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Estimation of fetal Age by Placenta Thickness in Second and Third Trimester using ultraSonography

تحديد عمر الجنين بسمك المشيمة في الفترتين الثانية والثالثة من الحمل باستخدام التصوير بالموجات فوق الصوتية

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

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الاية

يَـٰٓأَيُّهَا ٱلنَّاسُ إِن كُنتُمْ فِى رَيْبٍ مِّنَ ٱلْبَعْثِ فَإِنَّا خَلَقْنَـٰكُم مِّن تُرَابٍ ثُمَّ مِن نُّطْفَةٍ ثُمَّ مِنْ عَلَقَةٍ ثُمَّ مِن مُّضْغَةٍ مُّخَلَّقَةٍ وَغَيْرِ مُخَلَّقَةٍ لِّنُبَيِّنَ لَكُمْ وَنُقِرُّ فِى ٱلْأَرْحَامِ مَا نَشَآءُ إِلَىٰٓ أَجَلٍ مُّسَمًّى ثُمَّ نُخْرِجُكُمْ طِفْلًا ثُمَّ لِتَبْلُغُوٓا۟ أَشُدَّكُمْ وَمِنكُم مَّن يُتَوَفَّىٰ وَمِنكُم مَّن يُرَدُّ إِلَىٰٓ أَرْذَلِ ٱلْعُمُرِ لِكَيْلَا يَعْلَمَ مِنۢ بَعْدِ عِلْمٍ شَيْـًٔا وَتَرَى ٱلْأَرْضَ هَامِدَةً فَإِذَآ أَنزَلْنَا عَلَيْهَا ٱلْمَآءَ ٱهْتَزَّتْ وَرَبَتْ وَأَنۢبَتَتْ مِن كُلِّ زَوْجٍۭ بَهِيجٍ ۝

(سورة الحج- الاية 5)

Dedication

To the spring that never stops giving, to my mother who weaves my happiness

With strings from her merciful heart……..to my mother

To whom he strives to bless comfort and push me in the success way who taught me to promote life stairs wisely and patiently, ……. to my dearest father

To those love flows in my veins, and my heart always remembers them, ……… to my brothers and sisters

Acknokkwledgements

I would like to express my special thanks of gratitude to my teacher

Dr: Babiker Abd Elwahab, who gave me the golden opportunity to do this wonderfull study and his helping me in completing this theiss.

 I came to know about so many new things. I am really thankfull to them.

Secondly I would also like to thank my parents and friends who helped me a lot in finalizing this project within the limited time.

To those who taught us letters of gold and words of jewel of the utmost and sweetest sentences in the whole knowledge. Who reworded to us there knowledge simply and from their thoughts made alighthous guides us through the knowledge and success path ,……… to our honoured teachers and professors**.**

My special thank for Reyad Alassaf.

Abstract

This study is across sectional descriptive study estimated gestational age by investigating placental thickness as a parameter for in normal singletone pregnancies in Sudanese women. 53 Sudanese women with normal singletone pregnancies, who are attending in Eman and Alsadat centers. Women were studied by trans Abdominal ultrasound between December, 2016 and February, 2017.sonography was carried out using ALOKA 500 ultrasound machine with 3.5MHZ transducer. Gestational age was estimated by bi parietal diameter (BPD) and femur length (FL). The composite average recorded while placental thickness was measured at the point of insertion of the umbilical cord. Mean placenta thickness with standard deviation was calculated for each gestational age. Correlation analysis was used to determine the relationship between the placenta thickness and gestational age while regression analysis yielded mathematical relationship between the placenta thickness and gestational age.

Study found that; the maximum mean placenta thickness of 35.15 +9.22 mm was recorded at 30 weeks gestation and there was a fairly linear increasing in mean placenta thickness with gestational age.

Study concluded that; there was a significant and strong positive correlation between placenta thickness and gestational age.

Study recommended that: Placenta thickness should be used in to estimation of fetal age in second and third trimesters of pregnancy.

مستخلص البحث

هذه الدراسة وصفية مقطعية لتحديد عمر الجنين بقياس سمك المشيمة عند النساء الحوامل طبيعيا في السودان وقد اخدت 53 عينة في مركزي السادات وايمان بجبل اولياء في الفترة من ديسمبر 2016 الي فبراير 2017 وكان التصوير عن طريق البطن بجهاز الموجات فوق الصوتية الوكا 500 و بتردد 3.5 ميقاهيرتز . تم تحديد عمر الجنين اولا بواسطة طول عظمة الفخد وقطر القحف ومن ثم قياس سمك المشيمة عند نقطة انقراص الحبل السري. كما تم ايجاد متوسط سمك المشيمة والانحراف المعياري لكل الاعمار للجنين.

ومن خلال تحليل البيانات عن طريق الحسابات الاحصائية للعلاقة بين سمك المشيمة وعمر الجنين وجد ان اعلي متوسك لسمك المشيمة هو 35.19 عند الاسبوع 36 وبدلك تم ايجاد علاقة خطية موجبة قوية بين سمك المشيمة وعمر الجنين مما يتيح امكانية تحديد عمرالجنين بواسطة سمك المشيمة. كما توصي الدراسة باستخدام سمك المشيمة في تحديد عمر الجنين في الفصل الثاني والثالث من الحمل.

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List of Abbreviations

AC	Abdominal circumference
BPD	Bi parietal diameter
CRL	Crown rump length
FL	Femur length
HC	Head circumference
HCG	Human chorionic gonadotropin
LMP	Last menstrual period
MS-AFP	Maternal serum alpha fetoprotein
PT	Placenta thickness
U/S	Ultrasound

Chapter one

Introduction

1.1 ntroduction:

 The placenta is an organ that connects the developing fetus, to the uterine wall, to allow nutrient up take. In human the placenta a verge 22 cm (9inch) in length and 2-5.5 (.8-1 inch) in thickness, with the center being the thickest and the edges being the thinnest. It typically weight approximately 500 grams. The placenta attached to the uterus .and the fetus connected to the placenta by umbilical cord. The placenta develops from chorionic villi at the implantation site, at about the fifth week of gestation, and by the ninth, or tenth week. The diffuse grandular echotecture each of the placenta, is cleary appearant at sonography.(peter/2007). Accurate estimation of fetal age is important for antenatal management.The estimation of fetal age in ultrasound to known the relationship between the fetal age and weight. Several sonographically fetal parameter used to date pregnancy, include fetal crown—rump length (CRL),   bi parietal diameter (BPD), head circumference (HC), femur length (FL), and abdominal circumference (AC). Placenta thickness measured at the level of umbilical cord insertion and can be used as a new parameter, to estimate gestational age of the fetus (peter/2007).

Several studies have reported an increase placenta thickness, with gestational age and it has reported the use of placenta thickness as an indicator of gestational age of fetus.

This study aimed to estimate placenta thickness as gestational age parameter of fetus in normal single pregnancy, in Jabell Aulia city.

1.2 Problem of the study:

There is some error in estimate the fetal age by FL, BPD and LMP we need to increase parameters and take the medium to all of them which lead to reduce the error.

1.3 Objective of the study

1.3.1 General objective:

Estimation of fetal age by Placenta thickness, in second and third trimester by using ultrasonography.

1.3.2 Specific objective:

-To Estimate the possibility the placenta thickness, to determine fetal age in second and third trimester.

-To compare between Placenta thickness with FL and BPD.

1.4 Overview of the study:

   This study falls in to five chapters, capter one was introduction which include proplem of study ,objective of study and over veiw of study, while chapter two included literature review and previous studies,chapter three deals with material used in collection data and methods of data and analysis ,chapter four presented the result of the study and finally chapter five includs discusion of the result ,conclusion and recommendations.

Chapter Two

Literature Review

2-1 Anatomy of placenta:

The placenta is the primary site of nutrient and gas exchange between the mother & fetus. It is a fetomaternal organ that has two components (Romak, 2011).

2.1.1 Component of the placenta:

A fetal part that develops from chorionic sac on the fetal side, the placenta is bordered by the chorionic plate. A maternal part that is derived from the endometrium: on the maternal side, the placenta is bordered the decidual plate chorion and outer- trophoblast (syncytiotrophoplast and cytotrophoplast) Inner-somatic mesoderm (Romak, 2011).

