

بسم الله الرحمن الرحيم

Sudan University of Science And Technology

College of Graduate Studies

**Assessment of the Relationship between
Placental Location and Fetal Gender using
Ultrasonography**

تقييم العلاقة بين موقع المشيمة ونوع الجنين باستخدام

الموجات فوق الصوتية

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Degree in Medical Diagnostic Ultrasound

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الآية

قال تعالى:

لِلَّهِ مُلْكُ السَّمَاوَاتِ وَالْأَرْضِ يَخْلُقُ مَا يَشَاءُ يَهَبُ ﴿٥٠﴾
لِمَنْ يَشَاءُ إِنَاثًا وَيَهَبُ لِمَنْ يَشَاءُ الذُّكُورَ {*} أَوْ
يُزَوِّجُهُمْ ذُكْرَانًا وَإِنَاثًا وَيَجْعَلُ مَنْ يَشَاءُ عَقِيمًا إِنَّهُ
﴿٥١﴾ عَلِيمٌ قَدِيرٌ

صدق الله العظيم

(سورة الشورى الآيات (49-50)



DEDICATION

This research is dedicated

To the Soul of my mother who was the first teacher in my life, and who
was the one encourages me to be the best I can be.

To my father for his prayers to me.

And

To my husband,who learn me(If at first you don't succed try try and try agian)

To my brothers and sisters who they didn't lift my side.

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My greatest and all thanks to Allah as he helped me to finish this research. He also gave me strength and good health while doing this work and patience to overcome the difficulties.

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Who help me too much to arrange my thoughts, words and data together.

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Finally many thanks to my Husband

Who always give me emotional support and encourage me, I will always appreciate all he have done.

Abstract

The aim of the study was to determine the role of ultrasound in relationship between placental location and fetal gender in second and third trimester of pregnancy.

An analytic, observational study was performed at multi-centers and hospitals in Khartoum state, during the period from (June-Sep2016).

The study excluded congenital abnormal uterus, multiple pregnancies in normal uterus and fetal demises, congenital fetal anomalies, technical factors make fetal gender not clear.

The study followed international scanning guideline and protocol to localize placenta and to detect fetal gender.

The data was analyzed using SPSS. The results revealed that the most affected age group in ranged 26-35 years with percentage of 53.3% , most of them have no history of C/S or abnormal placental location.

The most placenta were located fundal posterior, most gender determined in this study were males.

The study found that there is no relationship between placental location and fetal gender, when the placenta was located posterior high proportion were males, Also when located anteriorly high proportion were males.

The study recommended more research should be done with increased duration and sample volume for more accurate results.

مستخلص الدراسة

الهدف من هذه الدراسة هو تحديد العلاقة بين موقع المشيمة ونوع الجنين في فترات الحمل الثانية والثالثة

هذه الدراسة وصفية تحليلية أجريت في بعض المراكز والمستشفيات بولاية الخرطوم في الفترة من يونيو إلى سبتمبر 2016م.

اشتملت الدراسة على 60 حالة من الحوامل تم تحديد موقع المشيمة ونوع الجنين فيها استبعدت الدراسة العيوب الخلقية للرحم، حمل التوائم والأجنة الميتة أو بها عيوب خلقية كما استبعدت العوامل التقنية التي تحد من معرفة نوع الجنين

اتبعت الدراسة البروتوكول العالمي لتحديد موقع المشيمة ومعرفة نوع الجنين

تم جمع البيانات وتصنيفها ثم تحليلها بواسطة برنامج التحليل الإحصائي وجدت الدراسة أن أكثر الفئات العمرية للنساء الحوامل في هذه العينة هي 26-35 سنة ، معظمهن لم يكن له تاريخ مرضى بوجود موقع غير طبيعي للمشيمة أو أجريت لهن عملية قيصرية

وجدت الدراسة ان موقع المشيمة في القاع الخلفي هو الاكثر في هذه الدراسة وان اكثر انواع الاجنة التي تم تحديدها هم من ذكور

نتيجة الدراسة أوضحت أن ليست هنالك علاقة بين موقع المشيمة ونوع الجنين

أوصت الدراسة بعمل المزيد من البحوث في هذا المجال بفترة زمنية اطول وبيانات اكثر لنتائج افضل وادق

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LIST OF ABBREVIATIONS

C/S	Cesarean Section
FU/anterior	Fundal anterior
FU/posterior	Fundal posterior
GA	Gestational Age

IUGR	Intra uterine growth restriction
3D & 4D	Three Dimension & Four Dimension
SPSS	Statistical Package For social sciences
TAS	Trans Abdominal Scan
TVS	Trans Vaginal Scan
U/S	Ultrasound

CHAPTER ONE

CHAPTER ONE: INTRODUCTION

1-1 Introduction

Documentation of fetal gender has medical as well social implications, and the use of ultrasound to evaluate the placenta is routine among the majority of pregnant women (Carol M. Rumack et al, 2011).

