Sudan University of Science and Technology

Collage of Graduate Studies

Study of Placenta Location in Sudanese Pregnant Women Using Ultrasonography

دراسة موقع المشيمة للحوامل السودانيات بإستخدام الموجات فوق الصوتيه

A thesis Submitted for Partial Requirements of M.Sc. Degree in Medical Diagnostic Ultrasound

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الايـة

قال تعالي:

﴿وَالَّذِينَ جَاءُوا مِنْ بَعْدِهِمْ يَقُولُونَ رَبَّنَا اغْفِرْ لَنَا وَلِإِخْوَانِنَا الَّذِينَ سَبَقُونَا بِالْإِيمَانِ وَلَا تَجْعَلْ فِي قُلُوبِنَا غِلّاً لِلَّذِينَ آمَنُوا رَبَّنَا إِنَّكَ رَءُوفٌ رَحِيمٌ﴾

صدق الله العظيم

(سورة الحشر الآية : 10)

Dedication

To;

My parents…

My brothers and all friends…

Acknowledgment

First of all, I thank Allah the Almighty for helping me complete this project. I thank Dr. Mohamed Elfadil Mohamed, my supervisor, for her help and guidance.

I would like to express my gratitude to Dr. Ahmed Elmostfa abo-Konna, and the whole staff of the diagnostic radiology department, for their great help and support.

I am greatly indebted to my college bearing with me during the past several months.

Finally I would like to thank everybody especially my brothers in college of medical radiological science who helped me prepare and finish this study.

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Abstract

Doppler ultrasound of the placenta is one of the method of determinations of fetoplacental locations and related abnormalities. A descriptive study aimed to determine and study of the placental location in normal Sudanese pregnant women in order to assess the common placental location related to the normal pregnancy. The data collected in Omdurman Maternity Hospital (Omdurman) from November 2015 to October 2016; one hundred pregnant women in first, second and third trimesters were scanned by ultrasound machine Toshiba-power vision-6000. Placental location was identified in a longitudinal section at the point of insertion of the umbilical cord. The variables used to establish this study was mother age, BPD, fetalAge, number of pregnancy, trimester, type of delivery, placental location, and liquor, where the result showed that mean age equal to (27.04±6.045) yrs., liquor equal to (5.527±0.4546cm). A significant correlation noted between the GA and liquor, while common placental location found to be posterior most commonly in age group of 27.2-30.5 yrs. Most fetal presentation appear to be in cephalic direction rather than the others most commonly in age group of (17-20.3yrs.).In Conclusions: US has an excellent presentation of placental location and therefore assessing the related abnormalities.

ملخص الدراسة

فحص المشيمة باستخدام الموجات فوق الصوتية واحدة من اهم الوسائل لتحديد موقع المشيمة بالنسبة للجنين ومايتعلق بها من مشاكل صحية. هذه الدراسة وصفية تهدف لتحديد ودراسة مواقع المشيمة الطبيعية للحوامل السودانيات من اجل تحديد الوضع الاكثر شيوعا المتعلق بالحمل الطبيعي. حيث جمعت البيانات من داخل مستشفي امدرمان للامومة (ام درمان) خلال الفترة من نوفمبر للعام خمسة عشر والفين الي اكتوبر للعام ستة عشر والفين، حيث ان عدد مائة من الحوامل في الثالوث الثاني والثالث تم فحصهم بالموجات فوق الصوتية باستخدام جهاز توشيبا – 6000.

وحدد موقع المشيمة في الوضع الطولي عند نفطة انقراز الحبل السري، غير ان المتغيرات التي جمعت لتحقيق هذه الدراسة كانت كل من عمر الام، القطر العرضي للراس، عمر الجنين، عدد مرات الحمل، الثالوث، نوع الولادة، موقع المشيمة والسائل الامنيوني. فوجد متوسط العمر (27.04±6.045) سنوات ومتوسط قياس السائل (5.527±0.4546)سم. حيث لوحظ وجود علاقة قوية بين عمر الجنين والسائل بينما وجد الوضع الاكثرشيوعا للمشيمة هو الخلفي شائعا بين الاعمار من (27.2 – 30.5)سنوات. كما وجد ان الوضع الاكثر شيوعا للجنين هو باتجاه الراس شائعا في الاعمار بين (17- 20.3)سنوات.

ختاما الموجات فوق الصوتية تعتبروسيلة فعالة في تحديد موقع المشيمة ومايتعلق بها من اوضاع غير طبيعية.

List of abbreviations

D	Diastole
DM	Diabetes Mellitus
FVW	Flow Velocity Waveform
GA	Gestational Age
GDM	Gestational Diabetes Mellitus
HCG	Human Chorionic Gonadotropin
IDDM	Insulin Dependent Diabetes Mellitus
IUGR	Intra Uterine Growth Retardation
NIDDM	Non InsulinDependent Diabetes Mellitus
PEDM	Pre Existing Diabetes Mellitus
SPSS	Statistical Package for Social Sciences
SYS	Systole
TNF	Tumour Necrosis Factor
US	Ultrasound
WKS	Weeks

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Chapter One
Introduction

Chapter One

1-1: Introduction

The placenta is an organ that develops in the uterus during pregnancy. It is a unique characteristic of the higher mammals. In humans it is a thick mass about 7 in. (18 cm) in diameter, liberally supplied with blood vessels. It usually weighs about 1 to 2 pounds (about 1/6 of the weight of the baby). The placenta is attached to the uterus, and the fetus is connected to the placenta by the umbilical cord (http// Wikipedia.com).

The placenta develops from the chorionic villi at the implantation site at about the fifth weeks of gestation and by the ninth or tenth week of diffuse granular echo texture of the placenta is clearly apparent at sonography (callen, 2007).

Placental location is described with respect to its relative position on the uterine wall and its relationship to the internal OS. The placenta may be described as predominantly anterior, posterior, fundal, right or left lateral. A placenta that is distant from the internal os may be described as being in a normal location, central, or non previa. A low-lying placenta describes a placenta which appears to extend into the lower uterine segment and is within 1-2 cm of the internal os. A placenta previa describes a placenta which appears to partly or completely cover the internal os. Documentation should include an image showing placental location and the relationship to the internal os (Devin D 2005).

The placenta is a vascular structure by which an unborn child is attached to its mother's uterine wall and through which respiratory gas and metabolic exchange occurs. The placenta is formed in part from maternal tissue and in part from embryonic tissue. The embryonic portion of the placenta consists of the chorionfrondosum, whereas the maternal portion is composed of the area of the

uterine wall called the decidua basalis, into which the chorionic villi penetrate. Blood does not flow directly between these two portions, but because their membranes are in close proximity, certain substances diffuse readily. When fully formed, the placenta is a reddish brown oval disc with a diameter of 15 to 20 cm and a thickness of 2.5 cm, It weighs between 500 and 600 g, about one sixth as much as the fetus. (Graaff 2001).

As a result of the continuous growth of the fetus and expansion of the uterus, the placenta also enlarges. Its increase in surface area roughly parallels that of the expanding uterus and throughout pregnancy it covers approximately 15 to 30% of the internal surface of the uterus. The increase in thickness of the placenta results from arborization of existing villi and is not caused by further penetration into maternal tissues. So Placental thickness is closely related to fetal wellbeing and may be a key factor in perinatal outcome. (Sadler 2004).

The use of ultrasound to evaluate the placenta is routine among the majority of pregnant women. A wide range of pregnancy complications result from abnormal placental development, including preeclampsia, intrauterine growth retardation (IUGR) and abruption. Other placental abnormalities, such as placenta previa, percreta or vasa previa, may cause major maternal and fetal complications. Timely recognition of these abnormalities can lead to improve management of pregnancy and delivery. Thus, careful examinations of the placenta by ultrasound can contribute directly to enhance patient care and improve outcomes. (Rumack et al 2011).

Before the availability of the ultrasound, manual examination of the maternal abdomen was the only approach that could be used to estimate fetal size. The physical examination, however, provides only a general approximation of fetal weight because the palpated dimensions of the uterus are affected by several factors other than fetal size, including amniotic fluid volume, placental bulk,

presence of fibroids and maternal obesity. Sonographic measurements of the fetus provide information about fetal age and growth. These data are used to assign gestational age, estimated fetal weight and diagnose growth disturbance. The measurements of fetal body parts provide a direct way of assessing fetal size. Numerous formulas have been published for estimating fetal weight from one or more of these fetal body measurements: head (bi-parietal diameter BPD or head circumference HC), abdomen (abdominal diameter AD or abdomen circumference, AC), and femur length (FL). Estimation of fetal weight, on its own and in relation to the gestational age, can influence obstetric management decisions concerning the timing and route of delivery. Early delivery may benefit a fetus that is small for dates. Such a fetus may be inadequately supplied by its placenta with oxygen and nutrients and therefore may do better in the care of neonatologist than in uterus. When the fetus is large, cesarean section may be the preferred route of delivery, particularly in pregnancies complicated by maternal diabetes. In view of these considerations, fetal measurements should be a component of every complete obstetric sonogram. (Rumack et.al 2011).

1-2: Problem of the Study:

Placental location might have implication for poor pregnancy outcome including preterm birth, small for gestational age, fetal malposition, mal-presentation, and development of pre-eclampsia, so knowing the normal location of the placenta will help to expect these problems and to get ready to solve them.

1-3: Objectives of the Study:

1-3-1: General objectives:

The general objective of this study was to identify placenta location in the Sudanese pregnant ladies using ultrasound.

1-3-2: Specific objectives:

- To establish standard protocol to find the location of the placenta.
- To correlate between histories of delivery considering normal vaginal delivery or caesarian section delivery and the placenta location.
- To correlate between liquor volume and the placenta location.
- To determine the most common placenta location.

1-4: Significant of the Study:

This study will help in identify the normal location of the placenta in Sudanese in order to make so many decisions related to problems that occur due to abnormally located placenta.

1-5: Overview of the Study:

This study is concerning to the normal location of the placenta in pregnant ladies accordingly it falls into five chapters: chapter one includes the introduction, the problem, the justification, the objectives, as well as the overview of the study. Chapter two includes anatomy, physiology, pathology, ultrasound scanning, and the previous studies related to the same topic. Chapter three deals with the material and methods by which we conduct the study. Chapter four represents the results. Chapter five includes discussion, conclusion, recommendations, followed by the references, and appendices.

Chapter Two
Literature Review

Chapter Two

Literature Review

2.1: placenta anatomy

2.1.1. Development:

The placenta and fetus both arise from the same single cell - the zygote, which is the fertilized ovum; hence, the placenta and the umbilical cord and the blood flowing in them are of embryonic or fetal origin (Plascencia, et.al 1998).

After the blastocyst attaches to the endometrial surface, it begins the process of implantation. In the early stages of implantation, the trophoblast begins to differentiate into two cell layers - the outer syncytiotrophoblast and the inner cytotrophoblast. As thetrophoblast invades the decidua, it breaks down decidual blood vessels and creates a network of blood-filled spaces known as lacunae; the lacunar network evolves into the intervillous spaces of the mature placenta. (Moore KL1988).

It is interesting to note that in the trophoblast's invasion of the decidua it normally penetrates just so far and then stops, probably as a result of limits imposed by the decidua rather than by the trophoblast itself (in a tubal pregnancy, trophoblast is not under any local control and invades freely all the tissue layers of the tube (mucosa, muscle, serosa). As the syncytiotrophoblast becomes embedded in the decidua, the inner cytotrophoblast proliferates forming a complicated system of tiny projections that push into the syncytiotrophoblast and the lacunae. The cytotrophoblastic projections, called the primary chorionic villi, eventually become branched and vascularized by fetal blood vessels originating from the arteries in the umbilical cord. Initially, the entire surface of the developing gestational sac is covered with chorionic villi. As the chorionic sac grows, the villi underneath the decidua scapsularis are compressed and their blood supply reduced; subsequently,

these villi degenerate, resulting in an avillous portion of the chorionic sac known as the smooth chorion or chorion laeve. Meanwhile, the chorionic villi associated with the deeper decidua basalis proliferate, branch profusely and hypertrophy to form the chorion frondosum or villous chorion (future placenta).(Moore KL1988)

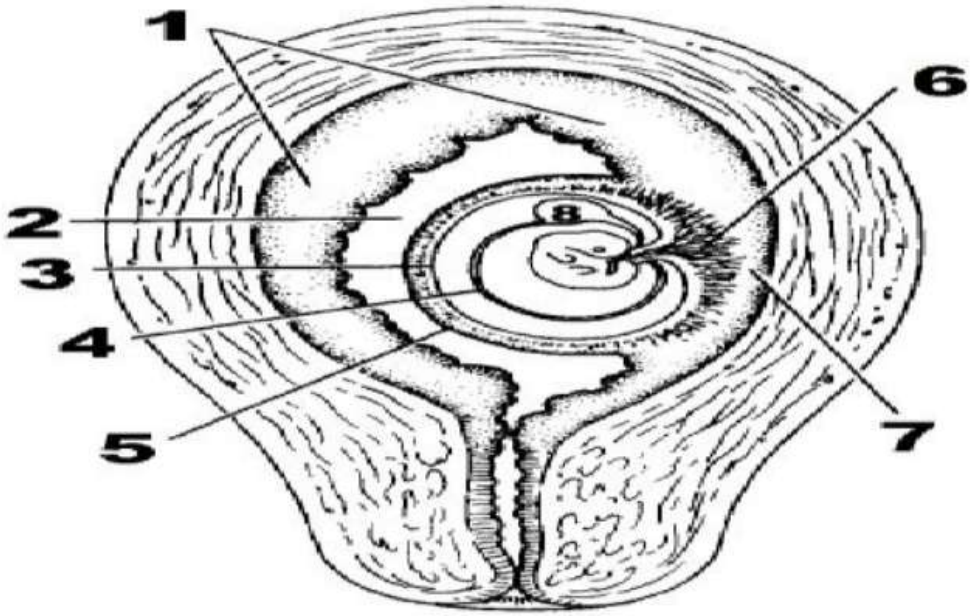

Fig 2.1: Relationship of the Gestational sac and surrounding deciduas (Moore KL1988)

2.1.2: Structure:

The placenta has two functional components: 1) a fetal portion that develops from the chorion, and 2) a maternal portion formed by the deciduas.

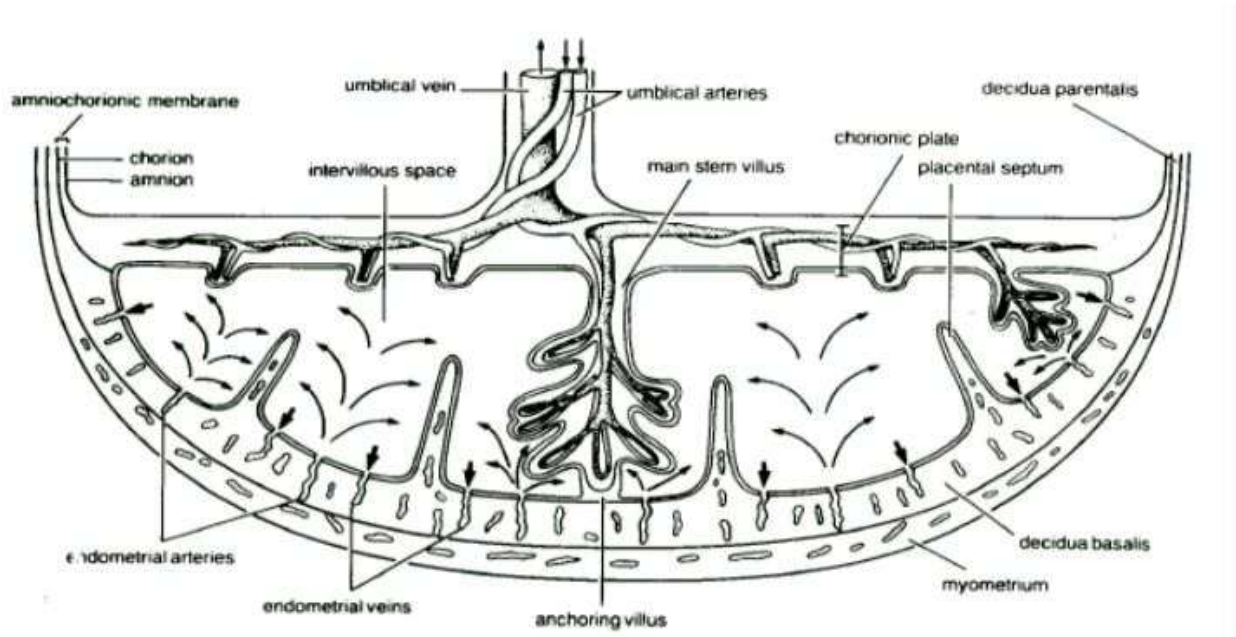

Fig 2.2: Fetal and maternal circulation (Moore 1988).