2.1.2 Devloping of the placenta:

The early developing embryo is surround by a minion and chorion. Villi cover the entire surface of the chorion up to about 8 weeks of gestation.The villi, which are the basic structures of the placenta, initially form by 4 or 5 week gestation. The villi next to the decidua capsulars degenerate, forming the chorion laeve. The villi contiguous with decidua basalis become the chorion frondosum and later the placenta.

The fetal side of the placenta consists of the chorionic plate and chorionic villi . the maternal side of consists of the desidua basalis , which open into large cisterns, the intervillous spaces. The fetal villi are emmersed in maternal blood located in intervillous spaces. Anchornig villi develop from the chorionic plate. These attached to the desidua basalis, holding the placenta in place.

By the end of pregnancy, villi have a surface area of 12 to 14 square meters (Romak, 2011).
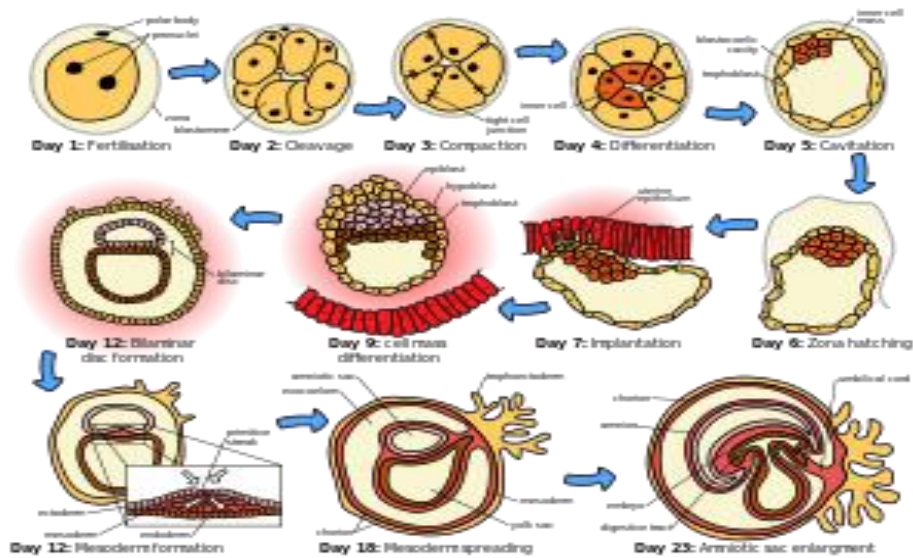
Fig (2.1) Initial stages of human embryogenesis (Moore, Persaud, 2008).

2.1.3 Normal Ultrasound appearance of Placenta

The placenta in the first and second trimesters is slightly more echogenic than the serrounding myometrium. The attachment site, or base of the placenta, should be cleary delineated from the underling myometrium. The edges of the placenta usually have small sinus, the marginal sinus of the placenta.Where intervillous blood drain into the maternal venous circulation. (Romak, 2011)**.**

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Fig (2-2) normal appearance of the placenta at 18weeks.(Rumak.et all -2011).
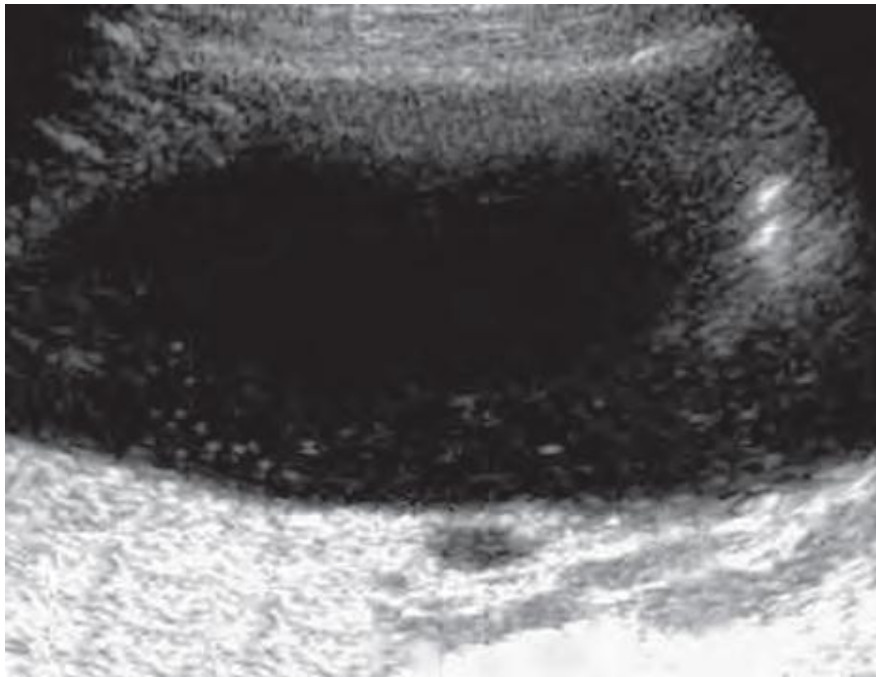
Fig (2.3) Marginal sinus of the placenta(Rumak.et all -2011)

2.1.4 Placenta size:

Placental length is approximately six times its maximal width at 18 to 20 weeks gestation. The mean thickness of the placenta in the millimeters in the first half of pregnancy closely approximates the gestational age in weeks.

If the placenta thickness is greater than 4cm (40mm) befor24weeks, an abnormality should be suspected include ischemic thrombotic damage, interplacental hemorrhage, chorioangioma, and fetal hydropes (Romak, 2011).
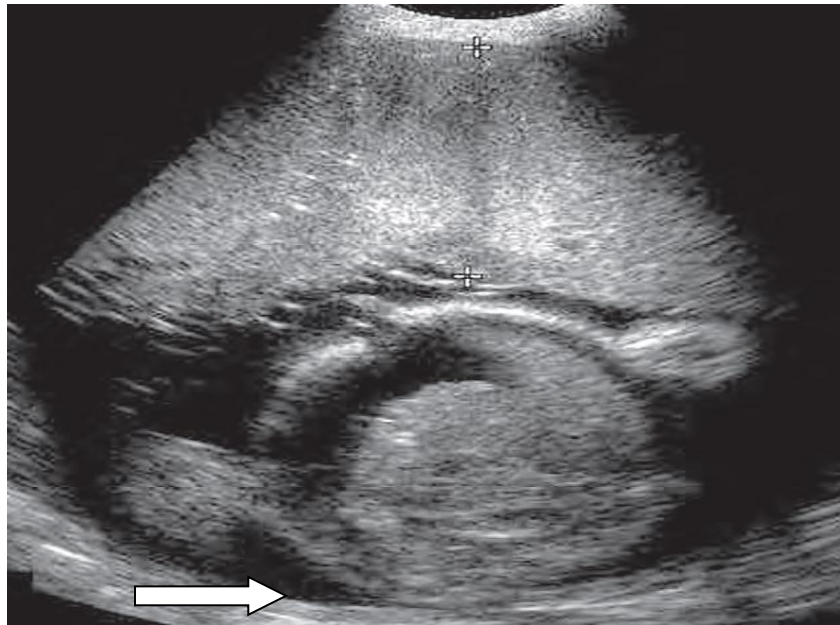
Fig (2-4) thick placenta in fetal hydropes, Note the ascites (Rumak.et all -2011).