All studies in this field contribute to advances in knowledge by understanding the history of fetal gender and various location of placenta ,adequate visualization of the fetal gender is feasible by high-resolution real-time ultrasonography during the prenatal examination , technical difficulties that were reported relate to fetal presentation, number of fetuses, fetal activity, amniotic fluid volume, and maternal obesity or bowel gas (<http://hcp.obgyn.org.net/articles>, 2016).

The fetal sex can be determined as early as 13 to 14 weeks; most sonographers agree that the sonographic detection rate sharply increases after 18 weeks of gestation. Some reasons of detecting fetal gender are abnormal genitalia in X-linked disorders, testicular feminization, pseudohermaphroditism, hydrocele (<http://hcp.obgyn.org.net/articles>, 2016). Determination of fetal sex is not only done for parental curiosity but also has many medical advantages. Accurately assessing fetal sex can assist in assigning zygosity in twin pregnancies. Ambiguity of the genitalia can occasionally be detected sonographically after detecting other abnormalities, because of a relevant family history. Some cases are diagnosed after careful evaluation of fetal gender because of an antenatal discrepancy between the fetal karyotype and the genital anatomy (<http://hcp.obgyn.org.net/articles>, 2016).

1-2 Problem of the study:

Ultrasound has the role in assessment of relationship between Placenta location and fetal gender.

1-3 Objectives

1-3-1 General Objective

To determine the role of ultrasound in relationship between placental location and fetal gender in second and third trimester of pregnancy.

1-3-2 Specific Objectives

To detect fetal gender as early as possible especially in families with genetic disorders that can be found in male or female fetuses.

To increase the skills of the sonographers and radiologists to detect fetal gender by applying this method.

To locate placental site.

To help endanger species and to increase the probability of conceiving male or female of certain species.

To evaluate amniotic fluid volume.

CHAPTER TWO

CHAPTER TWO: LITERATURE REVIEW

Up to 11 weeks of gestation the growth and the development of the external genitalia is identical in both sexes. After this there is rapid differentiation of the genital tubercle into the male or the female phallus. As significant differences in the rate of penile and clitoral growth only become evident after 14 weeks, when most of the prenatal growth of the penis occurs, evaluating phallic size before this time will lead to erroneous genderassignment (<http://hcp.obgyn/org.net/articles>, 2016).

2-1 Placental locations

Normally, the placenta is located in the fundal area on the left or right lateral side, the posterior or the anterior side or a combination of there. The most important clinically useful distinction of the location is the relation between the lower portions of the placenta and the internal os of the uterus (<http://hcp.obgyn/org.net/articles>, 2016).

Terms such as low-lying placenta, marginal placenta Previa, partial and total placenta previa, all refer to an abnormally low placenta. A total placenta previa completely spans across the internal os (Carol M. Rumack et al, 2011).

2-2 Placenta Embryology

The placenta is regarded as an organ of fetal origin as it develops solely from the outer cell layer of the blastocyst, the trophoblast. The contact with the uterine endometrium and the trophoblast induces a proliferation of the trophoblast. Some of the trophoblast cells lose their cell membrane and form a syncytium, the so-called syncytioblast. This process stimulates a decidual reaction in the

endometrium that causes the stroma to become thicker and highly vascularized, then called decidua. A thin capsule of the decidua called decidua capsularis covers the part of the embryo which is protruding into the endometrial cavity. The deciduas at the embryonic pole develop into the decidua basalis, which takes part in the formation of the future placenta. During early development, the vessels supporting the decidua capsularis regress and the smooth chorion or chorion laeve develops. The vessels supporting the decidua basalis are retained and the leafy chorion or chorion frondosum is developed and the growth process of the placenta, which takes most of the remaining time of the pregnancy (<http://hcp.obgyn.org.net/articles>, 2016).

2-3 Functional anatomy

The human placenta is the interface between the circulations of the mother and fetus for the exchange of nutrients, respiratory gases and waste products. The physiological mechanism of the transfer of specific substances is complicated and remains a field for advanced research. This is in contrast to other organ systems where such a mechanism is mostly understood. The human placenta has approximately 120 cotyledons that together comprise the functional unit of the organ. Each of these cotyledons has a primary villus stem which arises from the chorionic plate and is supplied by the primary branches of the fetal vessels. Further down the vascular tree, these branches form the secondary and tertiary stem where the vascular exchange takes place. From the maternal side, the pulsative blood flow from the spiral arteries enters the inter-cotyledonary space and flushes the maternal side of the vascular space all the way up to the chorionic plate. Between the cotyledons, the blood filters into venous channels and returns to the decidual plate. There is complete separation between the fetal and the maternal blood and all exchange of nutrients and blood gases takes place through the vasculosyncytial membranes separating the two circulatory systems (Juriy Wladimiroof et al 2009).