The fetal component of the placenta consists of the chorionic plate and the chorionic villi that arise from it and project into the intervillous spaces. The maternal component of the placenta is formed by the decidual basalis. This comprises all the endometrium beneath the fetal component of the placenta, except the deepest part, which is called the decidual plate. This layer remains after parturition and is involved in the regeneration of the endometrium during the subsequent menstrual cycle. The placenta is usually round or discoid. As the villi invade the decidua basalis they leave several wedge-shaped areas of decidual tissue called placental septa. The placental septa compartmentalize the placenta into 15 to 20 segments known ascotyledons. The decidual septa do not completely extend to the chorionic plate, thus allowing maternal blood in adjacent cotyledons to freely communicate. Certain large branches of chorionic villi (called anchoring villi) arise from the chorionic plate and pass through the intervillous space to attach firmly to the decidua basalis. In addition to anchoring the chorionic plate to the decidua

basalis, the anchoring villi give origin to smaller branches called free or floating villi because they float in the blood-filled intervillous spaces). (Devin 2005**)**.

2.1.3: Placental Maternal-Fetal Circulation:

Maternal blood propelled under maternal blood pressure and heart rate enters the intervillous spaces of the placenta via numerous spiral arterioles and to the maternal circulation via the basal veins. Oxygenated and nutrient-rich fetal blood passes from the fetal capillary bed in the villi to an enlarging system of veins that eventually converge to form a single umbilical vein in the umbilical cord. In the fetal abdomen, the umbilical vein courses cranially towards the liver where it joins the portal sinus (umbilical portion of the left portal vein) to supply the liver. Most of the fetal blood bypasses the liver via the ductus venosus which originates at the portal sinus and terminates in the inferior vena cava or left hepatic vein. Deoxygenated blood returns from the fetus to the placenta via two umbilical arteries which originate at the right and left internal iliac arteries in the fetal pelvis. The two umbilical arteries divide into numerous radiating branches as the cord inserts in the placenta. Fetal and maternal bloods do not normally come into direct contact. CD/PD are helpful technologies to demonstrate the normal and deranged anatomic vascular relationships of the maternal and fetal circulations. (Moore 1988).

2.1.4: Location:

Placental location is described with respect to its relative position on the uterine wall and its relationship to the internal os. The placenta may be described as predominantly anterior, posterior, fundal, right or left lateral. A placenta that is distant from the internal os may be described as being in a normal location, central, or non previa. A low-lying placenta describes a placenta which appears to extend into the lower uterine segment and is within 1-2 cm of the internal os. A placenta previa describes a placenta which appears to partly or completely cover the

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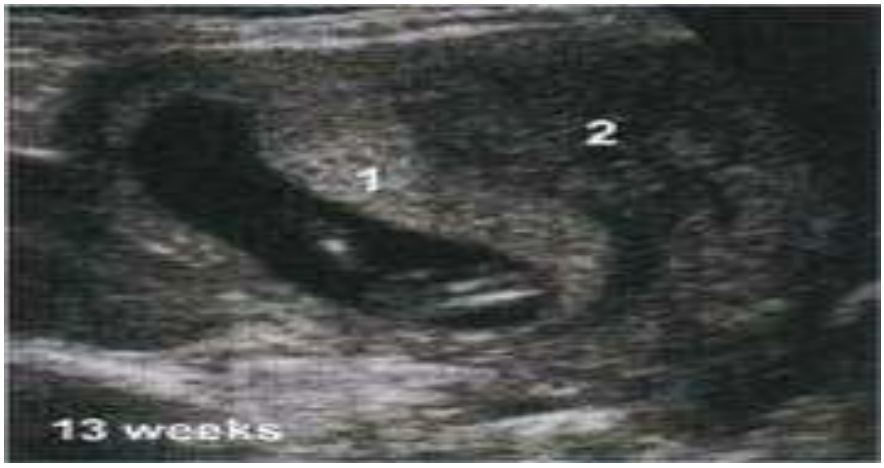

Fig 2.3. Normal Early Placenta Longitudinal TAS image of the uterus (bladder is empty) shows a normal anterior placenta (1) and a retroplacental FMC (2) (Devin 2005).

2.1.5 Cord Insertion: The placental cord insertion site should be sought and documented. According to the literature, the placental cord insertion site may be visualized with real-time ultrasound between 50-60% of pregnancies in routine clinical practice and over 95% of cases with colour Doppler. Not surprisingly, theplacental cord insertion site is most difficult to assess when the placenta is posterior and in the presence of oligohydramnios. The umbilical cord normally inserts near the center of the placenta. A cord which appears to insert near the edge of the placenta is calleda marginal insertion or battledore placenta and is generally thought to be of no concern. A cord which fails to reach the placenta and inserts in the membranes is known as a velamentous insertion and may complicate the pregnancy especially if the intramembranous umbilical vessels are close to or cross the internal os (a condition known as vasa previa). (Devin D 2005).

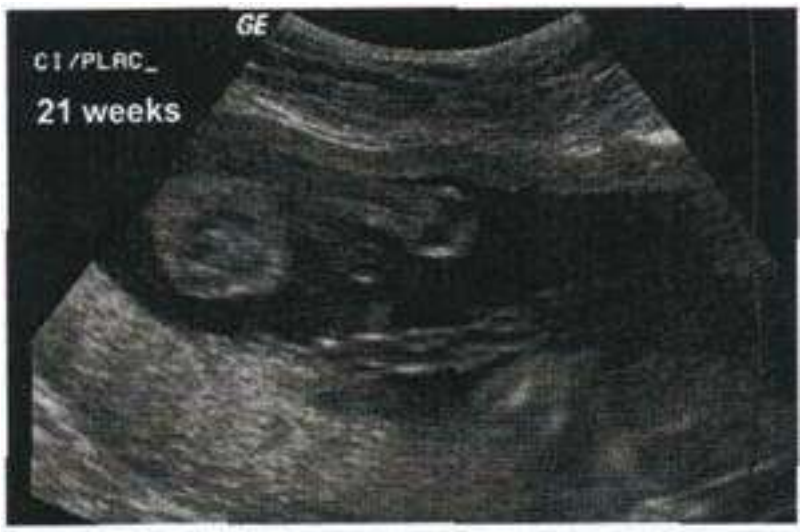

Fig: 2.4 Normal Cord, Insertion Sonogram of the uterus shows a posterior placenta with a centralumbilical cord insertion. (Devin 2005).

2.2: Physiology

In order to grow and to differentiate into the various tissues that form the placenta, the placenta must be able to metabolize raw materials from the maternal blood pumped into the intervillous spaces. The metabolism of proteinin the placenta is largely governed by the demands of fetal and placental growth. No other organ carries out the synthesis of such a diverse group of proteins for such a wide range of purposes. The vast quantities of structural proteins that will be incorporated into proliferating fetal and placental tissues must be derived from maternal sources. Little of the raw material in the massive flow from the mother, however, is in the precise forms required for the different stages of fetal and placental development. Hence, in addition to the placenta's prefabrication of specific proteins for its own purposes it must sort through the available supply, matching the quality and quantity of the material available to the current fetal demand. (Moore KL, 1988).

The production of hormonesto regulate the activities of pregnancy is one of the most interesting special functions of the placenta. It is the placenta that bears this responsibility and not the mother or the fetus. From the first days after fertilization,

thecells of the trophoblast and their successors in the placenta manufacture a large variety of hormones. The first to be manufactured in appreciable amounts is human chorionicgonadotropin (hCG). As pregnancy proceeds, large amounts of progesterone are synthesized in the placenta. In addition to sustaining the necessary decidual reaction of pregnancy, this hormone serves as a raw material for the production of placentalestrogen which in turn act on many organs and tissues of both the mother and fetus. (Moore KL, 1988)

Large amounts of progesterone are produced during the first months of pregnancy by the corpus luteum but the placenta takes over this activity after the third month of pregnancy. The processes influenced by estrogen and progesterone include thesynthesis of protein and the metabolism of cholesterol, the functioning of specific organs such as the maternal uterus and breast and the regulation of many aspects of fetal development. Another hormone produced by the placenta is human chorionicsomatomammotropin (hCS) or human placental lactogen. HCS can be detected in maternal serum as early as the sixth week of pregnancy. It rises steadily during the first Functional Representation of the Placenta Featuring Fetal and Maternal Circulation. (Moore KL, 1988).

In the second trimesters with little variation. HCS has several important physiologic effects on the mother and is referred to as the "growth hormone" of the second half of pregnancy because it promotes good fetal growth by ensuring a good supply of energyto the mother. Maternal HCS serum measurements have been used as a test to measure placental function however it lacks sensitivity and specificity to be of clinical value (Devin D 2005).

Among the physiological processes in pregnancy that call for particular precise coordination are those concerned with protecting the embryo from immunological rejection by maternal tissue. One of the many mechanisms that seem to play a part inthis task is the non-specific suppression of lymphocytes, the cells that would

normally mediate the rejection of a foreign tissue to the host tissue. Another highly specific immunological function of the placenta is to supply the fetus at the end of pregnancy with maternal antibodies of the type known as immunoglobulins. These antibodies summarize the mother's experience of and resistance to various infections and provide the newborn infant with a ready-made prophylaxis against infection until its own immune system can begin to function. (Devin D 2005).

2.3: Pathology

2.3.1: Placental Infarcts:

Small placental infarcts are common and of no clinical significance. Large infarcts (e.g. greater than 10% of the placental volume) are most commonly associated with maternal hypertensive disease and may cause IUGR, fetal hypoxia and fetal demise. Fresh placental infarcts appear as non-specific anechoic spaces in the placenta and are undistinguishable from other anechoic placental lesions. Aging or healing infarcts appear as hyperechoic lesions (more echogenic than the surrounding placental tissue) and may become calcified. (Shaheen F 2003).

2.3.2: Placental Size and Growth:

There is less emphasis nowadays in measurements of the placenta largely because the information is of limited diagnostic value. Thus, the placenta is not routinely measured. The most popular measurement is placental thickness (data on placental area, volume, and weight estimates have all been studied and reported in the literature). As a guideline, placental thickness should be measured if the placenta appears to be either thick or thin. Placental thickness measurements should be made near the mid portion or center of the placenta with one caliper placed at the amniochorionic surface (chorionic plate) and the second caliper placed at the basal surface perpendicular to the amniochorionic surface. The measurement should exclude retroplacental veins, myometrium, fibroids, and contractions of the uterus that might incorrectlyincrease the measurement. In a normal pregnancy, placental

Thickness increases with gestational age. As a rule of thumb, the mean thickness of the placenta in millimeters is roughly equal to the gestational age in weeks (e.g. 20 weeks, mean placental thickness is 20 mm; 28 weeks, mean placental thickness is 28 mm; and 36 weeks, mean placental thickness is 36 mm). (Shaheen F 2003)

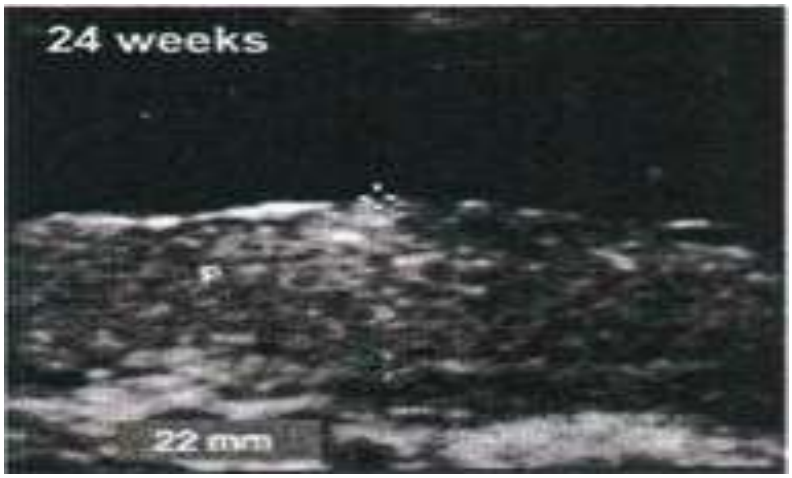

Fig2.5 Placental Thickness Measurement

Representative image of the posterior placenta shows caliper placement for placental thickness measurement. One caliper is positioned on the amniotic surface of the placenta and the other is positioned at the boundary between the placentas! Tissue and the hypoechoic basal vessels (Shaheen 2003).

False thickening of the placenta may be seen with placental abruption if the retroplacental hematoma has the same echogenicity (isoechoic) as the normal placental tissue. Colour Doppler may be helpful in distinguishing true placental thickening from pseudothickening. With true placental thickening, the normal intraplacental vascular network should be seen from the chorionic to basal surface; with abruption and a retroplacentalhematoma,colour will be seen in the placental tissue and be lacking inthe hematoma.(Shaheen F 2003).

A placental thickness greater than 4 cm is considered abnormal at any gestational age. Less than 2.5 cm at or greater than 35 weeks is considered too thin. The four conditions most commonly associated with placental thickening are:

a) Diabetes mellitus, especially gestational diabetes.

b) Immune and no immune fetal hydrops.

c) Fetal infections (e.g. cytomegalovirus)

d) Chromosomal abnormalities, especially triploidy

Small or thin placentas are most commonly associated with maternal hypertensive disease, severe IUGR, and severe diabetes mellitus. (Rarely, a thin placenta may be due to a membranous placenta (placenta membranacea or diffusa) which is a thin, poorly functional placenta that covers the entire surface of the chorionic sac. The placenta may also appear unusually thin with severe polyhydramnios as it is stretched over a large surface area of the uterine wall. (Shaheen 2003).

2.3.3: Placental Tumours:

All primary and secondary tumours of the placenta are rare. The most common tumour of the placenta by far is chorioangioma. Other primary tumours of the placenta include teratoma and choriocarcinoma. Choriocarcinoma is most likely to develop secondary to hydatidiform mole. Melanoma is reported to be the most common tumour to metastasize to the placenta (Devin 2005).

2.3.4: Developmental Variations:

Variations in the configuration of the placenta is very uncommon however the sonographer should be aware of the most common variants and understand their clinical significance. Only the most commonly encountered forms (succenturiate lobe and placenta circumvallate) will be considered in detail. Other less frequent forms include placenta annularis, placenta membranacea, fenestrate placenta, and placenta spuria. (Devin 2005).

2.3.4.1 Succenturiate Lobe:

A succenturiate lobe or succenturiate placenta is defined as one or more accessory lobes connected to the main body of the placenta by velamentous connection of the umbilical vessels (vessels traversing the membranes). The pathogenesis of succenturiate lobe is uncertain but it is likely due to a failure of the normal chorionic villi associated with part of the decidua capsularis to atrophy. Succenturiate placenta has a reported incidence of about 2.5 per 1,000 deliveries.Potential associated symptoms and complications include antepartum hemorrhage (if the velamentous vessels rupture before delivery), vasa previa (velamentous vessels cross the internal os), postpartum hemorrhage and infection (due to retention of the accessory lobe), and perinatal morbidity and mortality (fetal anemia and shock due to rupture of velamentous vessels). (Devin D 2005). A succenturiate lobe appears as a smaller mass of placental tissue at variable distance from the main placental body (typically very close). The diagnosis can be made accurately when the connecting velamentous vessels are seen between the two islands of placental tissue. Colour Doppler is very helpful to localize the connecting vessels which will show typical fetal umbilical flow. Focal myometrialcontractions (FMC) and subchorionic hematomas (SCH) have sonographic characteristics that may mimic a succenturiate placenta with SCH being more Challenging to distinguishSCH will lack connecting vesselsand changes appearance over the course of serial studies. A FMC is a transient event which changes appearance Placenta Membranacea. Colour Doppler should demonstrate normal intraplacental flow in the succenturiate lobe (colour flow similar to the main placental body) whereas SCH will lack normal colour flow signals (Devin 2005).