◄

Given the variable shape of the placenta, calculating a volume from two dimensional (2D) imaging can be complicated. Multi planar volume calculation involves sequential section of the placenta at intervals such as 1.0 mm. most current studies appraising the use of three dimensional (3D sonography have used the vocal (virtual organ computer aided Analysis) Method in which the 3-D volume in question is rotated and the area of the interest traced at its margin, After which volume is calculated (Rumak.et all -2011)
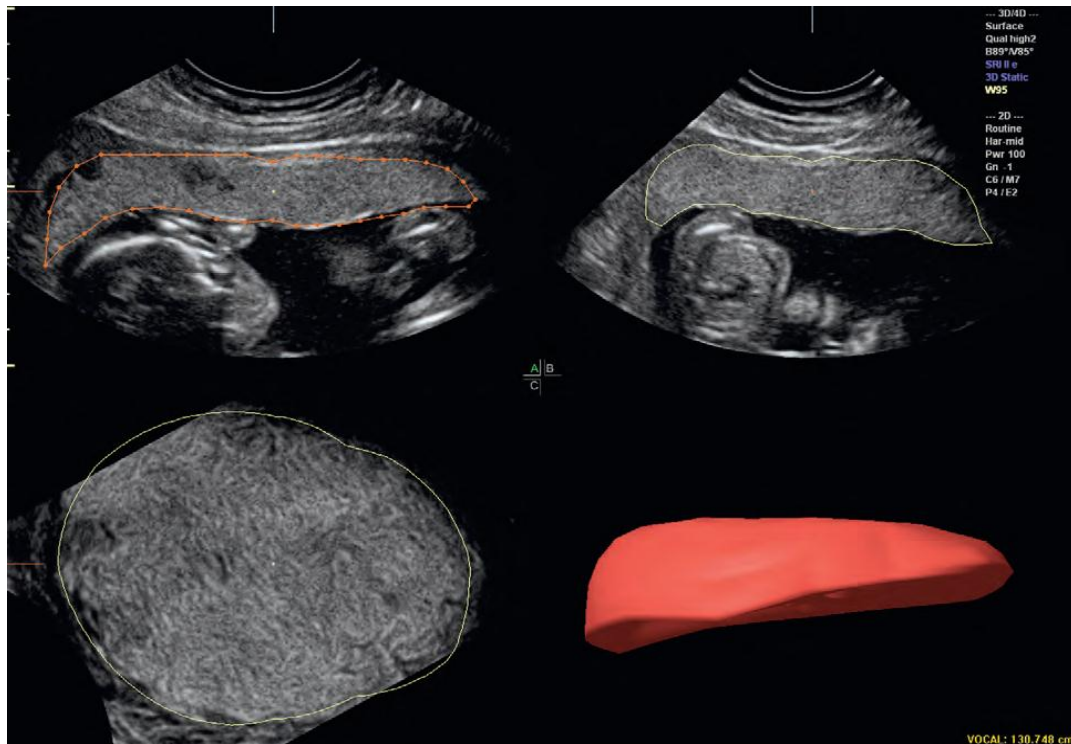
Fig (2-5) three dimensional assessment of placenta volume in second trimester. Rumak (2011).

2.1.5 Placenta circulation:

The placenta is a unique vascular organ that receives blood supply from the both the maternal and fetal systems.

The two systems are, the maternal placenta (uretroplacenta) and blood circulation

The maternal circulation starts with maternal flow into the intervillous space decidual spiral arteries. Exchange of oxygen and nutrients take place as the maternal blood flows around terminal villi in the intervillous space. The maternal arterial blood bushes the deoxegenated blood into the endometrial and the uterine veins back to the maternal circulation.**(Moore, Persaud, 2008).**

2.1.6 Fetal placental circulation

The fetal circulation allows the umbilical arteries to carry deoxygenated and nutrient depleted fetal blood from the fetus to the villous fetal core vessels. After the exchange of oxygen and nutrients, the umbilical vein carries fresh oxygenated and nutrient-rich blood circulating back to the fetal systemic circulation. **(** Moore, Persaud, 2008).

2.1.7 Placenta localization

With the exception of women undergoing chorion villus sampling accurate assessment of placental position is not necessory when examining the first trimester uterus. Because of positional changes of the body of the uterus in the early pregnancy, the placental site can be change relative to the internal os. Where there for do not recommend reporting placenta position in normal circumstances until the routine 20-22weeks scan.

Placenta previa is a term related to is related to placental position to the lower segment. Before 28 weeks the uterus does not have a true lower segment. If the

placenta over lapse or encrouches on the internal os before 28 weeks it is better to define it as low lying and retain the term (placenta previa) until 28 weeks gestation. (Trish Chudleigh, 2004)**.**

2.3 Normal variations in the placental morphology:

2.3.1 Succenturate lobe:

This defines as one or more accessory lobes of the placenta that attach to the bulk of the placenta by blood vessels. Making the diagnosis is important because is possible to have afundal placenta to gather with Succenturate lobe that is centrally placed over internal os. These women have same problems as those with placenta previa . (Trish Chudleigh, 2004)

2.3.2 Placenta lakes:

This lie within the bulk of the placenta and are filled with slowly moving blood. They probably represent the intervilous space in an area lacking fetal villi. Also there is relationship between the presenceof placenta lakes utroplacenal inssufficiency**.** (Trish Chudleigh, 2004)

Fig (2-6) placenta lakes in an anterior placenta, Note the lake lie within the bulk of the placenta.(Trish Chudleigh, 2004)

2.3.3 Placental cysts:

These are found immediately beneath the chorionic plate, the smaller ones are blood vessels viewed in cross-section. The larger one is distinct entities caused by the deposition of fibrin in the intervillous space (Trish Chudleigh, 2004)**.**
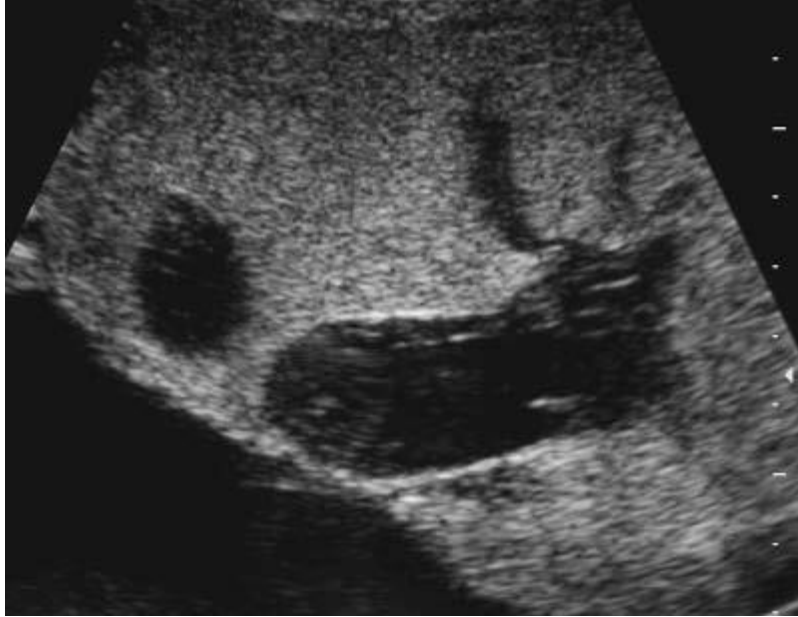
Fig (2-7) Placental cyst, Note the position of the mass, immediately

Beneath the chorionic plate(Trish Chudleigh, 2004)

2.3.4 Highly echogenic areas:

echogenic area in the placenta in the late pregnancy represent normal changes that occur with increasing gestation (Trish Chudleigh, 2004)**.**

2.4 Placenta grading:

His is the classification of the normal changes that occur in the placenta during the course of the pregnancy, it is often known as grannum grading. It is used to be thought that agrannum grade III placenta was associated with mature fetal lung and placental dysfunction. (Trish Chudleigh 2004)

Grade 0: Placenta body is homogenous the amino chorionic plate is even throughout late 1st trimester>

Grade I: placenta body shows a few echogenic densities ranging from 2-4mm in diameter. Chorionic plate shows small identation.

Grade II: Chorionic plate shows marked identation creating comma like densities which extend to the placenta substance but do not reach the basal plate. The echogenic densities within the placenta also increase in size and number. The basal layer comes punctuated with linear echoes.

Grade III: Complete identation of the chorionic plate through to the basilar plate creating cotyledons (portion of the placenta separated by the identation) 39wks & post date. (Trish Chudleigh, 2004)

Fig (2-8) Grannum grade III anteror placenta at 38 weeks gestation

(Trish Chudleigh ,2004)

2.5 Function of the placenta:

2.5.1 Nutrition:

The perfusion of the intervillous spaces of the placenta with maternal blood allows the transfer of nutrient and oxygen from the mother to the fetus .and the transfer of the waste products and carbon dioxide, back from the fetus to the maternal blood supply (pough et al. 1992).

Nutrient transfer to the fetus via both active and passive transport

Active transport systems allow significantly different plasma concentration of various large molecules to be maintained on the maternal and fetal side of the placenta barrier. Adverse pregnancy situation, such as those involving maternal diabetes or obesity, can increase or decrease level of nutrient transporters in the placenta resulting in over growth or restricted growth of the fetus. (pough et al. 1992).

2.5.2 Excretion:

Waste products excreted from the fetus as urea, uric acid and cretinine are transferred to the maternal blood by diffusion across the placenta (pough et al. 1992).