Development of the placenta as evaluated by ultrasound technology during weeks 8–12 the development of the placenta may be followed and the chorionfrondosum (placenta) may be easily differentiated from the chorion leave (chorion). From week 12 onwards it becomes possible to differentiate between the placenta, the basal plate facing the maternal side of the placenta and the chorionic plate facing the fetus. The placenta grows as pregnancy progresses allowing easy identification (JuriyWladimiroof et al 2009).

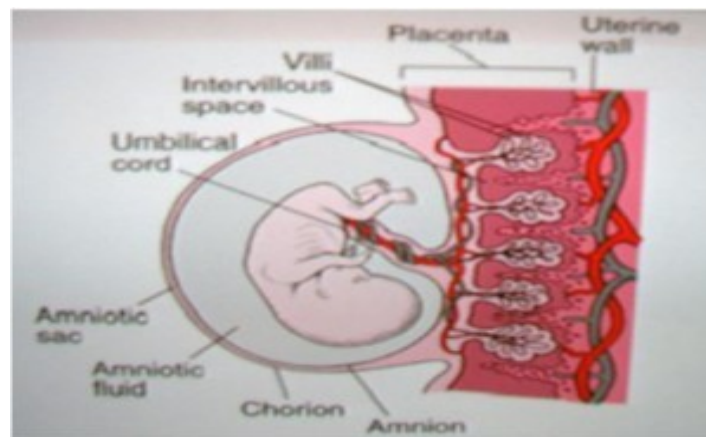


Fig 2-1 Placentation and the chorionic villi illustration
(<http://hcp.obgyn.org.net/articles>, 2016).

2-4 The use of ultrasound to evaluate the placenta

It is routine among the majority of pregnant women because they have at least one ultrasound examination during pregnancy. A wide range of pregnancy complications result from abnormal placental development, including preeclampsia, intrauterine growth restriction (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 improved management of pregnancy and delivery.

Thus, careful examinations of the placenta by ultrasound can contribute directly to enhanced patient care and improved outcomee (JuriyWladimiroof et al 2009).

2-5 Indications for the location of placenta

- First-trimester invasive procedures such as abdominal or transvaginal chorion villus biopsy
- Trans-abdominal amniocentesis in the second trimester and other invasive procedures performed any time later in the pregnancy
- Bleeding in the second and third trimesters
- Evaluation of the placenta and its location and relation to the uterine wall in cases of suspected placental abruption
- Routine fetal examination performed at 18–20 weeks
- Prior to external version of the fetus in late pregnancy.

The most common indication for location of the placenta is during systematic evaluation of the uterus and the intrauterine contents during the second-trimester fetal examination or ‘routine fetal examination’ as it is frequently called. The fetal examination is best initiated by the inverted U-movement of the transducer starting at the symphysis, slowly moving the transducer in a transverse plane on one side of the uterus to the top of the uterus and then down to the symphysis on the contralateral side. During this procedure the placenta may be located and other important features such as the viability of the fetus, the position and the number of fetuses may be established. In early pregnancy, i.e. before the 18–20-week routine fetal examination, there is no reason to register the location of the placenta except for those indicated above (<http://hcp.obgyn.org.net/articles>, 2016).