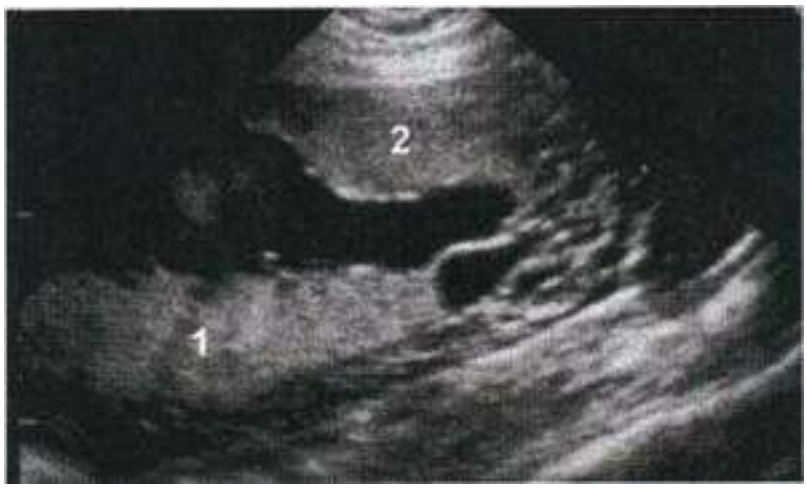

Fig: 2.6. Succenturiate Lobe

Transverse TAS image of the uterus shows a main placental lobe posteriorly (1) and a smaller lobe anteriorly (2). There are numerous vascular channels between the two lobes (Devin 2005).

2.3.4.2: Placenta Membranacea:

Also known as placenta diffusa. Classically, this term describes a thin membranous placenta covering the entire or greater part of the chorioamniotic membrane. The essential feature of the anomaly is thatall or most of the chorioamniotic membranes are covered on their outer (endometrial) aspect by functioning chorionic villi. Exceptionally, there may be a focal thickening to form a placental disc, but more commonly the gestational sac is diffusely covered by villous tissue, albeit of varying thickness. (Devin 2005).

In nearly all instances there is recurrent vaginal bleeding in the late first and second trimesters the consequence of which is either spontaneous abortion or premature labor. The bleeding is due to the fact that the placenta membranacea must also, of necessity, be placenta previa. Fetal survival is usually hampered by prematurity and IUGR. Antenatal diagnosis of this condition is exceedingly rare but the routine and extensive use of ultrasound in obstetrics will undoubtedly result in more cases.being diagnosed prenatally. A review of the ultrasound literature

reveals three reported cases since 1976. The diagnosis is established by noting placenta surrounding the entire gestational sac or uterine cavity**.**

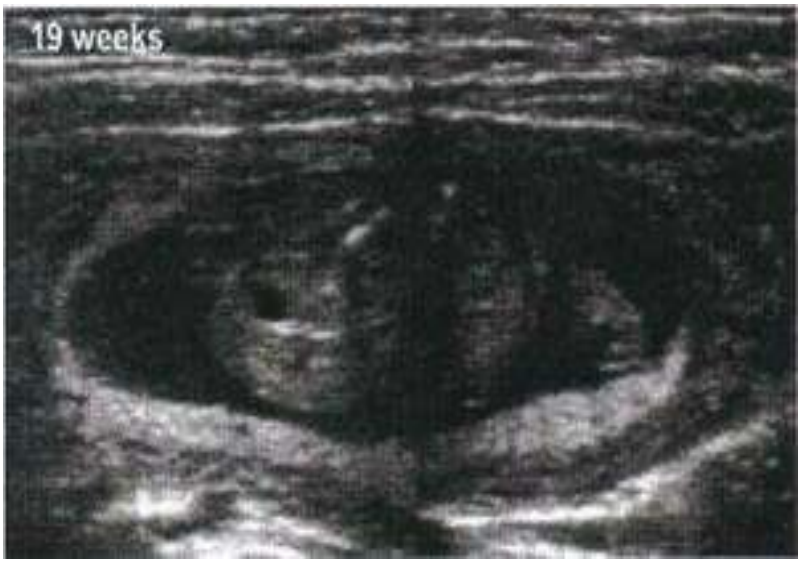

Fig: 2.7. Placenta Membranacea

Transverse TAS image of the uterus at 19 weeks gestation shows a thin posterior placenta that covers 60 - 60% of the perimeter of the uterus. (Devin 2005).

2.3.4.3: Placenta Annularis:

Defines a ring-shaped placenta which surrounds the gestational sac. This type of placenta is considered by some investigators to be a variant of placenta membranacea. It is associated with anincreased risk of ante- and postpartum bleeding and IUGR. Placenta Extrachorialis or extrachorialplacenta is a placenta in which the membranes and decidua have an abnormal relationship to the amniochorionic surface of the placenta (resulting in a chorionic surface that is smaller than the basal surface). (Devin 2005).

2.3.4.4: Placenta circummarginate represents a minor degree of this abnormality and is not of clinical significance (asymptomatic and very unlikely to be recognized with prenatal ultrasound).

2.3.4.5: Placenta circumvallate results in significant raising and folding of the membranes at the edge of the placenta forming a raised ring of tissue. Placenta circumvallate is usually asymptomatichowever it may be associated with antepartum hemorrhage (APH) and premature labour. Placenta circumvallate appears as a placenta with a peripheral echogenic Fenestrate Placentaband of tissue near the amniochorionic surface of the placenta representing the abnormally raised and folded amniochorionic membrane. (Devin 2005).

2.3.4.6: Fenestrate Placenta:

This is an exceptionally rare variant of placental development in which the central portion of a discoidal placenta fails to develop creating a large gap. Does not appearance to be of significance.

2.3.5: Abnormal Placental Attachment:

The normal placenta should attach to the decidua basalis and not invade the underlying myometrium. Abnormal placental attachment to the myometrium is a significant maternal risk. This condition varies in severity depending on the degree of invasiveness in the myometrium. Three grades are described based on the depth of penetration of placental tissue:

Placenta accreta: villi invade decidua but not the myometrium

Placenta increta: villi invade myometrium but not the serosa

Placenta percreta: villi invade myometrium and the serosa and can also invade local tissues like the bladder wall.

The true incidence of this condition is unknown and difficult to ascertain. The average incidence is reported to be about 1 in 7,000 pregnancies, with placenta accrete accounting for approximately 60% of cases. Most cases in the ultrasound literature are based on placenta accreta with very few cases describing the sonographic findings associated with placenta increta or percreta. Our discussion

with therefore focus on theclinical and sonographic features of placenta accreta. (Devin D 2005).

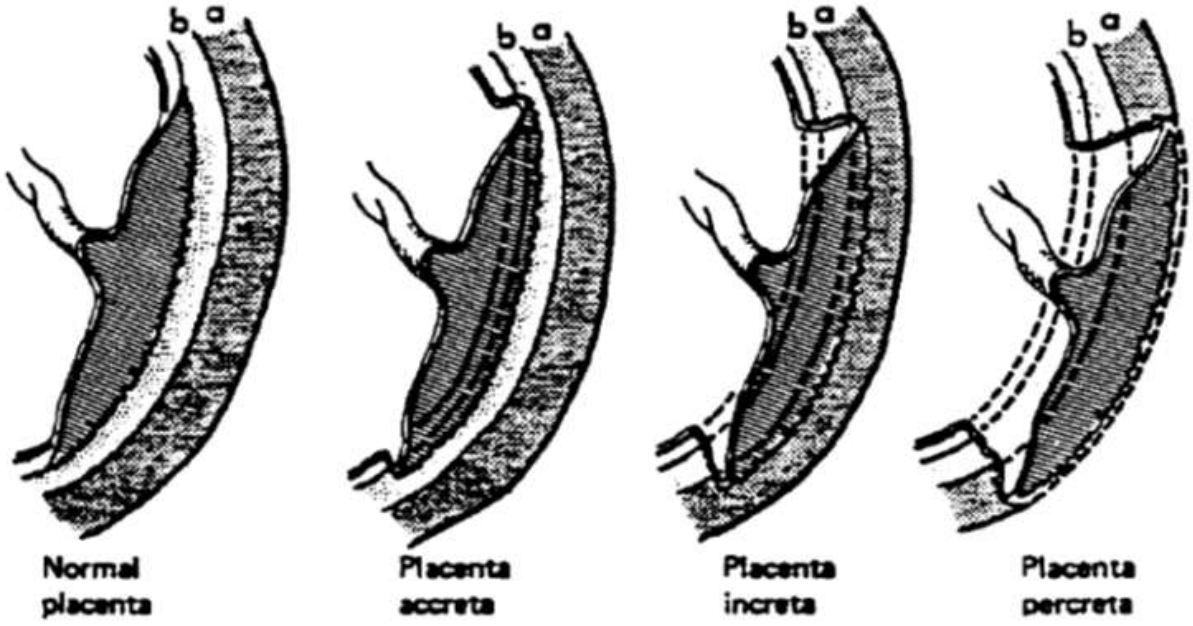

Fig: 2.8 abnormal placental attachments. (Devin 2005).

The most important predisposing risk factor for placenta accreta is previous uterine surgery resulting in focal damage to the endometrium and uterine scarring, most notably C-S delivery. Other significant risk factors include advanced maternal age,increasing parity, previous endometritis or history of Asherman's syndrome, and submucousmyomas.Patients are either asymptomatic or may present with antepartum bleeding. In one published series, 5 of 11 patients (45%) had elevated maternal serum alpha-fetoprotein. Placenta accreta is usually discovered at the time of delivery and may be associated with lack of normal progress during labor (Devin D 2005).

2.3.6: Placenta Previa:

Placenta previa describes a placenta that partially or completely covers the internal os. Three degrees of placenta previa are generally described:

Complete or Total Previa: The internal os is completely covered by the placenta. Complete placenta previa may be either symmetric or asymmetric. A symmetric placenta previa is indicated when the central portion of the placenta is over the os and equal portions of the placenta appears to be attached to the anterior and posterior walls of the lower uterine segment. With asymmetric, complete placenta previa, the placenta is predominantly anterior or posterior in relation to the internal os.(Devin D 2005).

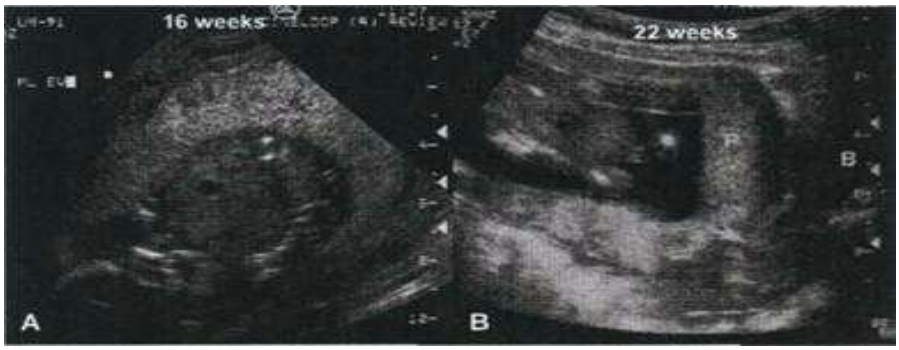

Fig: 2. 9 Central Complete Placenta Previa (A)Midline EVS image at 14 weeks. B) Midline B) TAS image at 22 weeks. The arrow indicates the approximate location of the internal OS (Devin 2005).

2.3.6.2: Marginal Previa:

The internal os is only partially covered by placenta.

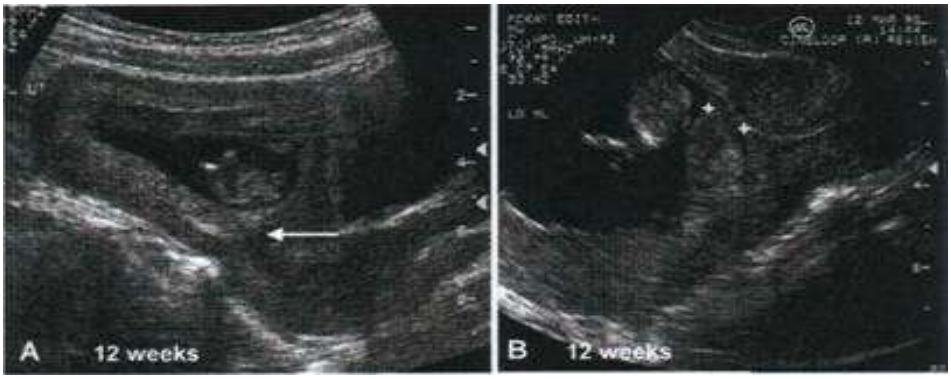

Fig: 2.10 Posterior Marginal Placenta Previa

A) Midline TAS image with a partially distended bladder shows a posterior placenta that is overlying the area of the internal os. B) Midline EVS image shows

the placenta covering the os by a distance of 0 mm. Follow up at 32 weeks showed complete resolution (Devin D 2005).

2.3.6.3:Low-Lying Placenta;

The placenta is close to the edge of the internal os but does not extend over it. Lowlying placentas generally convert to higher positions by 34 weeks gestation.

The incidence of placenta previa at the time of delivery is reported to be about 1%. Three factors which increase the relative risk of placenta previa are advanced maternal age, parity, and smoking. Multiparous women are twice as likely to have placenta previa as women delivering for the first time. A possible reason for this association is endometrial scarring which occurs with increasing age or repeated pregnancies. The scarring is thought to cause inadequate placental blood supply, for which the placenta compensates by becoming thinner and occupying a greater surface area of the endometrium. A consequence of greater placental surface area attachment is an increased chance for encroachment over the internal os. The majority of patients with placenta previa present with painless vaginal bleeding near the end of the second trimester or early in the third trimester (antepartum hemorrhaging or APH) howeverplacenta previa may remain asymptomatic until the onset of labour. (Devin 2005).

The clinical course and management of placenta previa depends on several factors including the onset and severity of APH, the maturity of the fetus, and the degree of placenta previa.

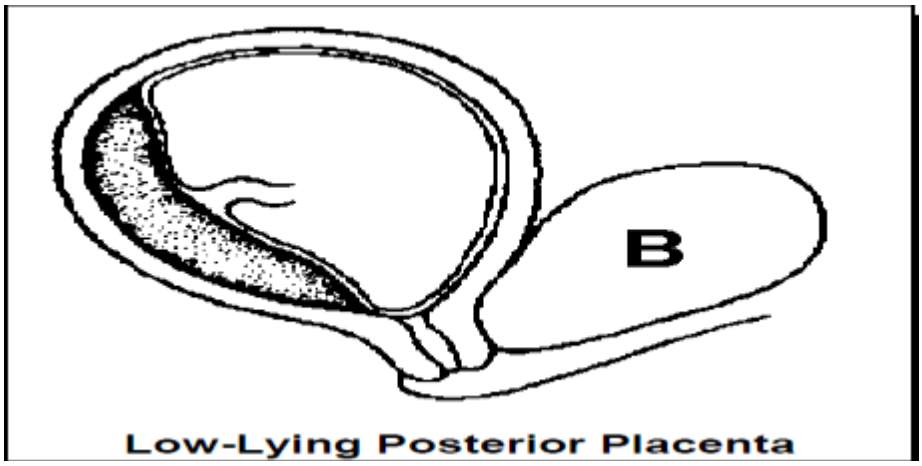

Fig: 2.11 low-lying posterior placenta. (Devin D 2005).