2.5.3 Immunity:

IgG anti bodies can pass through human placenta, they by providing protection to the fetus in uterus. This transfer of antibodies begins as early as the 20th wks of gestational age, and certainly by the 24th week. This passive immunity linger for several months after birth, thus providing the new born with a carbon copy of the mothers long –term humeral immunity to see the infant through crucial first month of extra uterine life (pough et al. 1992).

IgM, however, cannot across the placenta, which is why some infections acquired during pregnancy can be hazardous of the fetus.

The placental functions as, a selective maternal- fetal barrier against transmission of microbes.

However, insufficiency in this function may still cause mother –to- child transmission of infection diseases.

2.5.4 Endocrine function:

The first hormone released by the placenta is called human chorionic gonadotropin. This is responsible for stopping the process at the end of menses when the corpus luteum ceases activity and atrophies. If hcg did not interrupt this process, it would lead to spontaneous abortion of the fetus.

The corpus luteium also releases progesterone and estrogen, and HCG stimulates it to increase the amount that it releases. HCG is also what is the indicator of pregnancy and the hormone that pregnancy tests look for. Thistestes will work when menses has not occurred or after implantation has happened on days seven to ten.

HCG assists the male fetus by stimulating the testes to produce testosterone, which hormone needed to allow sex organs of the male to grow.

Progesterone helps the embryo by assisting passage through fallopian tubes. It is also affect the uterus by stimulating an increase in secretions necessary for fetal nutrition. Progesterone like HCG is necessary to prevent spontaneous abortion because it prevents contraction of the uterus, and is necessary for implantation.

Estrogen is crucial hormone in the process of proliferation. This involves the enlargement of the breasts and uterus, allowing for growth of the fetus and

production of milk. Estrogen is also responsible for increased blood supply toward end of the pregnancy through vasodilation . The levels of estrogen during pregnancy can increase so that they thirty times what a non pergnant woman mid cycles estrogen level would be.

Human placenta lactogene is a hormone used in pregnancy to develop fetal metabolism and general growth and development. Human placental lactogen works with growth hormone to stimulate insulin like growth factor. Production and regulating inter mediary metabolism.

Placenta and fetus may be regard as a foreign allograft inside the mother, and thus must evade from attack by the mothers immune system. (pough et al. 1992).

2.5.5 Other functions:

The Placenta also provide a reservoir of blood to the fetus, delivering blood to it in case of hypotension and vice versa. (pough et al. 1992).

2.6 Umbilical cord:

2.6.1 Size and appearance:

Umbilical cord length varies, and a normal length has been established. However extremes of cord length are associated with abnormal outcome. Short umbilical cord is associated with condition that impaired fetal movement early in gestation, such as akinesia syndrome, aneuploidy, and extreme IUGR.

Excessive cord length is associated with asphyxia or death resulting from a variety sof situation that compromise cord flow, including excessive colling, true knots, multiple not of nuchal cord, and cord prolapsed (Romak, 2011).

The potential importance of the diameter of the umbilical cord is unclear. In the 1st trimester, fetal size correlates with cord diameter, and small diameter may be marker for pregnancy loss. Also, data from multiple centers suggest that diameter may be a marker for chromosomal abnormalities when larger or smaller than expected. In the second and third trimester, the largest contributor to size of the umbilical cord is wharoton's jelly. Anomogram has been develop for the area of wharton's jelly that correlate with fetal biometry up to 32weeks gestation. In the 2nd trimester a larger than expected umbilical cord is associated with aneuploidy. IUGR has been associated with thin cord, and diabetes, fetal macrosomia. Placental abruption and rhesus iso immunization have been associated with thicker cord (Romak, 2011).

Information on the umbilical and its manner of twisting come the pathology literature. It twisting over in 83%, Rt twisting in 12 %, and abscent twist in 5% of umbilical cord in live born singletones.

For the umbilical cord that has a twist, ascertainment of the degree of the twist has been reported antenatally.

The umbilical cord index is calculated by dividing the number of the helices by the cord length in centimeters. The main umbilical cord index .44$\pm$ .11 antenatally and .28$\pm$.08 after delivery(Romak, 2011).

A bscent umbilical cord twists are associated with single umbilical artery, multiple gestation, fetal demise, preterm delivery, aneuploidy and both marginal and velamintous umbilical cord insertions. lower degree of coiling are associated with lesser degree of fetal growth.

True knots of the umbilical cord occure in 1% to 2% of pregnancies. Also some arenormal varients, these knot may also be associated with increase fetal mortality. Sonographic features such as the hanging ʺnose signʺ have been proposed to make this diagnosis antenatally, with 2-D as well as 3-D and 4-D sonography.

Cysts of the umbilical cord can be seen throughout pregnancy, occurring most frequently on the portion closest to the fetus. Trismies 13 and 18 are the most common chromosoml abnormalities associated with umbilical cord cysts and genotounrinary and gastrointestinal anomalies are the most common structural defect.

Vascular anomalies of the umbilical cord are associated with adverse fetal outcome.

Umbilical artery aneurysms are associated with vascular abnormalities, trisomy 18, and fetal demise.

Umbilical cord tumors are exceedingly rare. The most common is the umbilical cord hemangioma, which appear as a hetrogenous mass surrounded by multiple peripheral cyst areas. Cord hematomass are associated with an increase risk of fetal demise.

Nuchal cord (cord around neck of the fetus) is often seen in the 2nd and 3rd trimester. Multiple tight loops of nuchal cord indenting the skin late in the 3rd trimester should prompt anon stress test.

The normal umbilical cord has three vessels one vein carries oxygenated blood to the fetus and two arteries carries deoxegenated blood from the fetus. In 1% to 2% of pregnancies, there is only single umbilical artery. The diagnosis is made either by examining a free loop of cord in the aminiotic fluid or by assessing the umbilical artery around the fetal bladder. Although associated with aneuploidy as well as renal and cardiac abnormalities, in isolation a single artery has no functional importance (Romak, 2011).
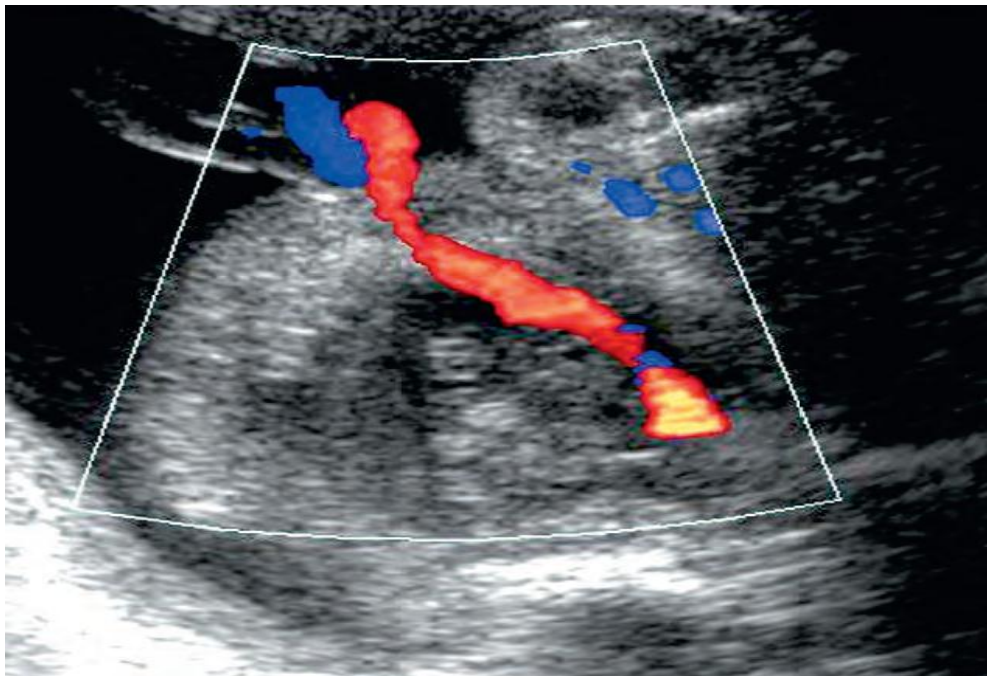
Fig (2-9) Color Doppler ultrasound adjacent to fetal bladder shows a single
. Umbilical artery. (Romak ,2011).