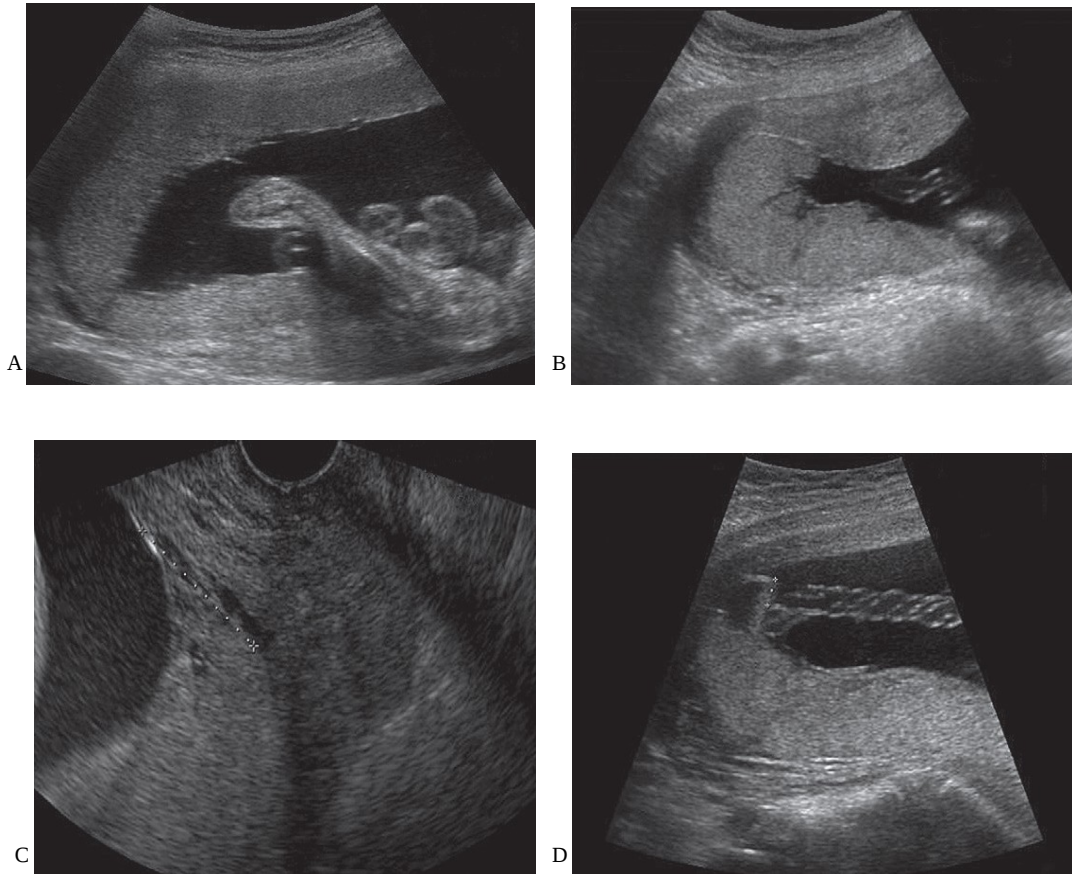
2-6 Various locations and texture of the placenta

Placental location should not be definitively assessed before the end of the second trimester since the placenta previa of an early can become normal or low lying placenta due to stretching of the uterine cervix (Matthias Hofer, 1999).

In the second trimester, the chorionic plate or the fetal surface of the placenta is usually seen as a white line. The placenta is usually relatively echogenic, with equally distributed, fine-grained echoes through the full extent of the organ. The basal plate is not always easy to distinguish but the uterine tissue, which is about 1.5 cm thick, appears slightly darker in its fine-grained echo setting compared to the placenta, making the delineation between the placenta and the uterine tissue possible. Normally, the placenta is located in the fundal area on the left or right lateral side, the posterior or the anterior side or a combination (<http://hcp.obgyn/org.net/articles>, 2016).

There for, the most important clinically useful distinction of the location is the relation between the lower portions of the placenta and the internal os of the uterus. Attempts should be made to demonstrate the lower portion of the placenta and the internal os on the same image. Care must be taken to distinguish between Braxton Hicks contractions and the placenta. The contraction appears darker and less echogenic. The final location of the placenta may require additional sagittal and Para-sagittal scans. It is not difficult to locate the placenta except when it is on the lower posterior wall. The overview might be difficult due to extremities or a larger presenting part of the fetus casting a shadow on the deeper portion of the image. Scanning from the right or left side of the uterus or scanning trans-vaginally can help overcome the problem. Placental morphology Sometimes small sonolucent areas may be located within the regular fine-grained texture of the placenta, usually towards the basal plate. They are usually referred to as placental lakes and represent areas without any fetal villi which consist of slowly moving blood. They have no clinical significance. Placental cysts may be located close to the chorionic plate. They are superficial vessels seen in cross-section or as longitudinal tubes. They have no clinical significance. The placental texture changes during the course of a pregnancy, these morphological changes have not been proven to have any clinical implications but the placenta is located on the posterior wall. A local contraction

of the uterus behind the placenta can clearly be distinguished, making the placenta seem to be protruding in to the amniotic fluid (JuriyWladimiroof et al 2009).



Fig(2-2) A, Transverse view of the uterus demonstrates a right side wall placenta that extends along the anterior wall of the uterus. B Sagittal view of the uterus reveals a posterior fundal placenta C placenta previa, D posterior placenta (Sandra L.Hagen.Ansert, 2012).