2.4: Ultrasound:

Ultrasound is the imaging modality of choice for the prenatal diagnosis of placenta previa however the sonographer must be aware of technical limitations and common interpretation pitfalls leading to false positive and false negative diagnosis. The false negative rate for the detection of placenta previa is very low (ultrasound misses the diagnosis of placenta previa), and makes ultrasound a good screening tool to rule out the diagnosis. The most significant factors contributing to a relatively high false positive rate (ultrasound falsely indicates the diagnosis of placenta previa) include distortion of the lower segment by an overdistended bladder and focal myometrial contractions (Devin D 2005).

Bladder distention pushes the anterior wall of the uterus posteriorly towards theposterior wall with the net effect of bringing an anterior lower segment placenta artificially closer to the cervix and also compressing the anterior and posterior lower segment walls together and masking the true location of the internal os. For these reasons, when evaluating a placenta that reaches the lower segment of the uterus and appears to be low-lying or previa, the sonographer should re-evaluate the patient after she has voided (postvoid scans). In the majority of cases, the postvoid study willresolve the situation, with most placentas changing in

appearance from previa or lowlying to normal (cases that remain suspicious should be evaluated with endovaginal (EVS) or transperineal (TPS) techniques).(Devin D 2005).

2.4.1: Focal myometrial contractions:

(FMC) can occur at anytime and in any part of the uterus, including the lower segment. The placenta - internal os relationship should not be assessed in the presence of a FMC on the placental wall or lower uterine segment. Simultaneous contraction of the anterior and posterior lower segment walls (referred to as circumferential or symmetric lower uterine segment contractions) is a little more problematic since it may be more difficult to recognize by the inexperienced sonographer. Keep in mind that the true length of the cervix (internal to external os) should measure approximately 3 cm. If the cervix appears to be significantly longer than 3 cm, the sonographer should question the true location of the internal os since both bladder filling and lower segment contractions can artificially distort the location of the internal os. Less commonly, the presence of a fibroid or subchorionic hematoma in the lower segment may also make it difficult to assess for placenta previa. (Devin 2005).

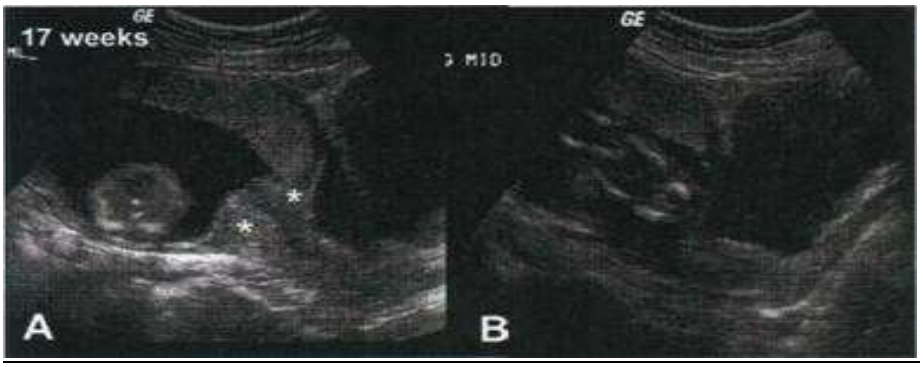

Fig: 2.12Focal Myometrial Contraction: A) Longitudinal scan of the uterus shows an anterior placenta and a symmetric FMC (*) of the lower uterine segment. B) Same view after dissipation of thecontraction. (Devin D 2005).

2.4.2: placental migration or placental retraction

The placenta does not truely migrate; the apparent upward movement of the placenta is due to the development of the lower uterine segment. At 16 weeks gestation, the placenta occupies approximately one-half of the internal surface area of the uterus; however, because theplacenta grows more slowly than the uterus, at term it occupies only onequarter to one-third of the uterine surface area.

The majority of apparent placenta previa and low-lying placentasdiagnosed with ultrasound in the first and second trimester will resolve. Are their reliable sonographic criteriathat will reliably predict those placenta previa that will persist andthose that will resolve?Some authors showed that a placenta which overlapped the internal os by 15 mm or more(evaluated with EVS at 18-23 weeks' gestation) was more likely to remain previa at term. The placenta that overlapped the internal os by 25 mm or more at 20-23 weeks' gestation was incompatible with a vaginal delivery. (Carneet et.al, 2001)

They initially performed TAS and followed with EVS if the diagnosis was uncertain. They observed that using EVS at 20-23 weeks' gestation to predict persistence of placenta previa to term has a low false-positive rate compared to using it at earlier stages of pregnancy. It show that the incidence of major complications is higher in women with a thick placental. He defined a "thin" placental edge as measuring less than 1 cm in thickness and or presenting an angle of less than 45 degrees. The thin-edge group had a significantly higher vaginal delivery rate, while the thick-edge group required more frequently emergency delivery by C-section, peripartum hemorrhage, placenta accreta, and preterm delivery. The rate of placental migration was a factor in predicting outcome. (CieminskiA 2005). In his study, EVS was performed at 4-week intervals in women who had been noted at 26 weeks' gestation to have a placenta lying within 3 cm of the internal cervical os, and the rate of placental migration was assessed.

They showed that the mean rate of placental migration in women who were to later require a C-section for related complications (bleeding and malpresentation) was 0.3 mm/wee, while the mean rate of migration in women who had a vaginal delivery or C-sectionfor other indications was 5.4 mm/week. They also made two other important observations: 1) when the placental edge was initially 20 mm or more from the internal os, migration occurred in all cases, and no C-sections were necessary for placenta previa;2) when the placenta overlapped the internal os by 20 mm or more at 26 weeks, all the women required C-section. Further studies are required to verify these reports however it may be possible in the future to predict in the second trimester whichplacentas will be previa at term and which will not. It may be possible to determine in the second trimester who will need a further sonogram and who will not. (CieminskiA 2005)

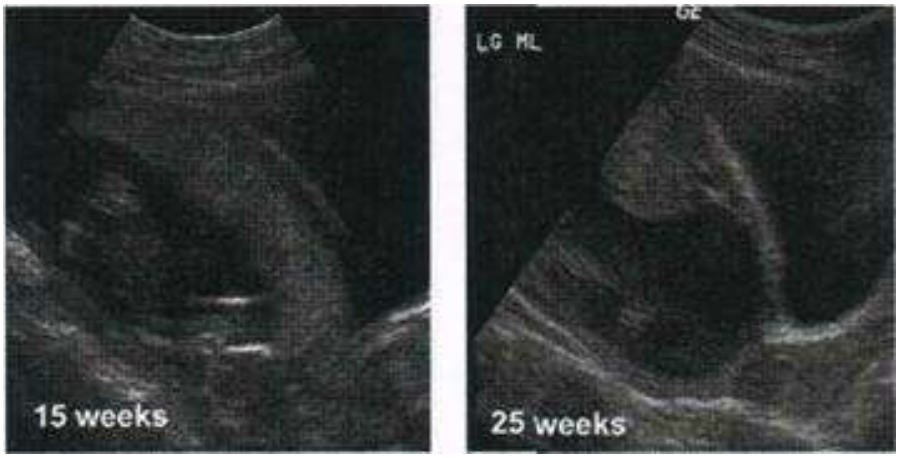

Fig: 2.13Migration, Midline image of the uterus at 15 and 25 weeks gestation shows an upward change in the cervical edge of the placenta. (CieminskiA 2005)

Complete placenta previa is generally not difficult to diagnose in the second or third trimester with conventional TAS. Partial placenta previas or low-lying placentas are sometimes difficult to diagnose with TAS, especially in the third trimester, largelybecause the fetus interferes with visualization of the posterior

placenta and the internal os region. When TAS evaluation is non diagnostic, EVS or TPS should be performed. The use of EVS has not been shown to lead to an increase in vaginal bleeding however many investigators prefer the less invasive TPS approach. The EVS probe should always be carefully and gently introduced in the vagina with the sonographer observing the insertion on the screen with real-time; the tip of the probe should be placed 3 to 4 cm from the external os. The general sentiment is that an EV study does not pose the same threat as a blinded digital examination which results in direct palpation and manipulation of the cervix. In this circumstance, EVS should be done by a qualified physician in a hospital setting.

It is much easier to evaluate a low-lying anterior placenta extending down into the lower uterine segment than a posterior or lateral placenta which may be masked by fetal parts. A posterior placenta will displace the fetal head or buttocks anteriorly and may interfere with descent. In this situation, if the cervical margin of the placenta cannot be adequately visualized with TAS, EVS or TPS should be performed especially if the patient presents with antepartum bleeding..(Devin D 2005). Ultrasound Evaluationevaluation of the placenta should be a routine part of every second and thirdtrimester ultrasound study as indicated in the American Institute of Ultrasound in Medicine Antepartum Obstetrical Ultrasound Examination Guidelines ("The placentallocation, appearance, and its relationship to the internal cervical os should be recorded").(Carne 2001).

2.4.3: Technique:

In general, there are no special equipment or transducer considerations (the equipment and transducer deemed most appropriate for the obstetrical ultrasound study may be used). If the system has electronic beam focusing, the focal zone should be adjusted to optimally visualize the placenta.(Carne JM2001).

A posterior placenta is more difficult to visualize in its entirety due to attenuation and shadowing from the overlying fetus. If indicated, positioning the patient in a left or right posterior oblique position may be helpful in better visualizing a posterior placenta. (Carne 2001).

For the standard transabdominal study (TAS), the bladder should be adequately distended to optimize visualization of the cervix and lower uterine segment and to show the relationship of the placenta to the internal os. Overdistention of the bladder distorts the appearance of the cervix and lower uterine segment and may lead to the false positive diagnosis of placenta previa. Endovaginal (EVS) or transperineal (TPS) techniques should be performed whenever TAS does not adequately show the relationship of the placenta to the internal os (e.g. due to attenuation by fetal parts or the patient presents with an empty bladder) and there is a high index of suspicion of placenta previa (e.g. patient presents with third trimester bleeding). Routine evaluation of the placenta with colour Doppler is now favoured to rapidly find the placental cord insertion site and to detect vascular abnormalities in the placenta and the retroplacental uterine wall. This is especially important if the placenta is anterior and appears to be low-lying or previa since the risk of placenta acreta is highest in this situation. An important view is the median lower segment and cervix image which may identify vasa previa associated with velamentous insertion of the cord or succenturiate lobe. Pulsed Doppler spectral waveform analysis of the placenta may be helpful to characterize flow in masses or abnormal appearing vessels. (Devin D 2005).

2.4.4: Echo Texture:

The normal placenta appears as a sonographically uniform structure with mid amplitude echoes (in contrast, the adjacent uterine wall (decidua and myometrium) appear less echogenic or hypoechoic). In the third trimester, the placenta generally appears less homogeneous and may have small anechoic or hypoechoic areas of

different pathological etiologies. Calcium deposits are seen in the majority of placentas in the third trimester and appear as high amplitude (white) linear echoes. The fetal or amniochorionic surface of the placenta (generally referred to by authors as the chorionic plate) forms a strong interface with the amniotic fluid. This surface is very angle dependent (specular reflector) and appears as a bright (white) echo when the sound beam strikes at normal incidence (perpendicular to the interface).(Devin 2005).

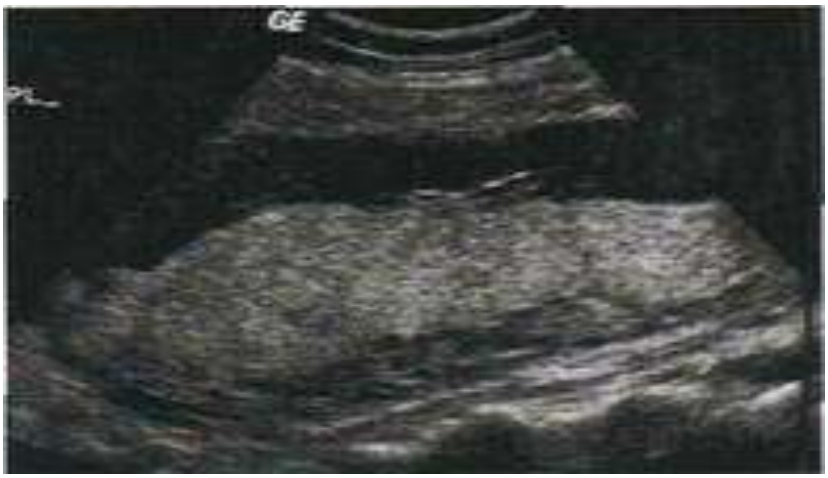

Fig2 -14 Posterior Placenta, Transverse TAS image of a posterior placenta shows the normal hypo echoic uterine wall behind the placenta. (Devin 2005).

2.4.5: Retroplacental Uterine Wall:

The retroplacental uterine wall consists of the richly vascular myometrium and decidua basalis. These tissues are distinctly hypoechoic in comparison to the placenta. After 18 weeks gestation, the normal anterior retroplacental uterine wall (sometimes referred to as the subplacental complex or the retroplacental space) has an average thickness of 9.5 mm. The sonographic diagnosis of placental acreta depends on this normal hypoechoic zone being invaded by more echogenic villi andappearing thinner or not seen. The endometrial veins in the decidua basalis may be quite dilated and appear as irregular, tubular spaces especially when the placenta is posterior (probably due to diminished venous drainage when the patient

is supine and the weight of the uterus on the posterior uterine wall impedes venous flow). Other retroplacental abnormalities include hematomas associated with abruption of the placenta and fibroids which must be distinguished from focal myometrial contractions. (Devin 2005).

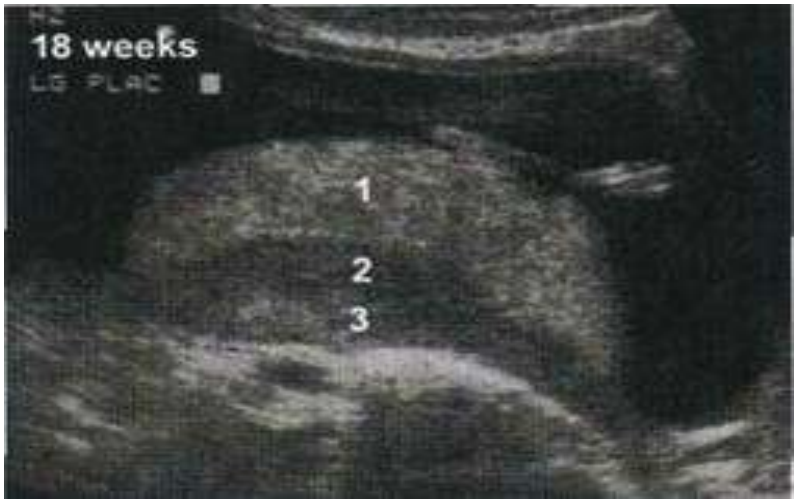

Fig 2.15. Retro placental Complex, Sagittal TAS image of a posterior placenta (1) shows a prominent retroplacental complex and the "end" of a FMC (3). (Devin 2005).

