout pregnancy affects the risk, with poor management being linked to poorer outcomes. Treatment for gestational diabetes is multidisciplinary and includes monitoring blood glucose levels, dietary and nutritional adjustments, lifestyle changes including increased physical activity, maternal weight control, and medication like insulin (Ye et al. 2022)(Vince et al. 2018)(Zehravi, Maqbool, and Ara 2021).

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 12, 2023

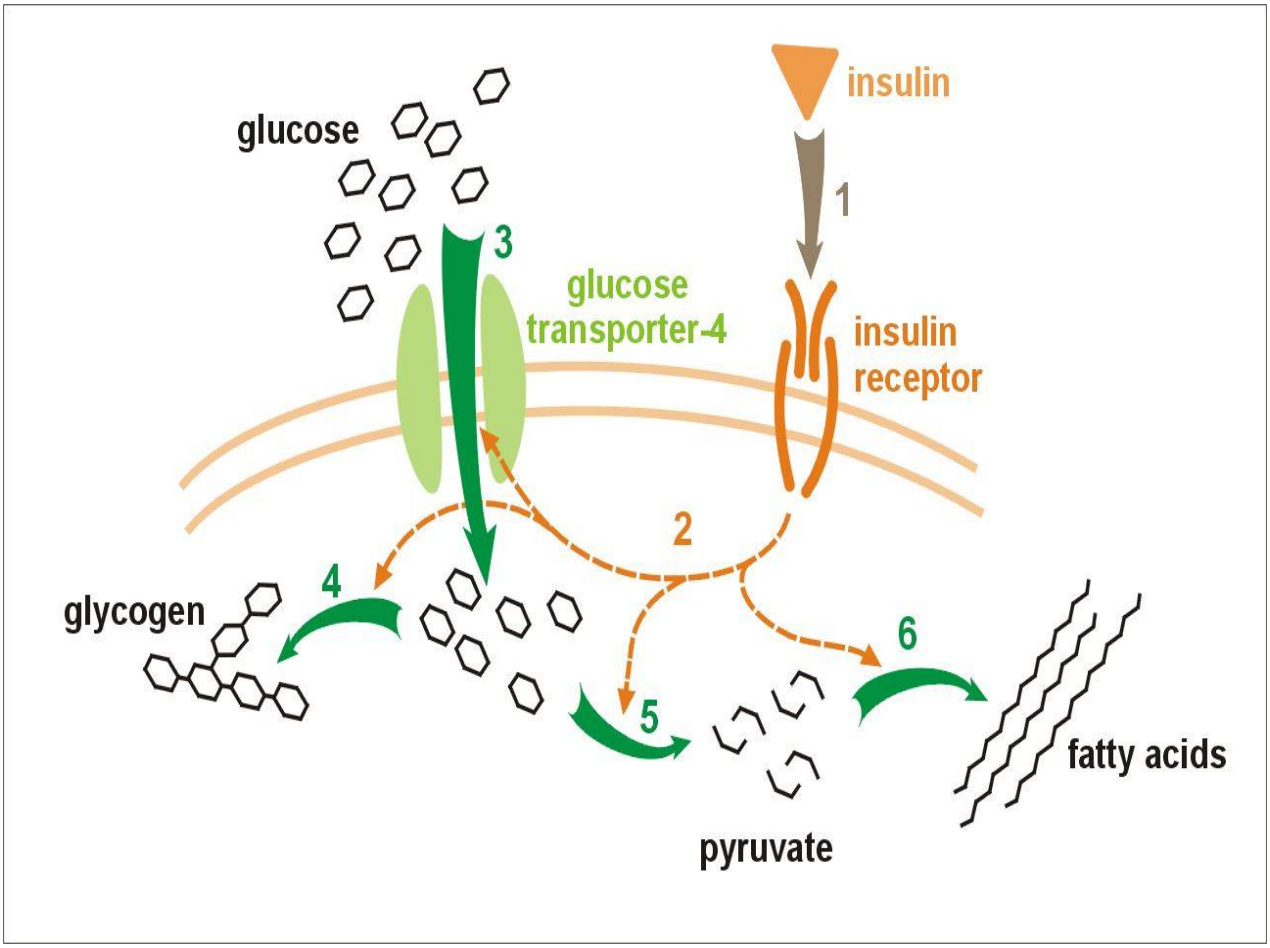

Fig 2: Insulin's impact on the metabolism and absorption of glucose.