2-7 Placenta Grading

Amniotic fluid and placental localization it is useful to have knowledge of the described changes, which are part of the gradual ageing process of the placenta. Grannum, who classified them into grades 0, I, II and III, has described these changes, called placental grading, in detail. Grade 0 represents the normal fine grained homogenic placenta. Grade I presents with multiple echogenic areas,

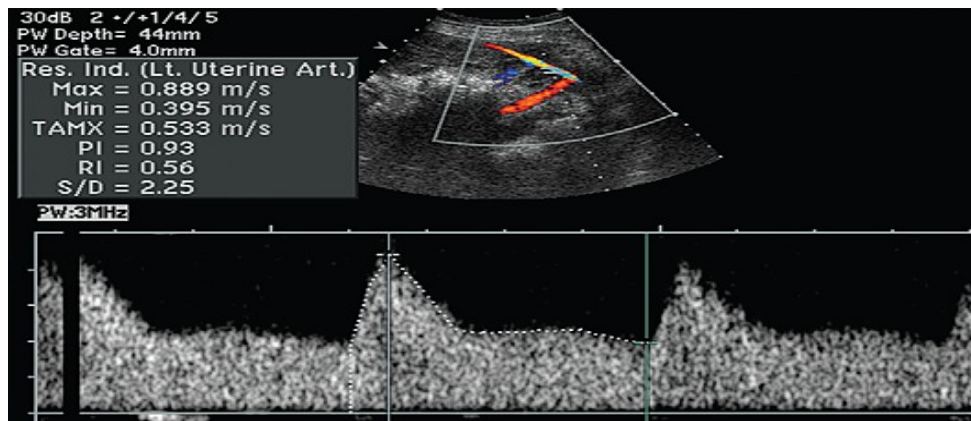
grade II has echogenic areas towards the base and comma-like indentions in the Chorionic plate. Grade III has, in addition to grade II, cystic areas within the placenta and echogenic irregular areas beneath the chorionic plate. The placenta is regarded as an organ of fetal origin as it develops from the trophoblast. It is the interface between the maternal and fetal circulation. The human placenta has approximately 120 cotyledons, each of which derives its vascular supply from the fetus. The development of the placenta may be followed from week 8 onwards. By week 12, distinction of the placenta, with the basal plate facing the uterus and the chorionic plate facing the fetus, is possible. The indications for localization of the placenta are in connection with intrauterine invasive procedures, with bleeding in the second trimester, as part of the routine second-trimester scan and prior to external version in late pregnancy. The distinction of the relation of the inner cervical os and the placental edge is important (JuriyWladimiroof et al 2009). A common pitfall in the diagnosis of placenta previa is an over distended bladder compressing the anterior and posterior myometrium, resulting in the placental margin appearing adjacent to the internal os, when the margin is actually removed from the cervix. Thus, if there is concern for placenta previa with a full bladder, examination should be repeated with an empty bladder (Lucy Chie, Deborah Levine, 2006).

2-8 Doppler evaluation of the placenta

Color, power, and pulsed Doppler can be used to assess placental function. The uterine artery sonographically reveals a high-resistance flow pattern in the first trimester, which should become a low-resistance flow pattern in the second trimester. The normal trophoblastic invasion of the spiral arteries produces this low-resistance Doppler pattern. In the first trimester, the flow velocity wave form shows a notched appearance in early diastole. This notch usually disappears by 24 weeks' gestation. In the second trimester, the obtained Doppler signals of the uterine arteries are variable depending on the location of the

placenta. The lowest resistance in the uterine arteries is seen on the placental side. Abnormal trophoblastic invasion of the spiral arteries of the maternal utero placental circulation is associated with a range of pregnancy complications, including placental insufficiency, IUGR, preeclampsia, and placental abruption (Sandra L.Hagen.Ansert, 2012).

To acquire a uterine artery waveform transabdominally, the sonographer should scan in a sagittal scanning plane, superior to the symphysis pubis. The transducer is moved laterally and manipulated to find the main branch of the uterine artery where it crosses the external iliac artery. With color Doppler the image is magnified, and to obtain a pulsed Doppler waveform, the image is optimized with the correct gate size and placement, gain, and scale. Both right and left uterine arteries are evaluated, and it is necessary to record if they are the placental or non placental waveform. The wave form should be measured and evaluated for the presence or absence of a diastolic notch. The resistance index, pulsatility index, and S/D ratio can be obtained. The umbilical artery can also be evaluated sonographically, and the normal waveform should always have antegrade diastolic flow. The sonographer should acquire an umbilical artery waveform in a mid segment of cord, making certain that the fetus is in an inactive state. Color Doppler should be utilized to visualize the umbilical cord vessels. The image should be magnified and then optimized with the correct gate size and placement, gain, and scale to obtain the pulsed Doppler waveform. The wave form should be measured and evaluated. The resistance index, pulsatility index, and S/D ratio can be obtained (Sandra L.Hagen.Ansert, 2012).