2.4.6: Placental Grading:

Calcium deposition in the placenta is a normal process of placental aging or maturation which occurs at different rates in normal pregnancies. Sonographically, macroscopic areas of placental calcifications appear as hyper echoic (white) echo densities in different areas of the placenta, with larger areas of calcification exhibiting shadowing. Calcium is deposited primarily along the basal surface and placental septa. Macroscopic and sonographic evidence of placental calcification is not evident until the third trimester. More than 50% of placentas show somesonographic evidence of calcification after 33 weeks' gestation however about 20% of normal term placentas have no macroscopic or sonographic evidence of calcification. Previously, investigators found it useful to assign placentas a numerical grade (0 to 3) based on the degree of calcification however such grading

Schemes have proven to be of limited value in clinical practice in predicting fetal maturity, fetal wellbeing, or perinatal outcome. Although of limited clinical value, I recommend you learn the basic facts about placental grade, especially the features of a grade 3 placenta and the significance of early or premature appearance. These placentas show an irregular amniochorionic surface (chorionic plate) with calcification extending along the cotyledenal division from the chorionic plate to the basal surface. The grade 3 placenta may also have larger areas of calcification that produce shadowing and the placental parenchyma may contain hypoechoic or anechoic areas. Grade 3 placentas are the most heavily calcified and are not seen before 36 weeks gestation in normal pregnancies. Only about 15% of normal term pregnancies are grade 3 placentas. A greater percentage of Grade 3 placentas are seen with increasing gestational age in pregnancies >36 weeks however a grade 3 placenta does not predict fetal lung maturity. The appearance of a Grade 3 placenta before 36 weeks gestation should raise concern for later development of IUGR, maternal hypertension and fetal distress (these conditions have been associated with premature placental senescence characterized by heavy placental calcification). (Devin 2005). Anechoic and Hypoechoic Placental Lesions Small, anechoic and hypoechoic lesions are commonly seen in the placenta, especially in the 3rd trimester. These anechoic and hypoechoic placental lesions have been referred to by different authors as “sonolucencies”, “lucencies”, and “holes”. Although sonographically alike, these lesions represent different pathologies including subchorionic fibrin deposits, intervillous thrombosis, perivillous fibrin deposition, fresh infarcts, subchorionic maternal venous lakes, and septal cysts. These lesions may be round, ovoid, or linear and are typically less than 2 cm in diameter. Occasionally, sludge-like blood flow can be seen in some lesions (e.g. subchorionic venous lakes) on real-time imaging and Doppler. The only significant fact pertaining to these placental lesions is that they may be associated with

elevated maternal serum alpha-fetoprotein values and an otherwise normal fetus. If the fetus appears structurally normal, the placenta should be evaluated carefully for evidence of placental bleeding, masses and these lesions. **.** (Devin D 2005).

Fig 2.16. Grade 0 Placenta, Linear array image of an anterior placenta at 32 weeks gestation shows no evidence of placental calcification. (Devin 2005).

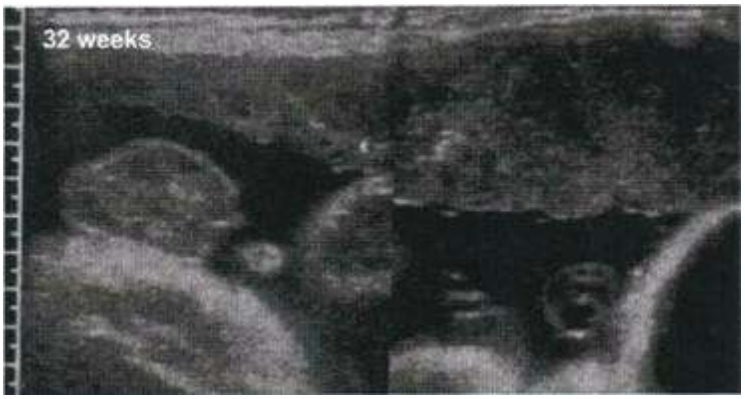

Fig 2.17 Grade 1 Placenta, Axial section of the uterus shows an anterior placenta at 32 weeks gestation with evidence of parenchymal calcification but no evidence of basal calcification (maternal surface of the placenta). (Devin 2005).

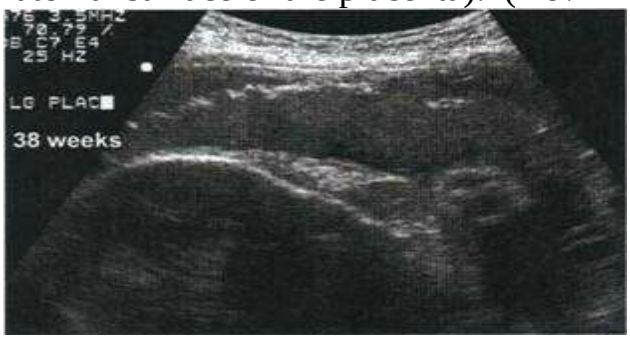

Fig 2.18. Grade 2 Placenta, Anterior placenta at 38 weeks gestation shows calcification of the basal surface of the placenta consistent with a grade 2 classification. (Devin 2005).

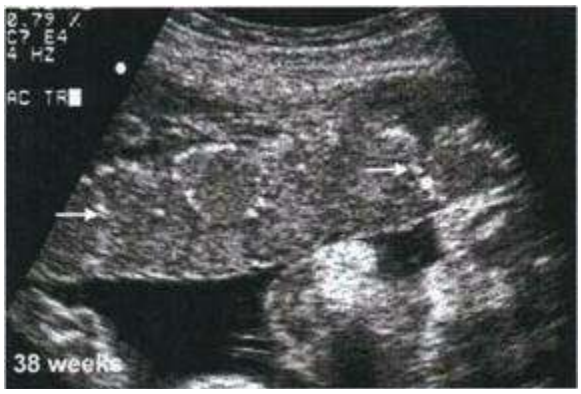

Fig2.19 Grade 3 Placenta, TAS image of an anterior placenta shows calcification of the placenta extending from the maternal to fetal surface, (arrows).(Devin 2005).

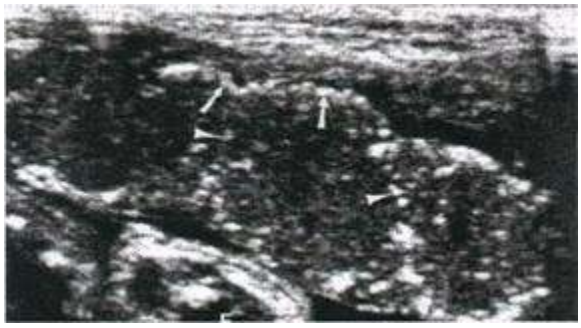

Fig2.20 Grade 3 Placenta, Representative TAS image of the placenta at 39 weeks gestation shows calcification of the placenta extending from the maternal to fetal surface and defining the cotyledon. (Devin 2005).

2.4.7:Ultrasound/Doppler

Prenatal sonographic diagnosis of placenta accreta is usually in the late second or third trimester based on the appearance of the placental interface with the anterior uterine wall and distended bladder. In patients with previous C-S delivery, a low-lying gestational sac on a scan at 10 weeks or earlier suggests the possibility of placenta accreta. A low position of the gestational sac can occur in other clinical situations including abortion in progress, cervical pregnancy, and normal pregnancy. **.** (Devin D 2005).

Placenta Accretamost cases of placenta accreta are associated with an anterior low-lying placenta or anterior placenta previa. The characteristic sonographic and

Doppler features include: Loss or notable thinning of the normal hypoechoic myometrial layer beneath the placenta, Large placental vascular spaces - The retroplacentaldecidual veins may be markedly enlarged and appear as irregular anechoic pockets. On CD, the enlarged veins may exhibit unusually intense or turbulent blood flow indicating abnormal Uteroplacental lacunar flow, Loss of the hyperechoic uterine serosa-bladder interface and extrauterine or intravesical masses representing hematoma formation**.** Scanning Flag should be highly suspicious of placenta accreta in patients with an anterior placenta extending into the lower segment (low-lying or previa) especially in patient with previous C-S delivery. (Devin 2005).

2.5. Previous studies:

Ozoko, et al 2014, studied Ultrasonographic Study of Placenta Positioning and Its Significance in Parturition among Women in Delta State. Ultrasound is a useful adjunct to the physical examination, particularly in obstetrics patients. By ultrasonography we visualize the placenta position in-situ and describe various positioning of placenta in the uterus. The placenta is positioned at different sites in the uterus which can predict methods of parturition. The objective of this study is to investigate the different positions of placenta as seen in ultrasound scan and it's significant in parturition among women in Delta state. The study comprises of 150 women who registered for antenatal care at Eku Baptist Hospital Eku, Delta state, and have given birth in the Hospital. The pregnant women were examined with ultrasound scan which determined the positions of the placenta at the radiodiagnostic department. The different positions such as anterior, posterior, fundal and previa were recorded. The methods of deliveries were also taken note of in the pre-maternal labour forms in obstetrics/gynaecology department and health record office of the Hospital. Data were presented as mean and standard deviation; data were analyzed using statistical package for social science (SPSS). The cases

of previa were related to the type of delivery out of 28 cases ofprevia 18 women delivered by caesarean section and 10 had normal delivery. 10 out of all are previa type I, 7 are previa type II, and 11 are previa type III. All type III cases delivered through caesarean section (Ozoko, et al 2014).

Shumaila Zia, 2013, studied Placental location and pregnancy outcome. Objective: The purpose of this study was to determine if placental location is associated with adverse pregnancy outcome and to assess whether any association exists between different blood groups and location of the placenta. Material and Methods:Medical records of women were reviewed retrospectively and placental position as documented in the case notes at routine antenatal (20–38 weeks) ultrasonography was identified. Placental position was categorized as anterior, posterior and fundal. Association of placental location with foeto-maternal outcome and different blood groups was noted. Results: A total 474 case notes of women were analyzed for placental location, feto-maternal outcome and blood groups. Anterior placenta was found to have a relation with a greater risk of pregnancy-induced hypertension, gestational diabetes mellitus and placental abruption ($p<0.001$), while posterior placenta had a significant association with preterm labour ($p<0.001$). Regarding foetal outcome, an anterior placenta was significantly associated with intrauterine growth retardation and intrauterine foetal death ($p<0.001$). The majority (54%) of women with an anterior placenta were O-positive blood group, while 46% of women in the posterior placenta group were A-positive blood group ($p<0.001$).Conclusion: Anterior placental implantation is associated with an increased risk of pregnancy-induced hypertension, gestational diabetes mellitus, placental abruption, intrauterine growth retardation and intrauterine foetal death. Posterior placenta has a significant association with preterm labour and A-positive blood group. Anterior placenta is common in women with O-positive blood group.

Placental location may be an important determinant of pregnancy outcome (Shumaila Zia, 2013).

Seadati, et al, (2013), studied Placental Location at Second Trimester and Pregnancy Outcomes. The aimed of this study was to find association between location of placental at second trimester and pregnancy outcomes. It was a descriptive -analytic epidemiological study which has performed on 250 pregnant women by simple random sampling in Razi hospital and Imam Khomeini hospital during July 201 October 2012 in Ahvaz city, Iran. Placental location was determined by sonography at 18 -22 weeks of gestation, and it was classified to high/low category and anterior/ posterior category. In this study has been assessed placental location with incidence of preeclampsia, intra uterine growth restriction and preterm birth. The incidence of preeclampsia and intrauterine growth restriction was 5.6%, 1.6% respectively, these parameters were not associated with placental location (p= .84, p=0.69).The incidence of preterm birth was 7.2%and it was associated with low placental location (p=0.01).There was no significant difference between anterior and posterior placenta in all of outcomes. Low placental location was associated with increased risk of preterm labor and preterm delivery (Seadati et al, 2013).

Kalanithi, 2007, studied Placental Localization and Perinatal Outcome. It was a retrospective case-control study was designed to investigate the relationship between placental localization and intrauterine growth restriction (IUGR). Pregnant women with an anatomic survey from January 1, 2000, to December 31, 2005, and delivery of the pregnancy at Yale-New Haven Hospital (YNHH) were identified using clinical and billing records. Multiple gestation, fetal anomaly, and incomplete medical information were reasons for exclusion. Cases (N=69) were consecutive pregnancies with evidence of IUGR (estimated fetal weight $<10^{th}$

percentile for gestational age) at last follow-up ultrasound. Randomly selected controls (N=258) from the same time period had no evidence of IUGR. Maternal, ultrasound, delivery, and perinatal data were collected by retrospective medical record review, and IUGR cases and non-IUGR controls were compared using the Student's t-test, Wilcoxon test, Chi-square analysis, Fisher's exact test, and ANOVA. Placental location was determined from the anatomic survey record (obtained at 18.4 ± 1.2 weeks' gestation in the IUGR group and 18.2± 1.0 weeks' gestation in the control group; P=0.18). Multivariate logistic regression with adjustment for confounders was used to investigate the association between IUGR and placental localization. Consistent with known predictors of IUGR, the IUGR group had a higher proportion of black women (36.4% vs. 19.8%, P=0.03), chronic hypertension (26.0% vs. 3.5%, P<0.001), and hypertensive disorders of pregnancy (36.2% vs. 5.0%, P<0.001). Mean birth weights of IUGR and non-IUGR pregnancies differed by 2 kilograms (3244 ± 625 grams vs. 1277 ± 637 grams, P<0.001). IUGR infants were more likely to receive antenatal steroids, deliver preterm, deliver by cesarean section, and be admitted to neonatal intensive care. In both IUGR and non-IUGR pregnancies, the placenta was most commonly anterior or posterior. Unilateral placentas were three times more common in the IUGR group than in the non-IUGR group (17.4% vs. 5.0%, P=0.01). IUGR pregnancies were over four times as likely as control subjects to have unilaterally-located placentas compared to anterior placentas (OR 4.8, 95% confidence interval, 1.9-11.7). Adjusting for ethnicity, chronic hypertension, and hypertensive disorders of pregnancy did not affect this finding (OR 4.6, 95% confidence interval 1.6-13.5). In conclusion, we compared a group of 69 IUGR pregnancies to 258 non-IUGR controls and found intrauterine growth restriction to be associated with unilateral placentation (Kalanithi, 2007).

Chapter Three
Material & Methodology

Chapter Three

Methodology

This study was concerning to the normal location of the placenta in pregnant ladies using ultrasonography.

3-1. materials:

The ultrasound machine used in this study was of Mindray ultrasound machine, DP, 2200, 2008, Germany, with three major probes, with full ultrasound departmental facilities, and coupling gel.

3-2. Methods:

This descriptive study includes fifty two Sudanese pregnant women in second and third trimesters came to the ultrasound department for regular checkup. The selected women were attending with viable singleton pregnancy. Pregnant women with hypertension (PIH), diabetes mellitus, and history of previous intrauterine growth retardation (IUGR), congenital malformation, twin gestation, and placental anomalies were excluded from this study. Ultrasound examinations is done using ultrasound machine Toshiba-power vision-6000, transabdominal convex transducer with frequency of 3.5 MHz and ultrasound gel. During the ultrasound examination BPD and abdomen circumference (AC). The placental location were assessed in longitudinal section at the point of umbilical cord insertion.

3-2-1. Study design:

This was a descriptive analytical study used to determine the placental location.

3-2-2. Area of the study:

This study was conducted in Omdrmam, in two hospitals, Lypia hospital, and Elsaudi hospital for obstetrics and gynecology.

3-2-3. Duration of the study:

This study was conducted in duration from (August to November, 2016)

3-2-4. Sample size:

This study was consist of 100 pregnant ladies in different trimesters from first to third trimester.

3-2-5. Data collection:

The data of this study was collected by using special data collection sheet consisting of eight variables which were the age, number of pregnancy, gestational age, trimester of pregnancy, history of type of deliveries, placental location, fetal presentation, and the amount of liquor.

3-2-6. Technique used:

Trans- abdominal approach was used: no need for patient preparation nor breathing technique used. The patient should be in supine possition, and the probe should be longitudinal to show the placental location.

3-2-7. Data analysis:

The data of this thesis was analysed by using SPSS system.

3-2-8. Ethical issue:

Verbal permissions were taken from the hospitals, and from the patients, and any patient refused to be candidate of study were excluded.