2.6.2 Insertion into the placenta:

The normal umbilical cord insert into the centeral portion of the placenta. Identifying the placental umbilical cord insertion is important to recognize abnormalties of the umbilical cord vessels, as with gray scale imaging and color or power doppler sonography (Romak, 2011).
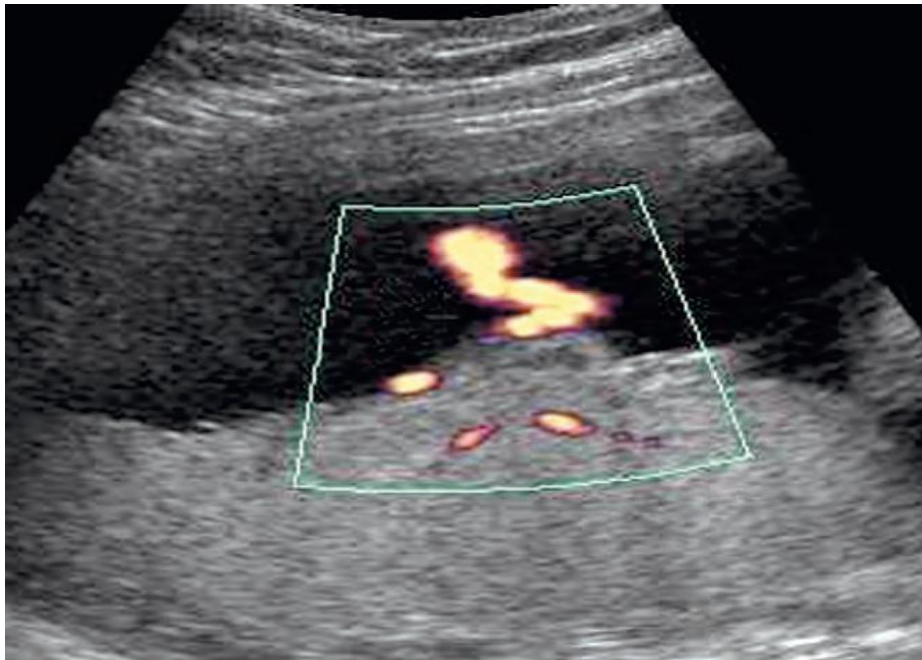
Fig (2-10) Power Doppler sonogram shows central cord insertion (arrow) in a posterior placenta (Romak, 2011)

2.6.3 Velamentous and marginal cord insertions:

Velamentous and marginal cord insertions refer to the situation where the umbilical cord insertion in to the membrane and not and the placenta disc. Amarginal cord insertion, also known as battle door placenta occure, where the umbilical inserts into the very margin of the placenta.

Velamentous umbilical cord insertion is sonographically identified throughout the 2nd and 3rd trimesters of pregnancy with great real ability.

Velamentous umbilical cord insertion using both gray scale and color doppler songraphically. Velamentous umbilical cord insertion has been identified as early as 10 weeks gestation and can be routinely identify on the 11-14 weeks first trimester scan. Velamentous umbilical cord insertion are associated with IUGR, preterm delivery, congenital anomalies , low apgarscores, neonatal death, and retain placenta after delivery. Marginal umbilical cord is not associated with IUGR and preterm delivery. But were a ssociated with vasa previa. (Romak, 2011)

Fig (2-11) Placenta after delivery shows umbilical cord (Romak, 2011)

2.7 Ultrasound for measuring placenta thickness:

The represent study was aprospective cross sectional study which was done on 53 antenatal people who were referred USG after ruling out maternal disease.

A transabdominal scanner (3.5 MHZ transducer) was used to determine the fetal age.

The geatational age was determine by measuring the biparietal diameter and femur length. The placenta thickness was measured at the level of the umbilical cord insertion the maximum thickness was noted in the cross section. Each placenta was measured to at 1 mm precision, at its greatest thickness, which was perpendicular to the uterine wall. The uterine myometrium and the retroplacental veins were excluded. The subjects were in the supine position . The placenta can be fundal, anterior, posterior or lateral, in which case it will be visualized on
both the anterior and posterior walls of the uterus. the patient scan first in longitudinal above symphysis pubis then rotae the prebe ate 90 angle after that copare the placenta measured with others parameters.

2.8 Previous studies:

Mr. christopher chukwuemeka et al. 2008, estimated gestational age by investigating placental thickness as a parameter for in normal singletone pregnancies in Nigerian women. 730 Nigerian women with normal singletone pregnancies who are attending antenatal clinic at federal medical centre, makurdy, Nigeria were studied by trans abdominal ultrasound between February. 2007 and January, 2008.sonography was carried out using sonoscape SSI 600b ultrasound machine with 3.5MHZ transducer. Gestational age was estimated by crown-rump length (CRL), bi parietal diameter (BPD), femur length (FL), and abdominal circumference (AC). The composite average recorded while placental thickness was measured at the point of insertion of the umbilical cord. Mean placenta thickness with standard deviation was calculated for each gestational age. Correlation analysis was used to determine the relationship between the placenta thickness and gestational age while regretion analysis yeilded mathematical relationship between the placenta thickness and gestational age. The maximum mean placenta thickness of 45.1 ± 6.4mm was recorded at 39 weeks gestation. There was a fairly linear increase in mean placenta thickness with gestational age. There was significant and strong positive correlation between placenta thickness and gestational age. Placental thickness appears apromising as an accurate indicator of gestational in the singletone pregnancies in Nigerian women (African Journal of Biotechnology, 2009).

M. mehndirata et al., 2002, evaluated placenta thickness, which measured at the insertion of the umbilical cord, to be as a parameter for estimation gestational age of the fetus. Material and method the study was conducted on 600 normal antenatal

Women of the gestational age (10 weeks of gestation) attending antenatal clinic at the department of obestitrics and gynecology, S.M.S. medical college, Japur

(rajasthan) from august 2001to February 2002. USG was done by using toshiba canasee II machine with wit a 3.75 MHZ sector probe. After estimation the fetus age by CRL, BPD, HC and FL. The placenta thickness with standard deviation was calculated for all gestational ages.

Result: It was observed that the placenta thickness gradually increase from 15mm at 11 weeks of gestation to 3.75mm at 39weeks. From the 22 weeks to 35th week of gestation the placenta thickness coincide almost exactly with the gestational age in weeks.

Conclusion: To conclude, the measurement of the placenta thickness an important parameter for estimation of fetal age along with other parameters especially in the Jlate mid trimester and early third trimester, where the exact duration of pregnancy is known.

Anna J. et al. 2001, performed study to determine the normal sonographically measured   placental thickness in millimeters at 2nd trimester scan (18 weeks to 22 weeks 6days) and determine whether the measured should be adjusted for gestational age and placental site. They conducted a cross-sectional observational pilot study involving 114 and secutive patients with single tone pregnancies presenting for routine second trimester sonography between 18weeks and 22weeks 6 days. And the result is adjusted over all mean placental thickness was 24.6 SD (SD, 7.29) mm. the placental thickness was normally distributed. On multivariable analysis, the predicted mean thickness was 6.6mm(95% confidence interval, 4.4 to 8.8 mm, p< .001) less in anterior compared to posterior or fundal placental and increase by 1.6 mm (95% confidence interval , -0.5 to 1.7mm mm, p= .27) for each week increase in gestation after 18 weeks. They conclusions the placenta position and possibly gestational age need to be considered when determining placental

thickness. Anterior Placenta are approximately 7mm thinner than posterior or fundal placentas. Anterior placentas of greater than 33mm and posterior placenta of greater than 40mm should be considered abnormally thick. (J. Clin. Ultrasound, 2004).

Chapter three

Material and methods

Material and Methods

3.1 Design of the study:

This study is across sectional descriptive study was collected from pregnant women in routine ultrasound examination.

3.2 Material and methods

The study concerns the estimation of fetal age, by LMP, BPD, FL, and relation between them and placenta thickness.

3.2.1 Material:

Diagnostic ultrasound machine.ALOKA , model SSD-500, SN MO7930 , ALOKA CO. LTD

3.2.2Duration of study:

The data was collecting during 2016---2017.

3.2.3 Area of study:

Alsadat center and Iman center (jabell aulia city)

3.2.4 Sample:

53n women had pregnancy in 2nd or 3rd trimester with different gestational age.