Fig(2-3) Pulsed Doppler gate is seen (arrow) within the Uterine artery after it crosses the external iliac artery. Corresponding Normal uterine artery waveform is demonstrated (Sandra L.Hagen.Ansert, 2012).

2-9 The Normal Genitalia

Although the evaluation of the fetal gender is not included in the minimal standards required by most guidelines, however the patients require knowing it and therefore the ultrasonographer should be able to recognize the fetal penis and scrotum (Fig.2.4) and the labia major (Asim Kurjak, et al, 2006).

Successful sonographic identification of fetal gender has been reported as early as 11 weeks using a midsagittal profile view of the fetal pelvis. With this technique, the orientation of the phallus determines the gender; caudal with the female fetuses and anterior with the males. This technique of gender identification has been coined the “sagittal” sign (Carol M. Rumack et al, 2011).

Accurate sonographic identification of fetal gender in the second and third trimesters depends on several factors including the gestational age, fetal position, amniotic fluid volume, and operator experience. In the second and third trimester, the overall accuracy of fetal gender identification is approximately 97% in fetuses that can be sexed due to a favorable fetal position however as many as one-third of fetuses may be in an unfavorable position. Incorrect gender identification is often due to labial hypertrophy during pregnancy which may be

mistaken for the scrotum. Gender identification may be helpful in certain situations to narrow the differential diagnosis; for example, identification of a male fetus with cystic hygroma excludes Turner's syndrome from the diagnosis, and identification of unmatched twins (male and female pair) indicates a dizygotic twin pregnancy, which may be helpful in cases where there is a single placental site seen and the separating membrane is difficult to visualize (Carol M. Rumack et al, 2011).

The penis appears as an echogenic, curved tubular structure anterior to the scrotum as early as 12-14 weeks gestation. The normal penis has a tapering end, erection is a frequent observation. The normal scrotum appears as a septated, echogenic sac in the anterior perineum. The testes develop in the posterior mid abdomen and descend into the inguinal canal to enter the scrotum between 26 and 34 weeks gestation in the majority of fetuses. Testes appear as homogeneous echogenic oval structures in the scrotum and add certainty to the identification of the scrotum and fetal gender. (Carol M. Rumack et al, 2011).

In females, the labia majora appear as symmetric, perineal bulges with a distinct midline cleft (Carol M. Rumack et al, 2011).

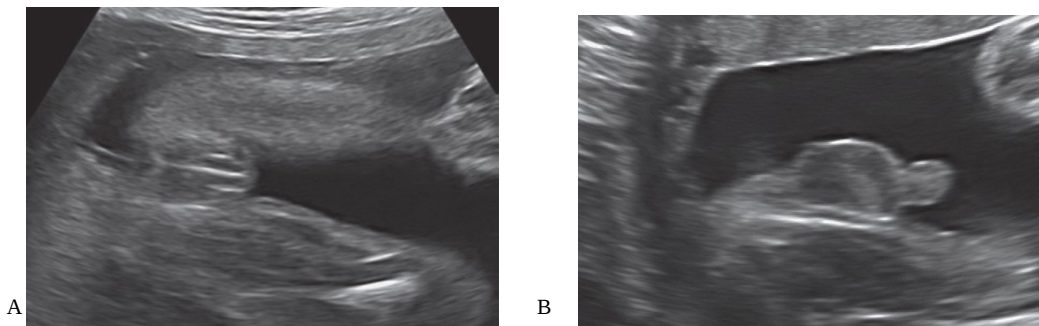


Fig (2- 4) A, Echogenic lines of the major labia and minor labia reflect the “hamburger sign” in this female fetus

B, The scrotum and penis of this male fetus is clearly appreciated (Sandra L.Hagen.Ansert, 2012).

The male genitalia can be more easily recognized than female. The scrotum and penis may be seen as early as 18 weeks, but the female genitalia can only be reliably identified after 22 weeks (P.E.S. Palmer, 1995).

2-10 Abnormal Genitalia

Abnormalities of the genitalia are very uncommon and not routinely searched for Ambiguous Genitalia (Devin Dean, 2005).

Various endocrine disorders and complex genitourinary malformations can be manifested in the form of ambiguous genitalia, and in some cases, a delay in diagnosis can lead to an increase in postnatal morbidity and mortality. Therefore, prenatal detection of genital abnormalities is therefore helpful in evaluating those disorders more easily corrected with prenatal and neonatal treatments (Devin Dean, 2005).