Chapter Four
Results

Chapter Four

Results

Table 4-1 the mean, max and min of age, liquor and No. of pregnancy

Variables	Minimum	Maximum	Mean	Std. Deviation
age	17.0	40.0	27.040	6.0451
Liquor	5.0	7.0	5.527	0.4546
No of Pregnancy	1.0	9.0	2.880	1.9031

Table 4-2 Frequency distribution of age for pregnant women

Age group	Frequency	Percent
17-20.3	21	21.0
20.4-23.7	12	12.0
23.75-27.1	14	14.0
27.2-30.5	28	28.0
30.6-33.9	7	7.0
34-37.3	14	14.0
37.4-40	4	4.0
Total	100	100.0

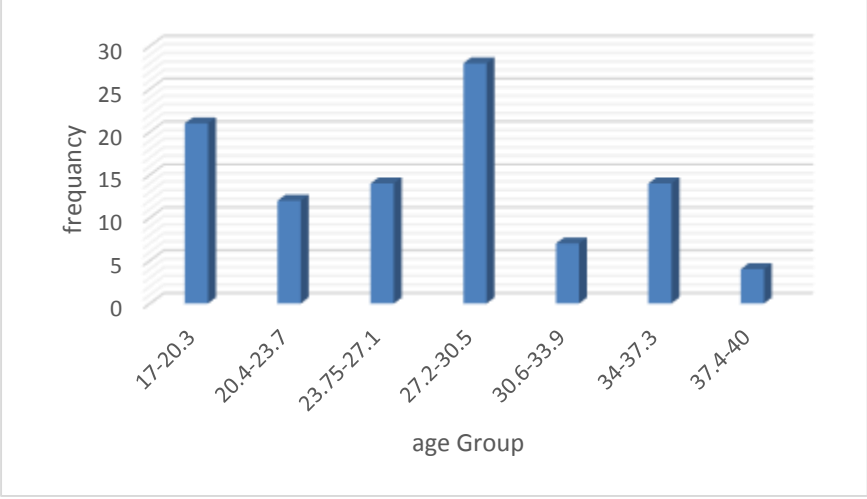

Figure 4-1 a bar graph show age frequency distribution.

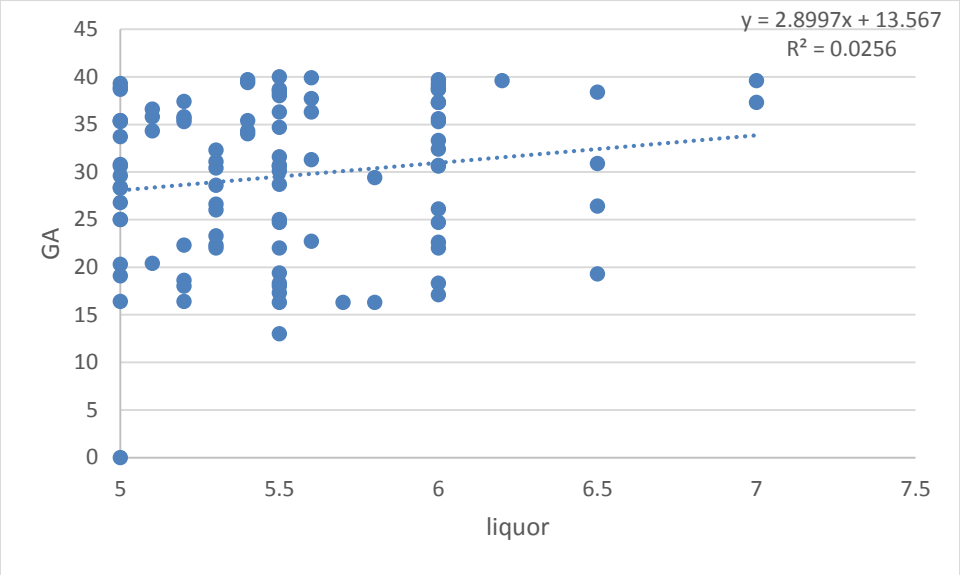

Figure 4-2. Scatter plot show a direct linear relationship between liquor amount and gestational age

Figure 4-3. cross-tabulation table show the relationship of pregnant age groups and trimester

		trimester			Total
		I	II	III	
age	17-20.3	0	10	11	21
	20.4-23.7	0	3	9	12
	23.75-27.1	0	4	10	14
	27.2-30.5	1	11	16	**28**
	30.6-33.9	0	0	7	7
	34-37.3	0	3	11	14
	37.4-40	0	3	1	4
Total		1	34	**65**	100

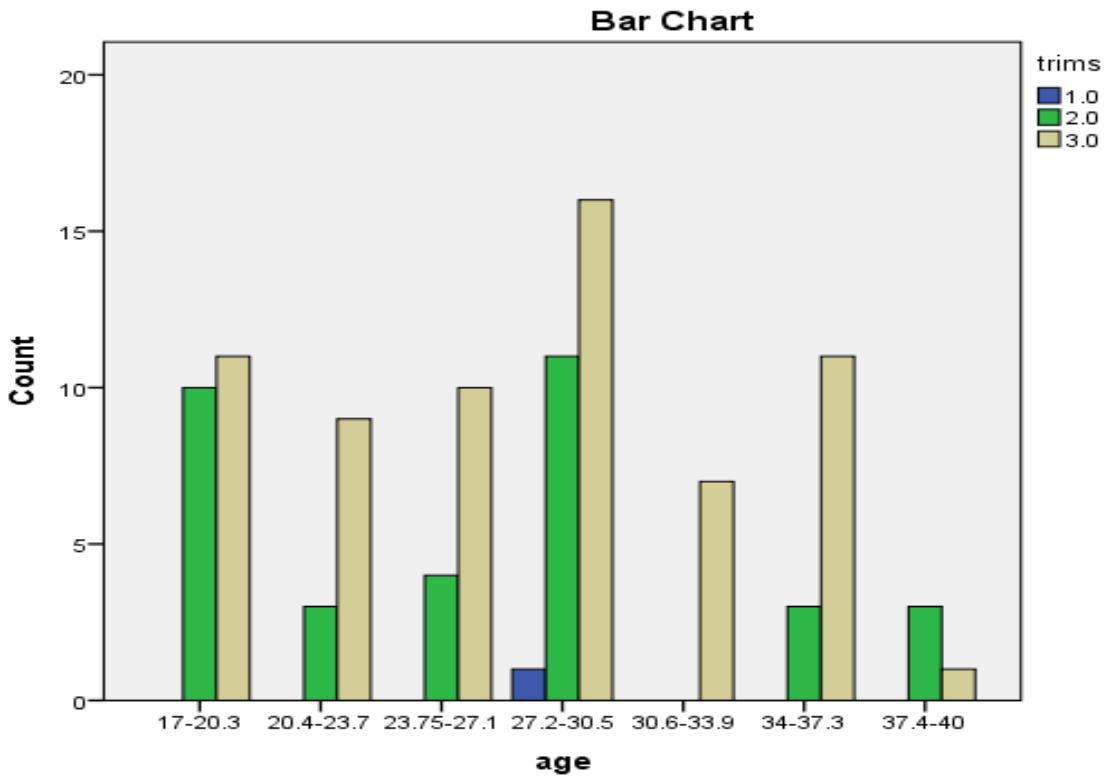

Figure 4-3 a bar show the relationship between pregnant women age group and trimester

Table 4-4 cross-tabulation table between age group and type of delivery

		H. of type of delivery			Total
		No vapor	NVD	C/S	
age	17-20.3	14	4	2	20
	20.4-23.7	4	7	1	12
	23.75-27.1	2	10	2	14
	27.2-30.5	5	22	1	28
	30.6-33.9	0	5	2	7
	34-37.3	0	13	1	14
	37.4-40	0	3	1	4
Total		25	64	10	99

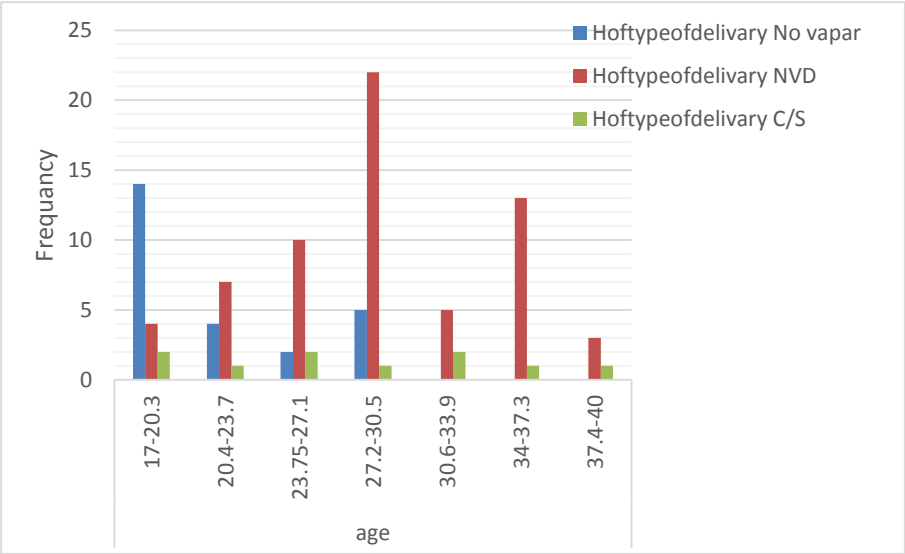

Table 4-4 a bar graphs between age group and type of delivery

Table 4-5 cross-tabulation table between age group and placenta location

		Placental location				Total
		anterior	posterior	fundal	Previa	
age	17-20.3	9	12	0	0	21
	20.4-23.7	6	5	0	1	12
	23.75-27.1	7	7	0	0	14
	27.2-30.5	13	14	0	1	28
	30.6-33.9	2	4	0	1	7
	34-37.3	6	7	1	0	14
	37.4-40	1	3	0	0	4
Total		44	52	1	3	100

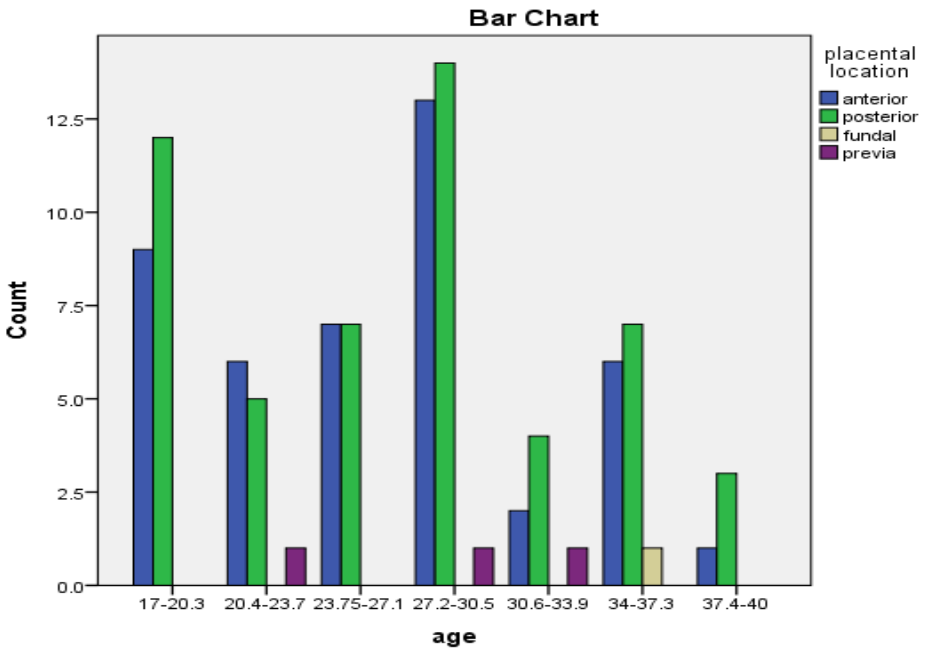

Table 4-5 a bar graph between age group and placenta location

Table 4-6 cross-tabulation table between age group and Fetal presentation

		Fetal presentation			Total
		Cephalic	breech	transverse	
age	17-20.3	19	2	0	21
	20.4-23.7	11	0	1	12
	23.75-27.1	11	1	2	14
	27.2-30.5	22	5	1	28
	30.6-33.9	6	1	0	7
	34-37.3	9	4	1	14
	37.4-40	2	2	0	4
Total		80	15	5	100

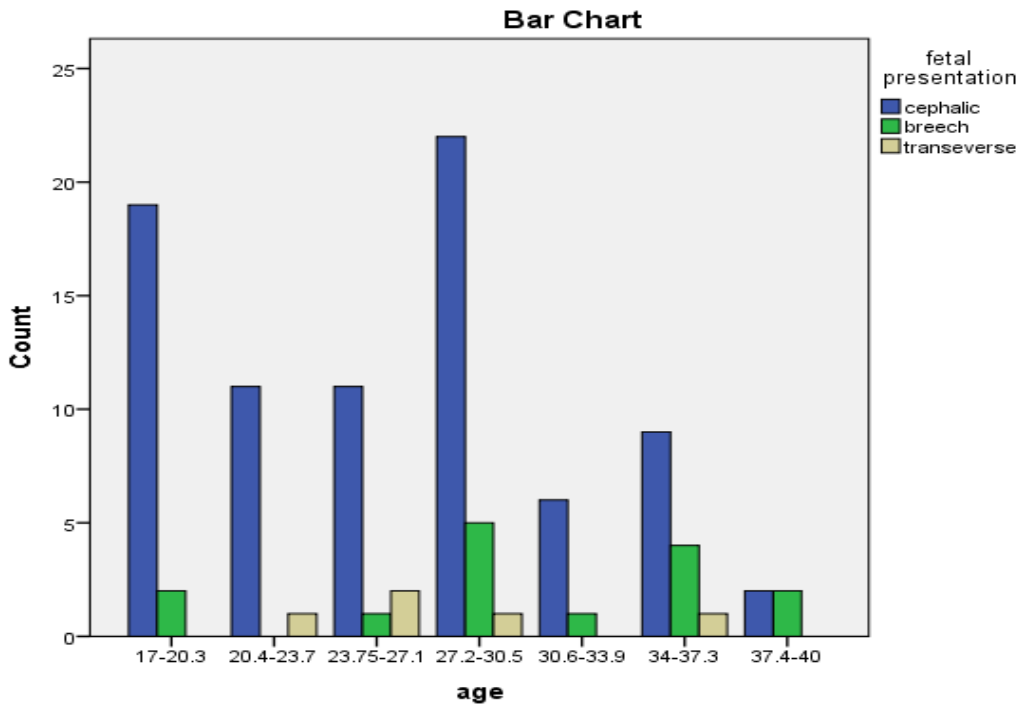

Figure 4-6 bar graph shows age group and placenta location

Table 4-7 cross-tabulation table between number of pregnancy and trimester

		trims			Total
		1.0	2.0	3.0	
No of Pregnancy	1.0	0	10	16	26
	2.0	0	7	20	27
	3.0	1	8	11	20
	4.0	0	3	7	10
	5.0	0	1	4	5
	6.0	0	3	3	6
	7.0	0	1	2	3
	8.0	0	0	1	1
	9.0	0	1	1	2
Total		1	34	65	100

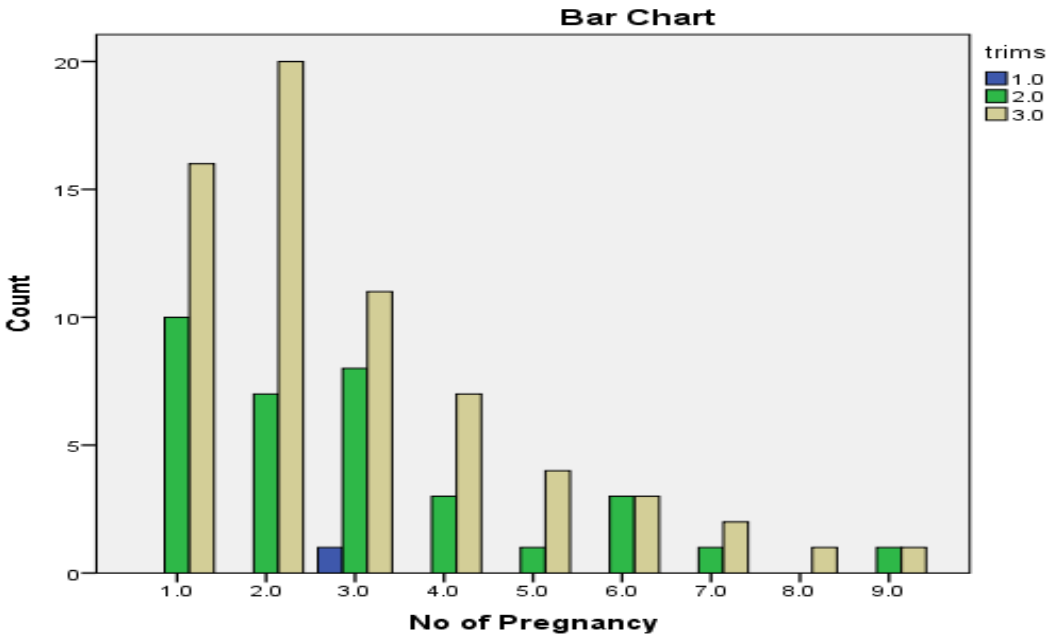

Figure 4-7 a bar graph between number of pregnancy and trimester

Table 4-8 cross-tabulation table between number of pregnancy and types of delivery