Any pregnant with the 1st trimester, had history of diabetes mellitus or hypertensive, had history of intrauterine or adnexial mass, intrauterine growth retardation, fetal anomaly and multiple pregnancy was excluded from this study.

3.3 Methodology:

3.3.1 Method of scanning:

The represent study was aprospective cross sectional study which was done on 53 antenatal people who were referred USG after ruling out maternal disease.

A transabdominal scanner (3.5 MHZ transducer) was used to determine the fetal age.

The geatational age was determine by measuring the biparietal diameter and femur length. The placenta thickness was measured at the level of the umbilical cord insertion. The subjects were in the supine position   (Trish Chudleigh, 2004) **3.3.2 Data analysis:**

The data of this study was analyzed by using Microsoft excel and SPSS program.

3.3.3 Ethical consideration:

The ethical approval was granted from the hospital and the radiology department; which include commitment of no disclose of any information concerning the patient identification.

Chapter four

Results

4.1 Results

Table (4.1) frequencyd age groups of the mothers in years

Age groups	Frequency	Percent
18-27	34	64.2
28-37	18	34.0
38-47	1	1.9
Total	53	100.0
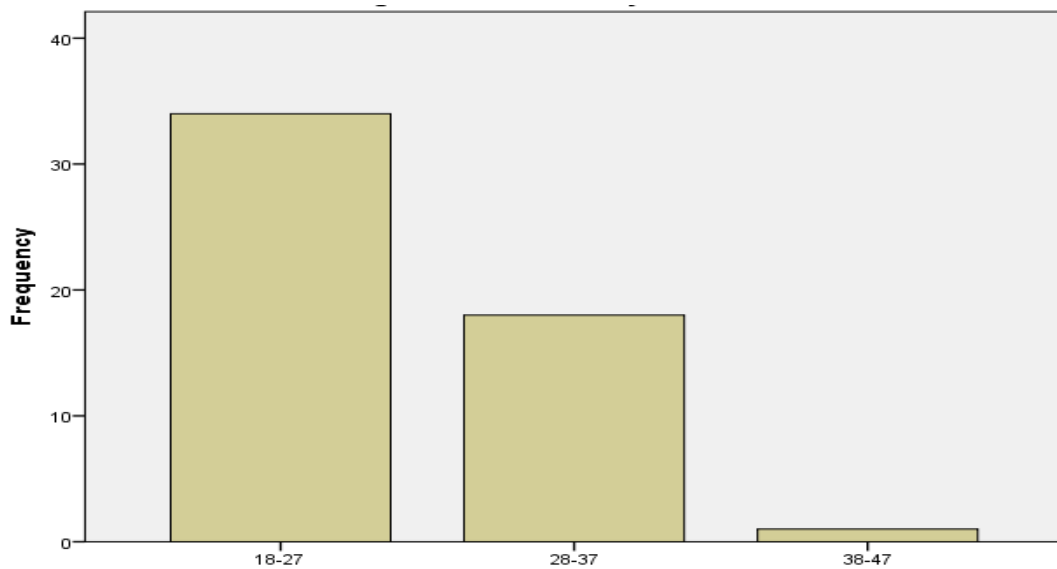
Fig (4.1) Frequency age groups of the mothers in years

Table (4.2)frequency length of femur of the fetus

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	20-24.5	5	9.4	9.4	9.4
	24.6-29.1	12	22.6	22.6	32.1
	29.2-33.7	20	37.7	37.7	69.8
	33.8-38.3	16	30.2	30.2	100.0
	Total	53	100.0	100.0	
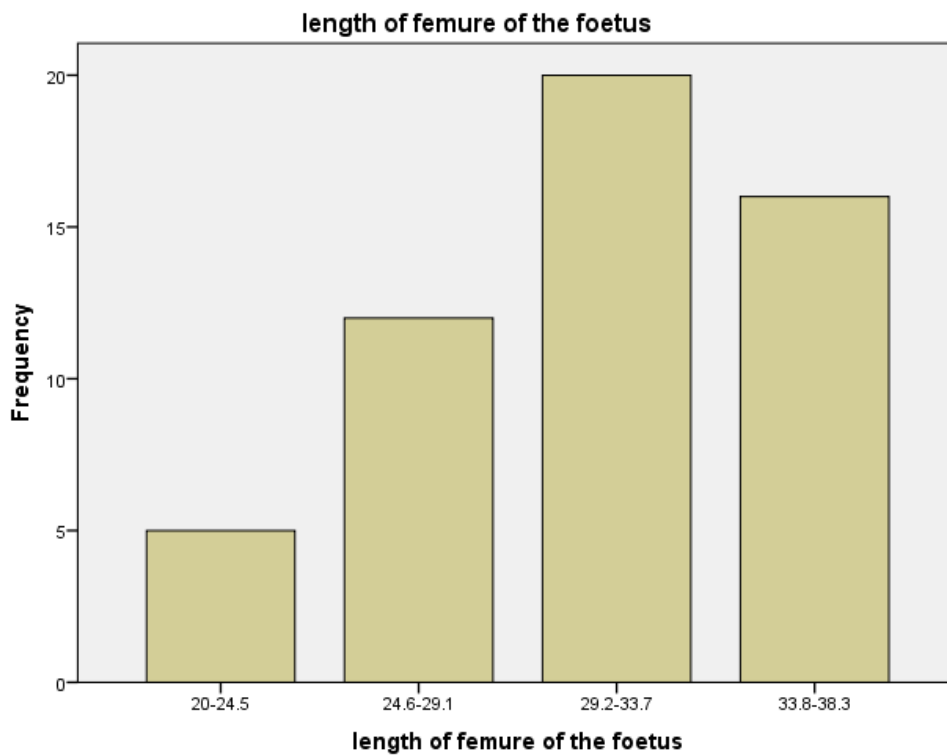
Fig (4.2) Frequency length of femur of the fetus

Tale (4.3) Frequency of Bi parietal diameter:

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-23.9	5	9.4	9.4	9.4
	24-29.9	16	30.2	30.2	39.6
	30-35.9	29	54.7	54.7	94.3
	36-41.9	3	5.7	5.7	100.0
	Total	53	100.0	100.0	

Fig (4.3) Frequency Biparietal diameter

Table (4.4)   placental thickness frequency and percentage.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	20-29	14	26.4	26.4	26.4
	30-39	30	56.6	56.6	83.0
	40-49	7	13.2	13.2	96.2
	50-59	2	3.8	3.8	100.0
	Total	53	100.0	100.0	