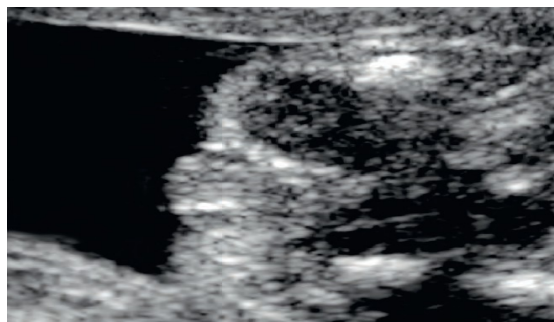
Ambiguous genitalia are a condition that affects approximately 1 per 5000 live-born infants. Prenatal diagnosis with targeted ultrasound is possible but diagnosis than standard 2D ultra-sonography (Devin Dean, 2005).

Documentation of fetal gender has medical as well as social implications. These include:

- (1) History of X-linked disorders.
- (2) Assignment of dizygosity in twin pregnancies,
- (3) Exclusion of maternal cell contamination during amniocentesis (with mixed cell population on karyotype).
- (4) Need to confirm fetal gender to diagnose certain structural abnormalities (e.g. posterior urethral valves, ovarian cysts).
- (5) Familial syndromes in which genital abnormalities are common (Devin Dean, 2005).

In the second trimester the external genitalia can be visualized in 84% to 91% of fetuses, and the fetal gender can be correctly assigned in 93% to 99% of these cases. A male fetus is diagnosed when the penis and scrotum are demonstrated, and the female fetus is diagnosed when the labia majora are shown (Devin Dean, 2005).

Inopportune fetal position, oligohydramnios, maternal obesity, and operator inexperience represent the major limitations in fetal gender assessment. Errors may occur when the rounded, apposed labia are mistaken for small, empty scrotum or when the umbilical cord is mistaken for the penis. Fetal gender can also be identified in the first trimester. During embryologic development, the male and female genitalia are identical until the 11th week of gestation, so gender determination is not possible before 11 weeks. In the first trimester the most useful scanning plane is the mid sagittal plane, where there is a different orientation of the phallus related to the gender. In males the penis is seen as a cranially or vertically directed phallus; in females the clitoris is represented by a caudally or horizontally directed phallus (Carol M. Rumack et al, 2011).



Fig(2-5) Ambiguous genitalia. (Carol M. Rumack et al, 2011).

Three-dimensional sonography allows the mid sagittal plane to be obtained and the genitalia to be visualized more easily. At 12 weeks' gestation, fetal gender can be identified in 87% to 100% of fetuses and is accurately predicted in 86% to 100% of these cases. Testicular descent into the scrotum occurs after 25 weeks' gestation. After 32 weeks, both testes have descended in 97% of the

fetuses. Small hydroceles are common in third-trimester male fetuses (15%) and are usually of no clinical importance. However, large hydroceles, especially if they increase in size over time, suggest an open communication between the processes vaginalis and peritoneal cavity. In such cases, postnatal evaluation for inguinal hernia should be performed (Carol M. Rumack et al, 2011).

2-11 previous studies

There are few literatures and studies regarding the placental site in relation to fetal gender.

(1) Ramzi's method

This study was done in Canada from (1998-2007) by Dr. Saad Ramzi

Materials and Methods of the study

This is a multi-centres prospective cohort study carried out on 5376 fetuses for various from 1998 to 2007. A single sonographer performed all examinations, for all the cases, at both 6 weeks gestation and 18 to 20 weeks gestation. Fetal age was determined by crown rump length at first trimester and by bipartite diameter, abdominal circumference, and femur length at second trimester.

The patients underwent trans-abdominal sonograms, the author documented the chorionic villi laterality with color flow and angio power Doppler. The documentation included the following: position of the chorionic villi blood flow in transverse scan: right lateral, left lateral, anterior left, anterior right, posterior left and posterior right, and on sagittal scan includes fundal anterior, and fundal posterior placental position.

At 18-20 weeks gestation, a routine prenatal sonogram was performed during which placental position and fetal gender were determined. The placental laterality (position) and the fetal gender were confirmed in 99% of the cases in

the second trimester. Coronal, transverse and axial views were obtained for adequate evaluation of fetal gender in the second and third trimester. Careful attention was given to the placental position (laterality) in relation to fetal gender. Scanning the uterus in transverse and sagittal plans were obtained starting from the midline to the right then to the left of midline and document the chorionic villi bulk or the placental bulk. The fetal gender was confirmed and documented after delivery in all cases.