		H. of type of delivery			Total
		No vapor	NVD	C/S	
No of Pregnancy	1.0	25	0	0	25
	2.0	0	22	5	27
	3.0	0	16	4	20
	4.0	0	9	1	10
	5.0	0	5	0	5
	6.0	0	6	0	6
	7.0	0	3	0	3
	8.0	0	1	0	1
	9.0	0	2	0	2
Total		25	64	10	99

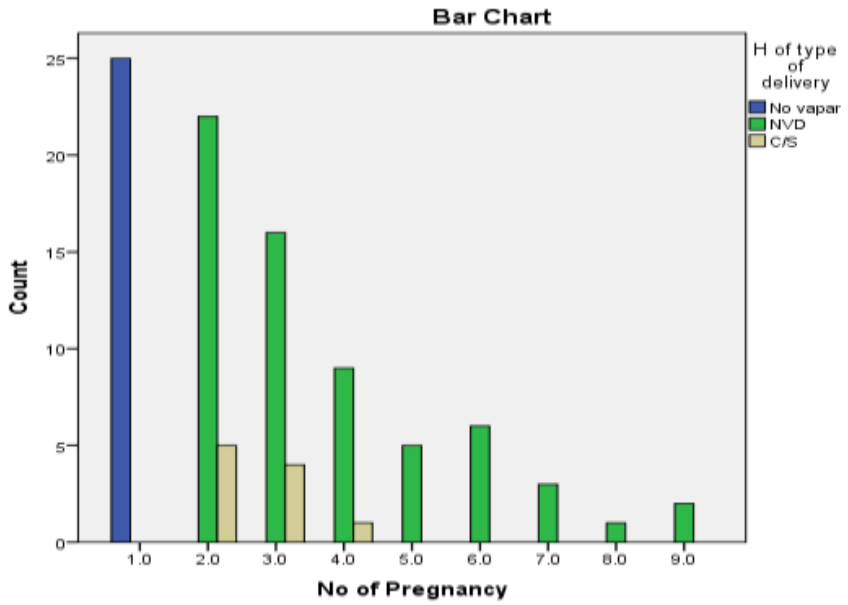

Figure 4-8 bar graph shows the relation between number of pregnancy and types of delivery

Table 4-9 cross-tabulation table between number of pregnancy and placenta location

		Placenta location				Total
		anterior	posterior	fundal	Previa	
No of Pregnancy	1.0	13	13	0	0	26
	2.0	13	14	0	0	27
	3.0	7	12	0	1	20
	4.0	5	4	0	1	10
	5.0	2	2	1	0	5
	6.0	2	3	0	1	6
	7.0	1	2	0	0	3
	8.0	0	1	0	0	1
	9.0	1	1	0	0	2
Total		44	52	1	3	100

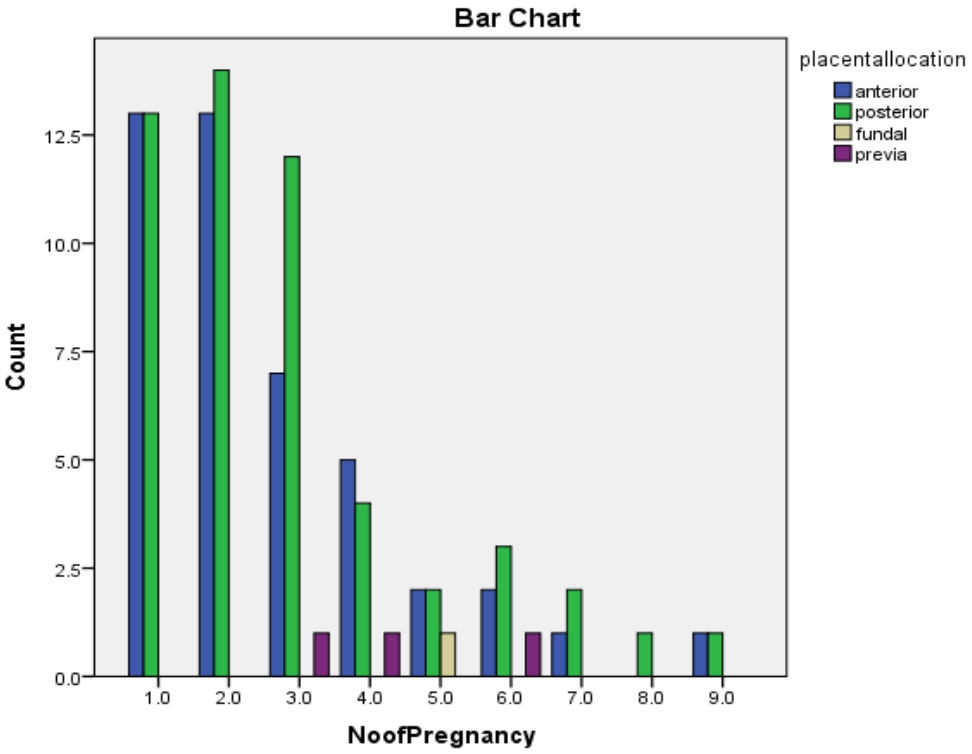

Figure 4-9 a bar graph between number of pregnancy and types of delivery

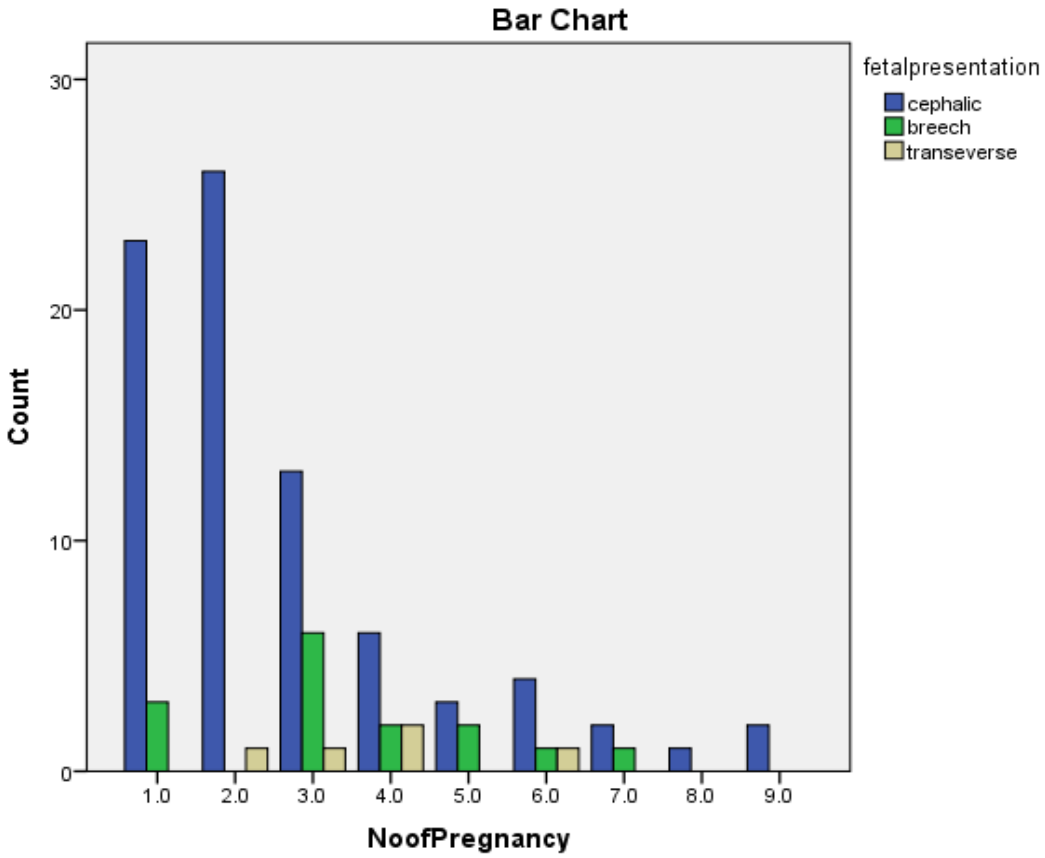

Figure 4-10 a bar graph between number of pregnancy and fetal presentation

Chapter Five
Discussion, Conclusions and Recommendations

Chapter five
Discussion, Conclusion and Recommendation

5-1 Discussion

The main objective of this study was to study placenta location in order to find them most prevalent location. The data of this study were collected from 100 pregnant ladies their average age liquor and number of pregnancy of 27±6 years, 5.5±.5 and 3 times respectively, with different trimesters (Table 4-1, 4-2 and Figure 4-1).

The result of this study showed that the liquor has a direct linear relationship with the gestational age; i.e. it increases with the increase of GA by 2.9/week (Figure 4-2).

Most of the patients were in the third trimester 65% distributed between different age groups with the peek distribution in the age group 27.2-30.5 years which is 16% as well 28% of the patient in this age group distributed between the three trimesters (Table and Figures 4-3).

The results also showed that 64% of the delivery were normal one (vaginal delivery) 22% their age group was 27.2-30.5 (Table and Figure 4-4).

Placenta mostly located either posterior 52% or anterior 42% and rarely fundal or previa most of those patient with anterior or posterior were in age group of 27.2-30.5 years 28% (Table and Figure 4-5), 80% of the fetal presentation were cephalic in the same age group and percentage (Figure and table 4-6); this result explains the 64% of the normal delivery.

Placenta location instead of number of pregnancy in case of one and two pregnancy it locate either posterior or anterior 26% and 27% respectively, which represent 53% of the sample size (Table and Figure 4-9)

5-2 Conclusion

Doppler ultrasound of the placenta is one of the method of determinations of fetoplacental locations and related abnormalities. A descriptive study aimed to determine and study of the placental location in normal Sudanese pregnant women in order to assess the common placental location related to the normal pregnancy. The data collected in Omdurman Maternity Hospital (Omdurman) from November 2015 to October 2016; one hundred pregnant women in first, second and third trimesters were scanned by ultrasound machine Toshiba-power vision-6000. Placental location was identified in a longitudinal section at the point of insertion of the umbilical cord. The variables used to establish this study was mother age, BPD, fetal Age, number of pregnancy, trimester, type of delivery, placental location, and liquor, where the result showed that mean age equal to (27.04±6.045) yrs., liquor equal to (5.527±0.4546cm). A significant correlation noted between the GA and liquor, while common placental location found to be posterior most commonly in age group of 27.2-30.5 yrs. Most fetal presentation appear to be in cephalic direction rather than the others most commonly in age group of (17-20.3yrs.). The delivery status showed that 64% of the deliveries were normal, while 94% of placenta either posterior or anterior, mostly it located posteriorly in 52% and only 1% fundal. Mostly in this study the placenta location were investigated in the third trimester their age ranged 27.2-30.5 years. US has an excellent presentation of placental location and therefore assessing the related abnormalities.

5-3 Recommendation

- Study the significant differences of blood flow and thickness of placenta in respect to the location.

- study the impact of placenta location on fetal weight

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Appendices

Appendix (A)

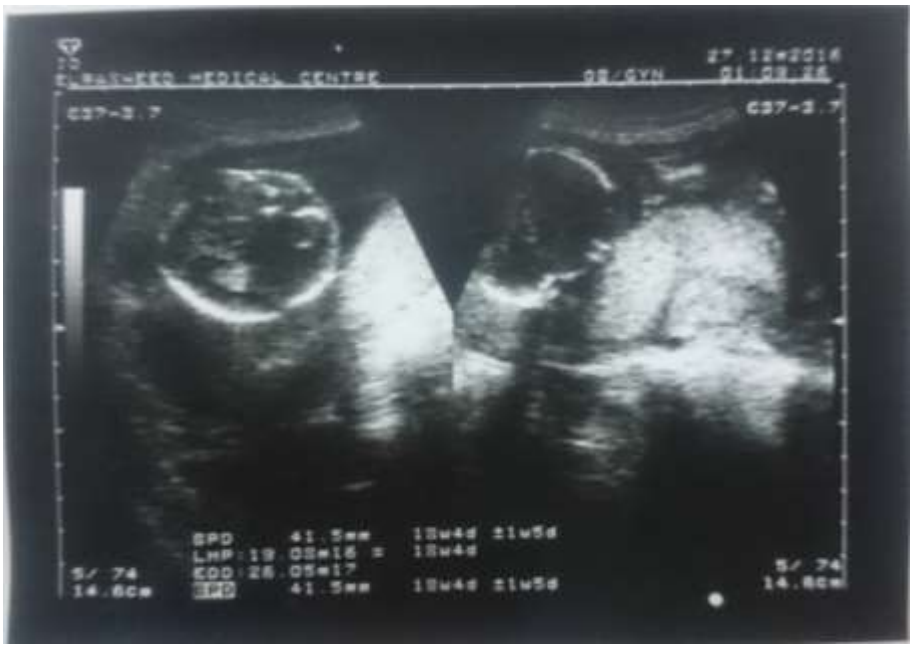

Image (1): posterior placenta location, with transverse fetal presentation.

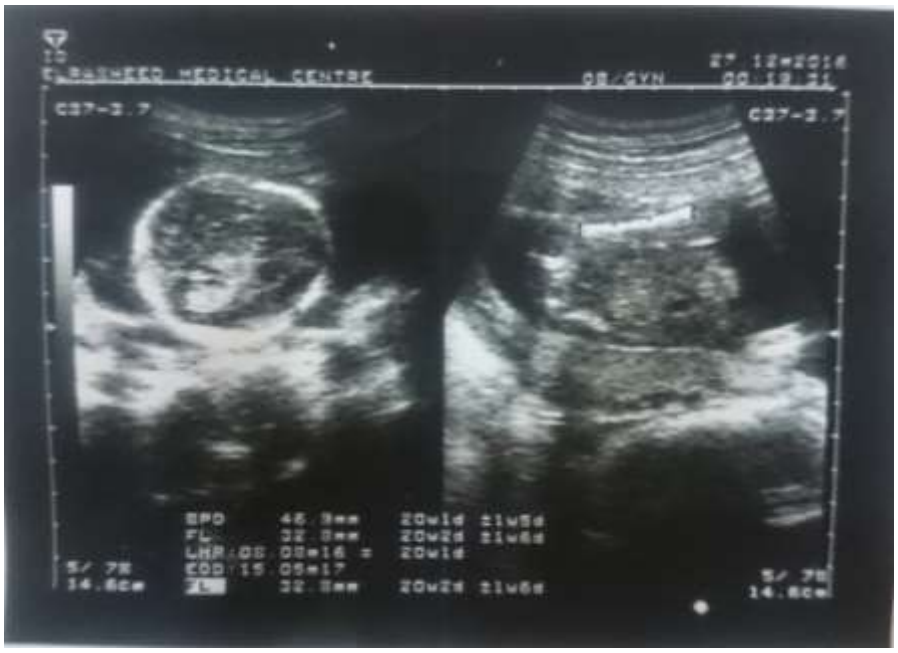

Image (2): posterior placenta location.