Fig (4.4) Placental thickness frequency

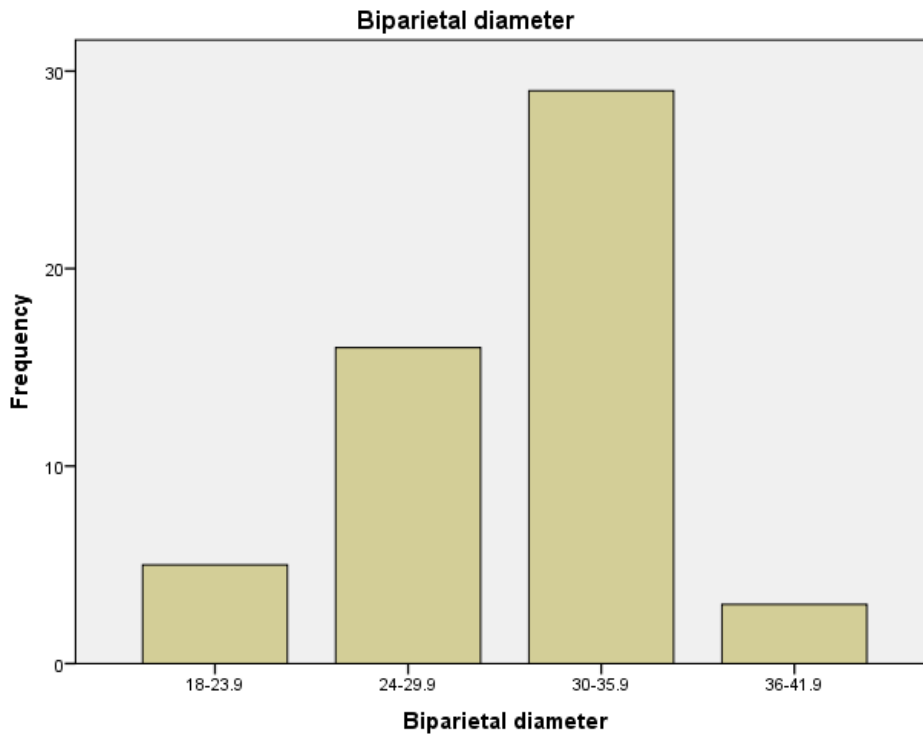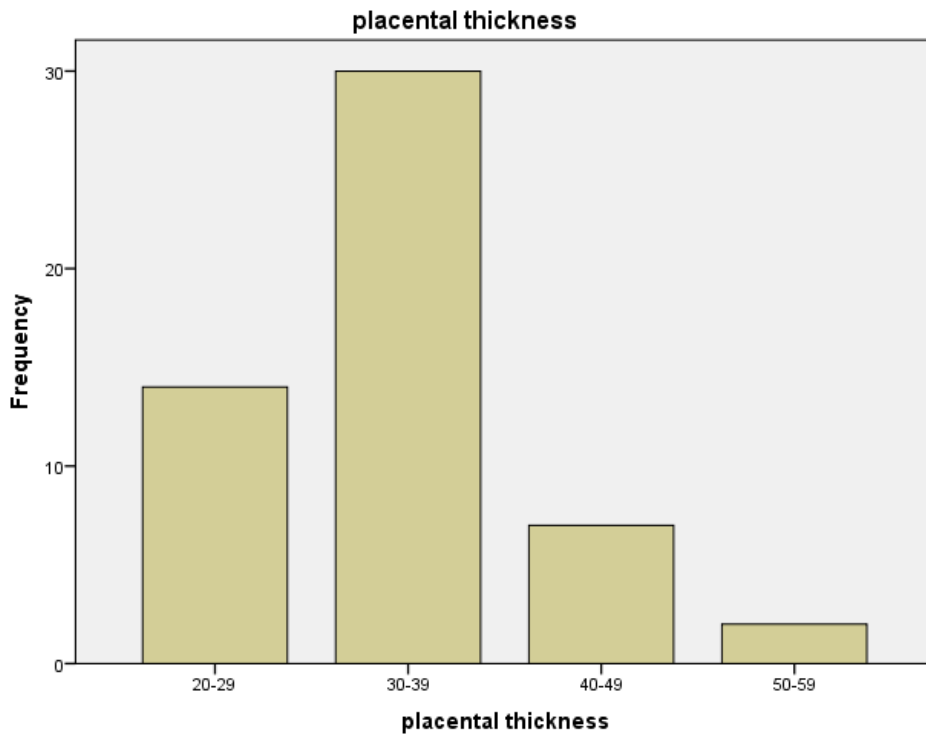Table(4.6) frequency and percentage of Placenta thickness

|		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	20	2	3.8	3.8	3.8
	24	1	1.9	1.9	5.7
	25	1	1.9	1.9	7.5
	26	2	3.8	3.8	11.3
	27	5	9.4	9.4	20.8
	28	3	5.7	5.7	26.4
	29	1	1.9	1.9	28.3
	30	7	13.2	13.2	41.5
	31	2	3.8	3.8	45.3
	32	3	5.7	5.7	50.9
	33	1	1.9	1.9	52.8
	34	3	5.7	5.7	58.5
	35	2	3.8	3.8	62.3
	36	2	3.8	3.8	66.0
	37	3	5.7	5.7	71.7
	38	1	1.9	1.9	73.6
	39	1	1.9	1.9	75.5
	44	2	3.8	3.8	79.2
	45	1	1.9	1.9	81.1
	46	1	1.9	1.9	83.0
	48	1	1.9	1.9	84.9
	49	3	5.7	5.7	90.6
	50	2	3.8	3.8	94.3
	52	1	1.9	1.9	96.2
	55	1	1.9	1.9	98.1
	60	1	1.9	1.9	100.0
	Total	53	100.0	100.0	
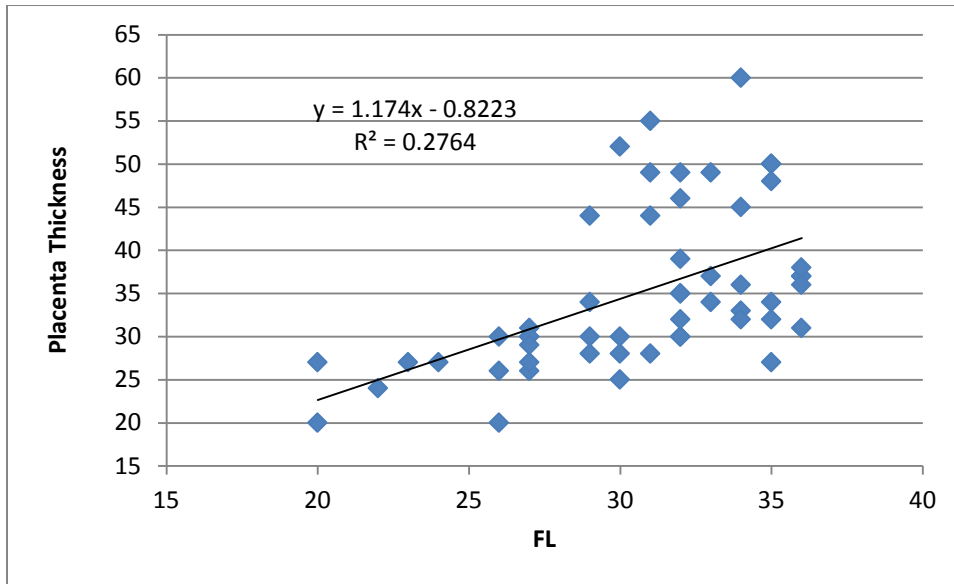
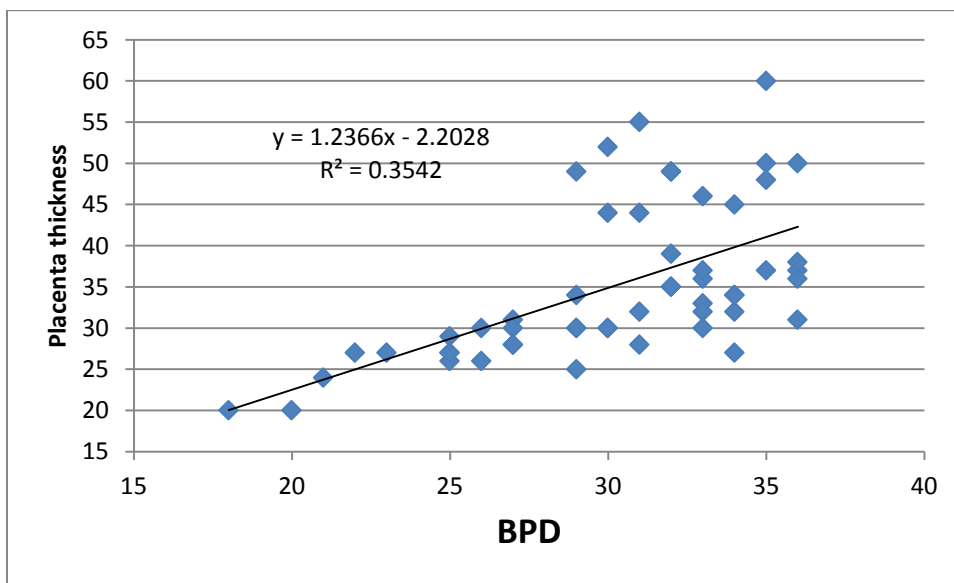Fig (4.5) Relation between placenta thickness and femur length