The two varieties of gestational diabetes are as follows:

Type A1: While fasting and two hours after meals, blood sugar levels were normal despite an abnormal oral glucose tolerance test (OGTT). The only thing necessary to control blood sugar levels is dietary adjustments.

Type A2: Abnormal OGTT exacerbated by abnormal blood sugar levels after meals or when fasting; further therapy with insulin or other drugs is necessary (Giuliani et al. 2022)(Peltokorpi et al. 2022).

Pre-pregnancy diabetes is further divided into a number of subgroups.

- **Type B**: beginning at or after the age of 20, and lasting fewer than ten years.
- **Type C**: 10 to 19 years from the time of beginning.
- **Type D**: beginning before the age of 10 or lasting more than 20 years.
- **Type E**: having hardened pelvic vessels and overt diabetic mellitus.
- **Type F**: diabetic kidney disease.
- **Type R**: proliferative retinal disease.
- **Type RF**: nephritis and retinal disease.
- **Type H**: cardiac disease that is ischemic.
- **Type T**: existing kidney transplant.

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 12, 2023

4.2. Cardiac Disease in Pregnancy

Heart problems associated with pregnancy include a variety of illnesses. Many of the cardiac issues that might arise during pregnancy are being researched, and many more that are still not apparent require more study. Some of these problems may appear as new disease processes or as exacerbations of pre-existing conditions that the pregnant woman already has as a result of the complex hormonal changes and physiology of pregnancy. Pre-existing conditions including hypertension, diabetes mellitus, and congenital heart disease might increase a pregnant woman's risk of cardiovascular disease. Pregnancy-related cardiovascular disorders have a variety of etiologies that depend on the pathology involved (Jones and Bhatia 2022)(Malin and Wallace 2019)(Hutchens, Frawley, and Sullivan 2022c). Pregnancy-related cardiovascular conditions that are often diagnosed and their potential causes are listed below:

Cardiomyopathy: Regarding the etiology of this illness process, there are several theories. The most popular hypotheses include microchimerism, autoimmune reasons, hemodynamic instability, and viral myocarditis, among others. It's crucial to remember that during pregnancy and the weeks immediately after delivery, the heart may even be more susceptible to the same exposures that can lead to cardiomyopathy in non-pregnant people. The misuse of medications, alcohol, and narcotics including cocaine and methamphetamine are some of these factors (Hutchens, Frawley, and Sullivan 2022c).

Coronary artery disease: Women who are pregnant and women who are not pregnant have the same aetiology for ischemic heart disease. Due to factors including hypertension, high cholesterol, high triglycerides, diabetes, obesity, smoking, and inactivity, these persons are at risk for ischemic heart disease (Hutchens, Frawley, and Sullivan 2022a)(Dawson et al. 2018).

Myocardial infarction linked to pregnancy: The same risk factors that contribute to coronary artery disease also increase the risk of MI during pregnancy. Pregnancy disorders including preeclampsia and eclampsia have been theorized to play a role in myocardial infarction (Dawson et al. 2018)(Nqayana, Moodley, and Naidoo 2008).

Valvular disease: It is unclear if pregnancy plays a particular role in the etiology of newly diagnosed valve disorders of pregnancy, despite the fact that the hemodynamics of pregnancy can make some valvular illnesses worse (Soma-Pillay, Anthony, and Mandondo 2018)(Lumsden et al. 2020).

Many of these alterations are thought to be brought on by the placenta's connection to the uterine walls, which causes hormones to be released and changes in maternal physiology as a result. These frequently hemodynamic and counter-regulatory adjustments do not affect the underlying vascular principles that support the new mean arterial pressure during pregnancy (Martin and Arafeh 2018)(Lumsden et al. 2020).

Cardiac output: An increase in cardiac output is predicted to rise by 20–50%. These findings begin to appear within the first five weeks of pregnancy and continue to rise until late gestation; this is often explained by an increase in stroke volume of around 25% during the first trimester. One reason why pregnancy can have such dramatic consequences on women with pre-existing heart issues, especially later in pregnancy, is the significant increase in cardiac output. For those

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 12, 2023

who have conditions like cardiomyopathy, this stress may not be sufficiently offset, leading to problems like pulmonary edema or states of fluid overflow (Chattopadhyay, Olwell, and Bhagra 2022)(Franklin et al. 2018).

Heart rate: The first trimester of pregnancy causes a 15–30% increase in heart rate in addition to an increase in stroke volume, which also aids in improving cardiac output (Hutchens, Frawley, and Sullivan 2022b).