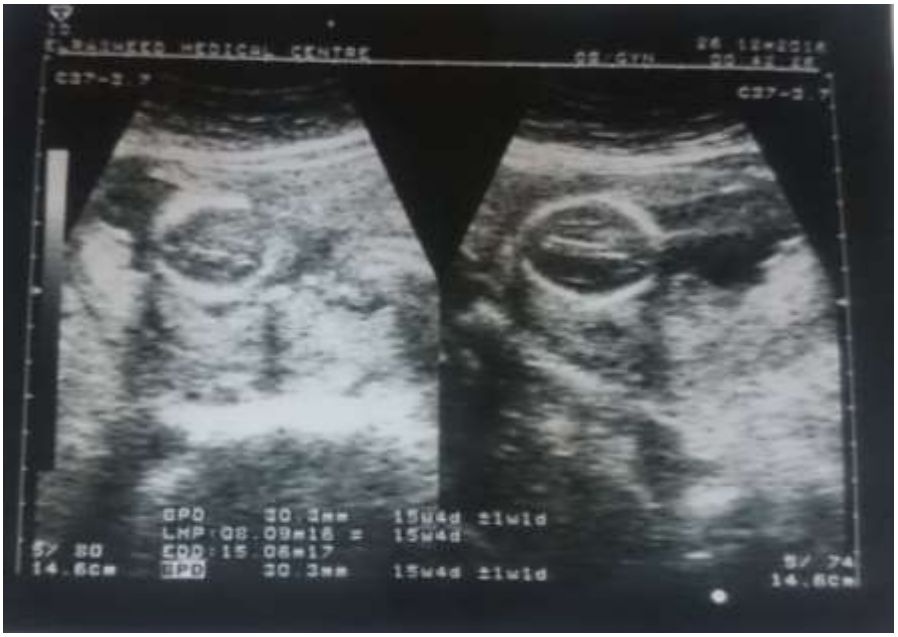

Image (3): posterior placenta location, with breech fetal presentation.

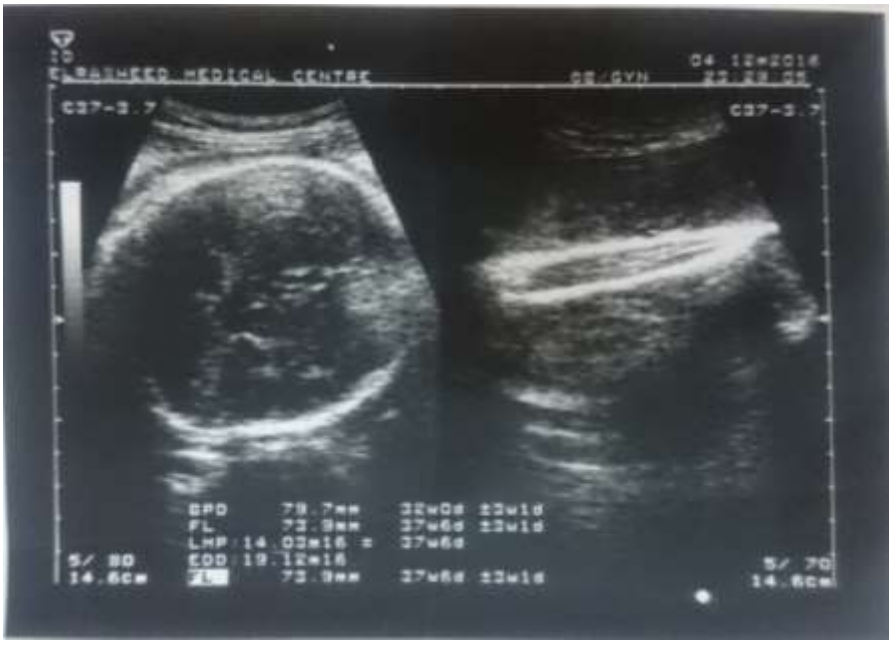

Image (4): anterior placenta location.

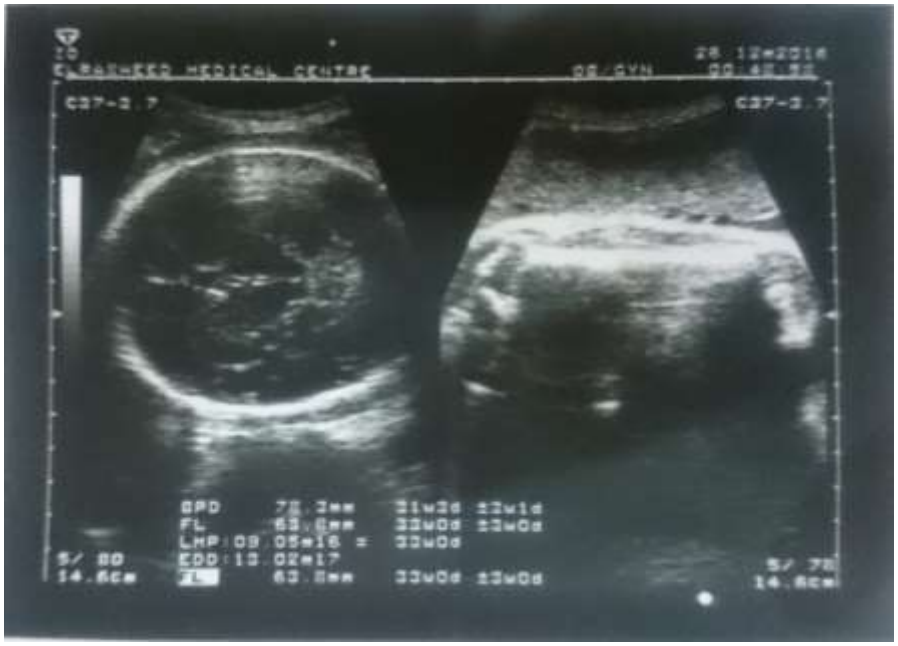

Image (5): anterior placenta location, with cephalic fetal presentation.

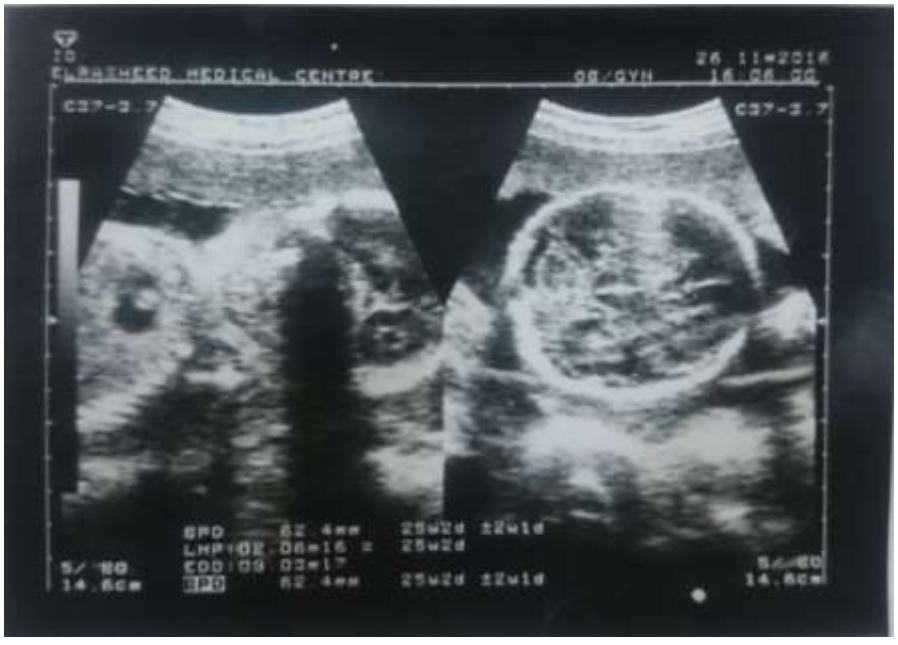

Image (6): anterior upper placenta location, with transverse fetal presentation.

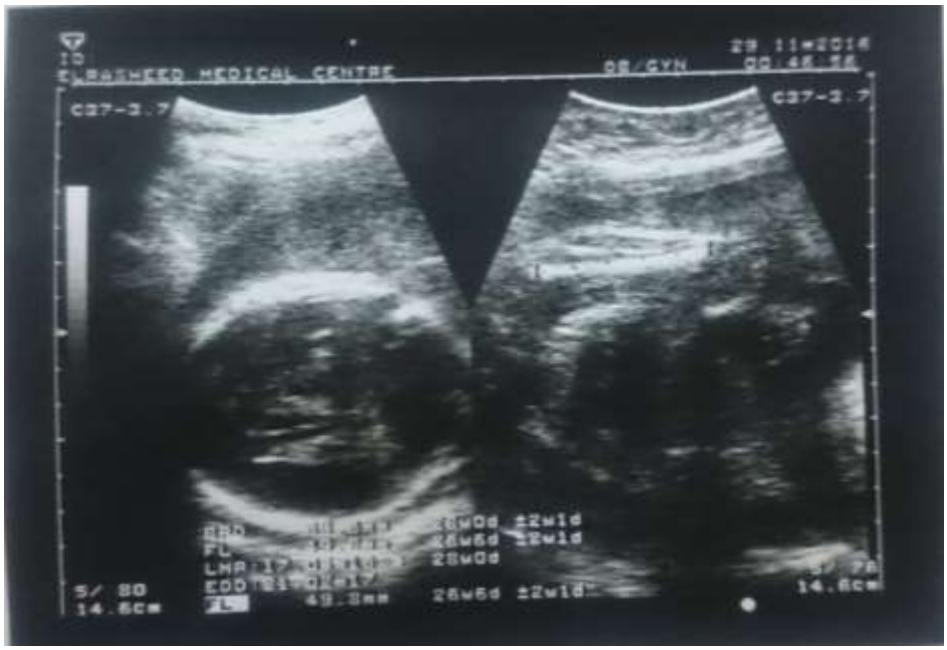

Image (7): anterior placenta location.

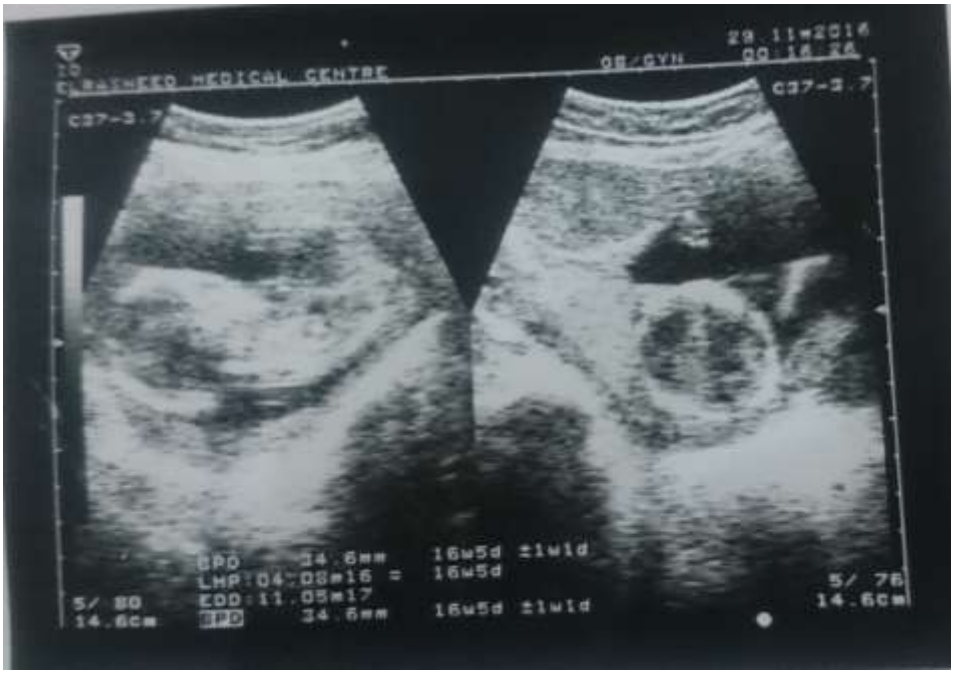

Image (8): posterior placenta location.

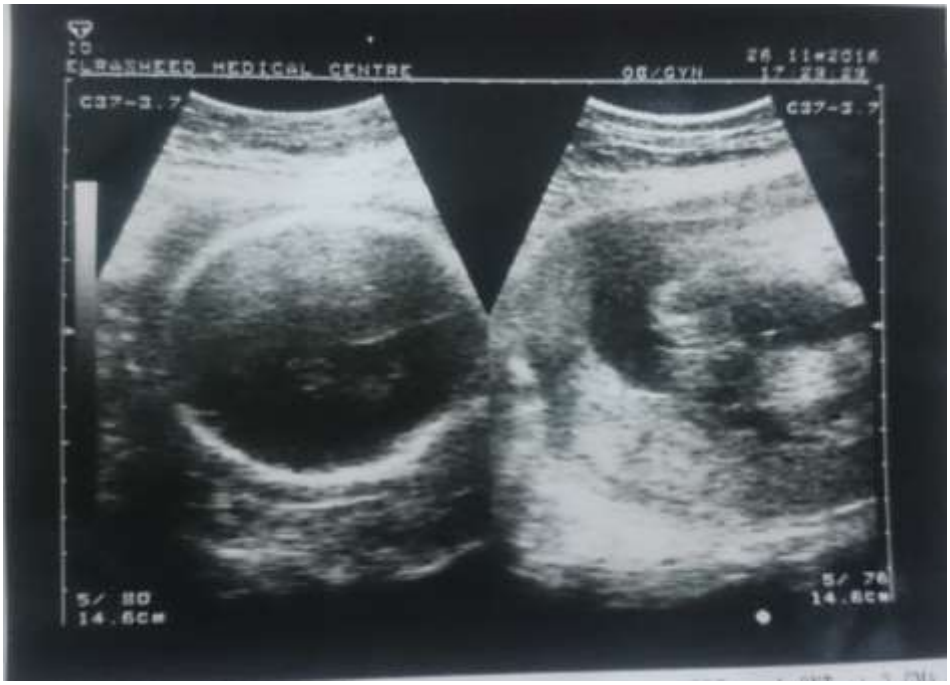

Image (9): posterior upper placenta location.

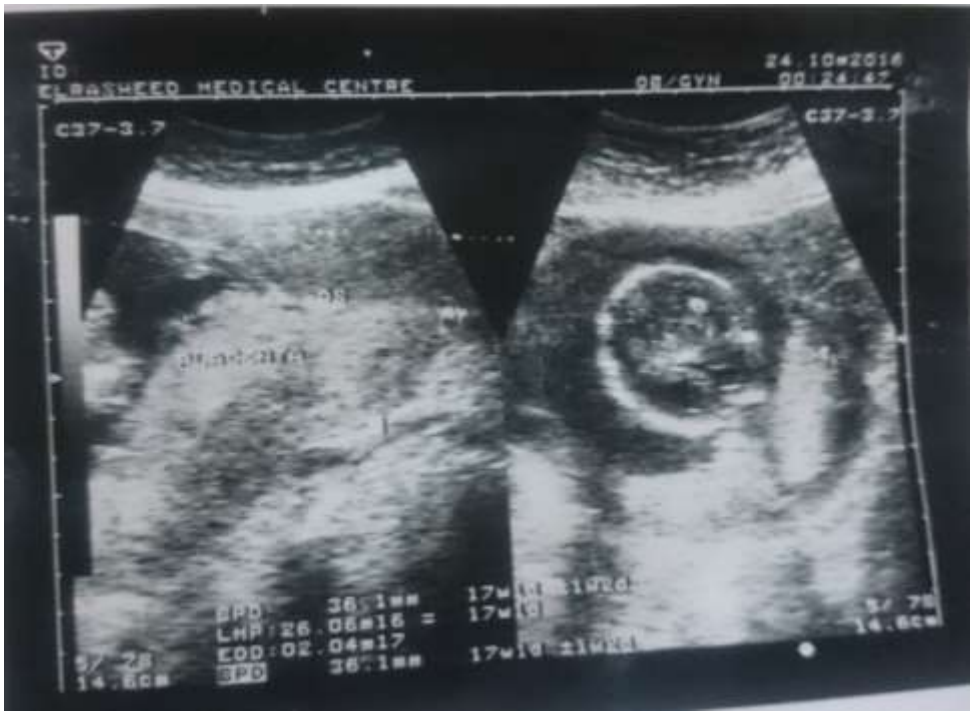

Image (10): complete placenta previa.

Appendix (B)

Study of placenta location in Sudanese pregnant ladies using ultrasound

name	Age	No. Preg	GA	Trims	H.of type of delivery	Placenta location	Fetal presentation	Liquor