Fig (4.6) Relation between placenta thickness and Bi parietal diameter
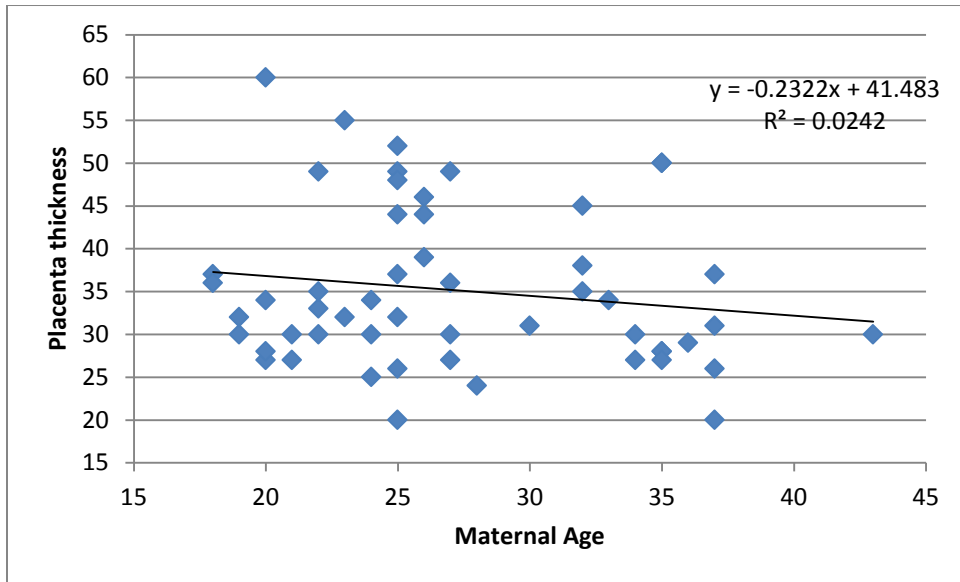
Fig (4.7) Relation between placenta thickness and maternal age

Table (4-7) Correlation between placenta thickness , femur length and   .
Biparietal diameter

		Maternal Age in years	Femur length in cm	Bi parietal diameter in…… …	placental thickness in mm
Femur length in cm	Pearson correlation	-.202	1	.935**	.513**
	sig. (2-tailed)	.146		.000	.000
	N	53	53	53	53
Bi parietal diameter in	Pearson correlation	-.232	.935**	1	.598**
	Sig. (2-tailed)	.094	.000		.000
	N	53	53	53	53
placental thickness in mm	Pearson correlation	-.202	.513**	.598**	1
	Sig. (2-tailed)	.146	.000	.000	
	N	53	53	53	53

**. Correlation is significant at the 0.01 level (2-tailed).

Chapter 5

Discussion, conclusion and recommendation

5.1Discussion:

This study attempts to find out the relation between placenta thickness and growth parameter (last menstrual period, bi parietal diameter, and femoral length) in the second and third trimester.

It was observed that the placenta thichness gradually increase from 26 at 20 weeks of gestation to 37mm at 36weeks.

The researcher examined 53 samples, with normal pregnancy women.

The study showed that the placenta thickness increase with gestational age.

There was significant positive correlation between the placenta thickness and (bi parietal diameter and femoral length).

There was a strong positive correlation between femur length and placenta thickness (r =.513) and (p =0.00)

The study showed linear regression between placenta thickness and Femur length, it was found that placental thickness was increased by 1.17 mm/each week of FL gestational age

There is a strong positive correlation between bi parietal diameter and placenta thickness (r =.598) and (p =0.00)

The study showed linear regression between Placenta thickness and biparietal diameter, it found that placental thickness was increased by 1.24 mm/each week of bi parietal diameter gestational age

5.2 Conclusion:

In conclusion, the measurement of the placenta thickness an important parameter for estimation of fetal age along with other parameters especially in the late mid trimester and early third trimester, where the exact duration of pregnancy was known.

Placenta thickness measured at the level of umbilical cord insertion can be used as an accurate sonographic indicator in the assessment of gestational age in the single tone pregnancies because of its linear correlation. There for, it can be used as an additional sonographic tool in cases where LMP was not known.

The placenta thickness was increased by 1.17 mm each weak femur length of gestational age and increased by 1.24 mm each weak biparietal diameter of gestational age.

5.3 Recommendations:

Placenta thickness should be used in to estimation of fetal age in second and third trimesters of pregnancy.

More training programmed should be planned for Sonographers and sonologists in the field of ultrasound especially in obstetric field.

According to the high cost of scientific research which the researcher was faced, the government should appeal universities in Sudan and companies to support the researchers in order to improve plans of treating and management of such diseases.

Further studies should be carried out in this field on many aspects such as increasing the number of patients, to show the relation between placental thickness and gestational age, comparing between the role of U/S scanning and other diagnostic tools, using color Doppler ultrasonography.

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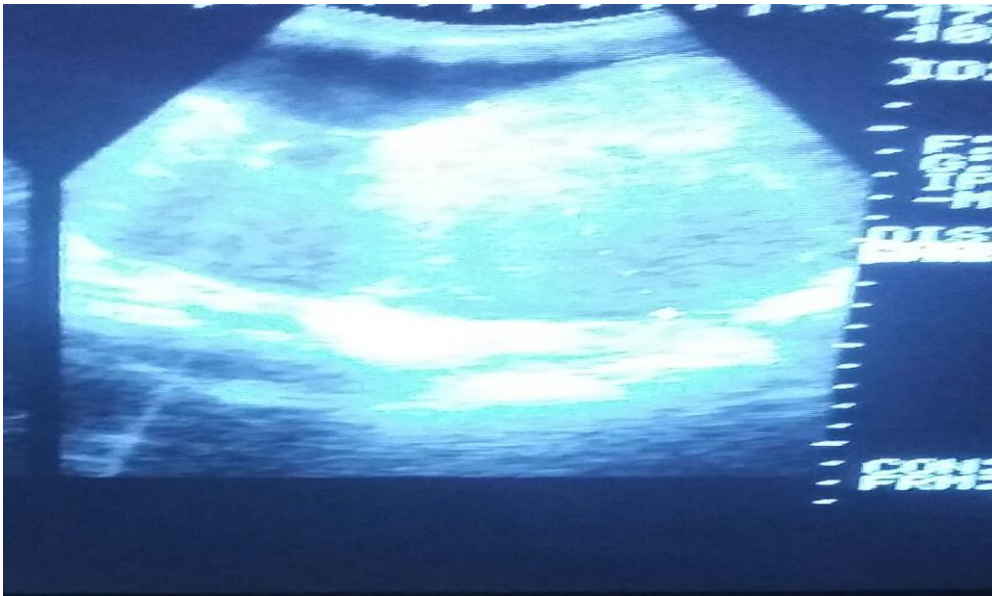
Appendices

Appendices

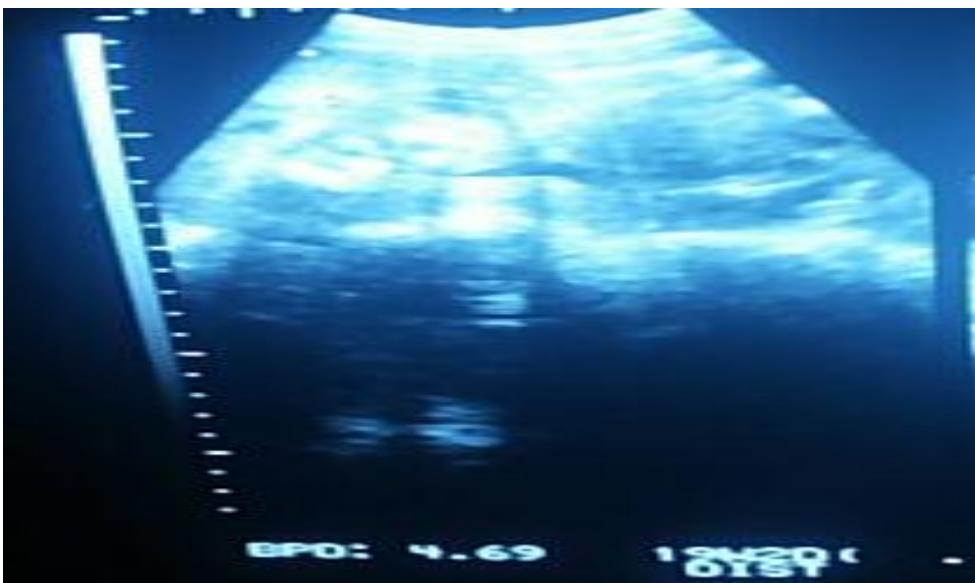Image (1) female 25 years shows normal placenta

Image (2) female 37 years shows normal placenta

Image (3) female 26 years shows normal placenta

Image (4) female 33 years shows normal placenta

Image (5) female 20 years shows normal placenta

Image (6) female 42 years shows normal placenta

# of case	Maternal Age	FL	BPD	Average GA	LMP	Placental thickness	
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

# of case	Maternal Age	FL	BPD	Average GA	LMP	Placental thickness	

21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						
34						
35						
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