Systemic vascular resistance: The systemic vascular resistance reduces during pregnancy. Estimates indicate that this change might rise by 30%. Due to various hormonal changes, the maternal vascular system's sensitivity to angiotensin II and norepinephrine has decreased. Additionally, compared to non-maternal females, the maternal female produces prostaglandins and nitric oxide at a faster rate(Aye, Boardman, and Leeson 2017)(Elkayam et al. 2016).

Blood pressure: Early on during pregnancy, blood pressure gradually decreases. Diastolic blood pressure frequently decreases earlier in pregnancy than systolic blood pressure overall. By the end of the pregnancy, this level frequently goes back to normal or even increases(Pujitha, R., and S. 2017)(Wiles, Damodaram, and Frise 2021).

4.3. Preeclampsia

One of the major obstetrical disorders is preeclampsia (PE). Nevertheless, while being the topic of favorable evaluations, its etiopathogenesis is still not entirely clear. Though this is not always the case, placental histology frequently reveals decidual arteriolopathy, evidence of shallow placental implantation, and maternal hypoperfusion. The vascular remodeling essential to feed the placenta with adequate blood supply from the mother may be hampered by a lack of trophoblastic invasion (Ogunwole et al. 2021)(Skoura et al. 2022). Retrospective analyses frequently focus on the differences between early-onset and later-onset preeclampsia in terms of their clinical and placental characteristics, arguing that the former is a maternal disease with few decidual arteriolopathy and maternal under-perfusion lesions and the latter is a placental disease with more placental pathology. According to the gestational age (GA) at diagnosis, preeclampsia at term was shown to be less common in the early third trimester than decidual vascular lesions and placental hypoplasia (Francisco et al. 2022)(Han et al. 2022). In terms of an amalgamation of foetal and maternal vascular anomalies, early-onset PE with foetal growth restriction (FGR) is more severe than early-onset PE without FGR. The traditional terms for preeclampsia include mild preeclampsia, severe preeclampsia, HELLP, eclampsia, and superimposed preeclampsia; however, the variations in placental abnormalities between these groups, as well as those connected with chronic hypertension and gestational hypertension without preeclampsia, are less widely understood(Wang, Wu, and Shen 2021)(Wainstock, Sergienko, and Sheiner 2020).

Edoema, particularly in the hands and face, was first believed to be a key sign of pre-eclampsia. Edoema is a common pregnancy side symptom, thus it isn't very helpful in recognizing pre-eclampsia. Pitting edoema, a strange swelling that often affects the hands, feet, or face and makes an impression when pressed, can be significant and has to be reported to a medical practitioner. Clinical signs of pre-eclampsia include vasoconstriction and end-organ ischemia, both of which are related to general dysfunction of the endothelial system. This widespread

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 12, 2023

endothelial dysfunction may be caused by an imbalance of antigenic and anti-angiogenic factors. Compared to healthy pregnant women, pre-eclampsia patients have higher levels of soluble fms-like tyrosine kinase-1 (sFlt-1) in their blood and placenta. The anti-angiogenic protein sFlt-1 inhibits the proangiogenic proteins vascular endothelial growth factor (VEGF) and placental growth factor (PIGF), both of which are present in the body. Soluble endoglin (sEng), a protein with anti-angiogenic properties similar to sFlt-1, has been shown to be more abundant in pre-eclamptic women(Gu et al. 2020)(Gu et al. 2020)(Jia et al. 2020).

4.4. Ectopic pregnancy

The pregnancy issue known as ectopic pregnancy occurs when the embryo attaches outside of the uterus. Traditional signs and symptoms include vaginal bleeding and stomach discomfort, however less than half of afflicted women experience both. The discomfort may be described as mild, acute, or cramping. If there has been bleeding into the abdomen, pain may also radiate to the shoulder. The effects of severe bleeding might include shock, a rapid heartbeat, and fainting. With a few extremely uncommon circumstances, the fetus cannot live (Mullany et al. 2023)(Okonofua 2021).

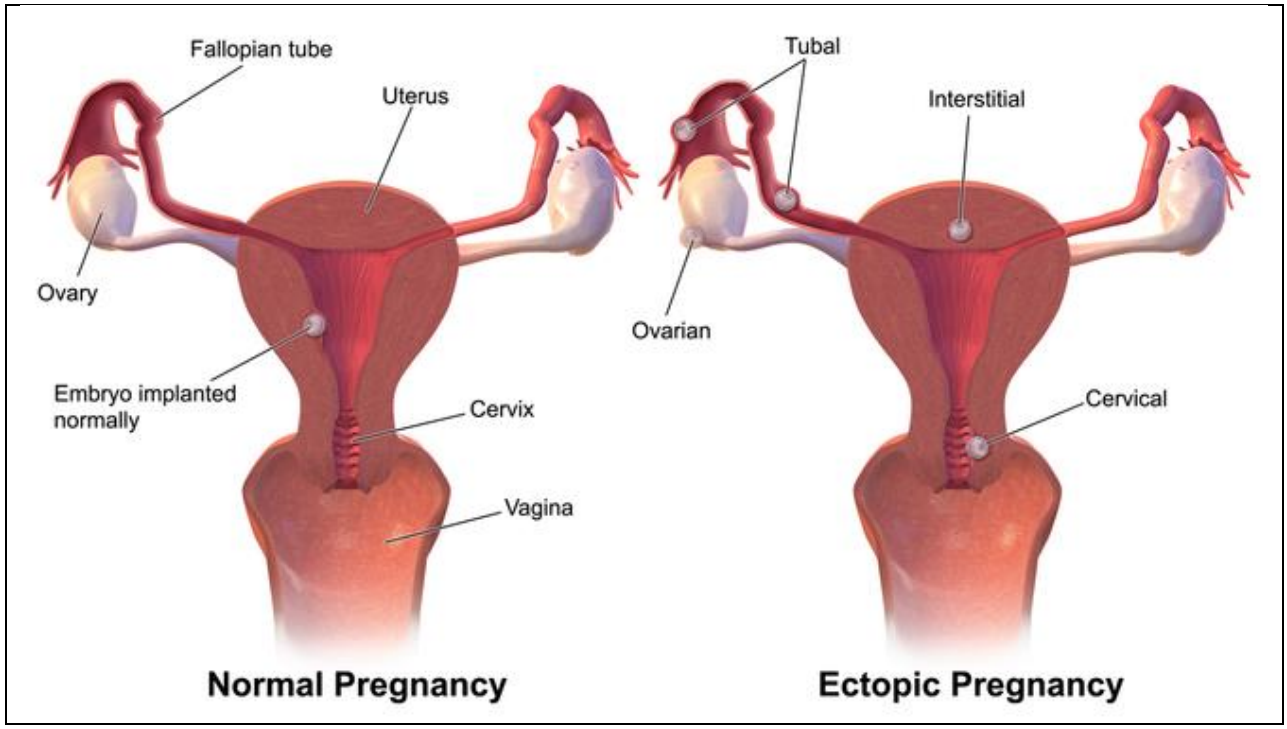

Fig 3: Difference between Normal and Ectopic Pregnancy

Less than 2% of pregnancies globally are ectopic on a yearly basis. Ectopic pregnancies can be caused by a number of conditions, including pelvic inflammatory disease, which is frequently brought on by chlamydia infection, smoking, previous tubal ligation, a history of infertility, and the use of assisted reproductive technologies. People who have once experienced an ectopic pregnancy are far more likely to do so again (Hendriks, Rosenberg, and Prine 2020). The majority of ectopic pregnancies, or tubal pregnancies, (90%) take place in the fallopian tube. However, implantation can also take place on the cervix, ovaries, caesarean scar, or inside the

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 12, 2023

belly. Human chorionic gonadotropin (hCG) blood tests and ultrasound are commonly used for ectopic pregnancy detection. It might be necessary to try this more than once. Similar symptoms can also be caused by ovarian torsion, severe appendicitis, and miscarriage (Karavani et al. 2021)(Petrini and Spandorfer 2020)(Haddaden et al. 2021)(Leziak et al. 2022).

5. Conclusion:

In conclusion, this comprehensive review has delved into the intricate and multifaceted world of pregnancy physiology and pathology. Throughout our exploration, we have learned about the remarkable adaptations the female body undergoes to support the development and nourishment of a growing fetus. From the hormonal changes that drive the entire process to the intricate physiological mechanisms responsible for fetal growth and development, it is clear that pregnancy is a complex and highly regulated phenomenon. We have also examined the potential complications and pathologies that can arise during pregnancy, from gestational diabetes to preeclampsia. Understanding these challenges is crucial in providing optimal care for expectant mothers and ensuring the health of both mother and baby.

This review highlights the importance of ongoing research and collaboration among healthcare professionals to improve outcomes for pregnant women.

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