The result of this study showed that total of 5376 singleton fetuses were studied in utero at two separate time intervals: 6 weeks gestation and at 18-22 weeks gestation. Visualization of the genitalia for gender determination was obtained in the second trimester in 99% of male fetuses and in 98% of female fetuses. All these results were confirmed after delivery. Repeated ultrasound examination at 26 –28 weeks gestation was performed in 1200 patients and this increased the predictability of fetal gender to 100 % for male fetuses and 99% for female fetuses. 97.2% of the male fetuses had a chorionic villi /placenta location on the right side of the uterus whereas, 2.4% had a chorionic villi /placenta location to the left of the uterus. On the other hand, 97.5% of female fetuses had a chorionic villi /placenta location to the left of the uterus whereas, 2.7% had their chorionic villi /placenta located to the right of the uterus. The study was tabulated according the position of the placenta (<http://hcp.obgyn/org.net/articles>, 2016).

(2) Another Study that disapproves Ramzi's method regarding placental location determining fetal gender, this might be the reason why physicians aren't using it to determine gender. Again, this study wasn't done in earlier ultrasounds (6 to 8 weeks), but what they found strange, is the placenta location is very close to 50/50 correlation for determining boy or girl, which not even close to Ramzi's 97% claims

Objective of previous study of fetal gender prediction in early pregnancy by assessment of the genital tubercle has shown that the technique has an accuracy

of about 85%. A recent study reported a strong association between placental location and fetal gender.

The aim is to evaluate the utility of placental location and compare this with genital tubercle assessment in the prediction of fetal gender. Methods Placental location was recorded in 277 women with uncomplicated singleton pregnancies attending for routine obstetric ultrasound. Assessment of genital tubercle/phallus position was also performed with images obtained in the mid-sagittal plane in those patients presenting in first trimester.

Results of 277 fetuses, 159 were female and 118 were male. Placental location assessment showed that the placenta was located at the midline in 78 cases (28%). In 89 fetuses, the placenta was located on the right side and of these 45 (51%) were males. The placenta was located on the left side in 110 fetuses and 63 (57%) of these were female. analysis confirmed poor correlation of placental location with fetal gender (<http://hcp.obgyn.org.net/articles>, 2016).

(3) Study was done in London KU to detect fetal gender in first trimester 11-14 wks.

In 172 singleton pregnancies, before chorionic villus sampling for karyotyping.

Methods

Transabdominal sonography and Trans vaginal sonography and examined the genital region in transverse and sagittal plane of the fetus.

Result

The accuracy of sex determination increased with gestation from 70.3% at 11 wks. To 98.7% at 12 wks and 100% at 13 wks (<http://hcp.fertilitycenter.org/vitro-fertilization-ivf/2020212862>, 2016).

(4) Study was done in Tikrit Iraq during period of (2007-2008) by Rana A-R.Al.Tae and Samira A-H Abdullah collage of medicine University of Tikrit

The study was done for umbilical artery blood flow and site of placenta and fetal gender

Methods and material

117placentae examined by ultrasound to detect their site during third trimester the baby gender were seen and the exact placental sites in utero

Result

Good opinion about the site of the placenta to be posterior in males while anterior in females also there is higher percentage in this study of the placental site to be fundal or pervia in females more than males (www.tu.edu.iq/index.php/TMJaccessdat,JUNE13,2016).

CHAPTER THREE

CHAPTER THREE: METHODOLOGY

3-1 Type of the study

Analytical observational study deal with ultrasound findings in pregnant patients.

3-2 Study area

This study was performed in multi-centers and hospitals in Khartoum state, but the most was performed in BashiarUniversity hospital.

3-3 Study duration

The study was carried out from (June –July 2016).

3-4 Study population

Pregnant women in the second and third trimesters.

3-5 Sampling and sample size

Random sampling technique was performed among 60 women in second and third trimesters of pregnancy.

3-5-1 Inclusion criteria of the study cases

(a) The study cases that were sure of the LMP in second, third trimester with either U/S or clinical evaluation.

(b) The study cases had no disease known to affect fetal growth.

(c) The study cases of normal uterus with normal singleton pregnancy had been included.

(d) The study cases of various location of placenta had been included.

3-3-2 Exclusion criteria of the study cases

This study excluded

(a) Congenital abnormal uterus.

(b) Multiple pregnancies in normal uterus and fetal demises.

(C) Congenital fetal anomalies.

(d) Technical factors make fetal gender not clear.

3-6 Study variables

Gender, Placental location (anterior, posterior, fundal anterior, fundal posterior, lowlying, previa), amniotic fluid, gestational age, past history of C/S, past history of abnormal placenta locations.

3-7 Method of data collection:

Data collection sheet which was designed to include all variables to satisfy the study and ultrasound examinations

3-8 Technique

3-8-1 Patient Preparation

Patient should be full bladder for placental location.

3-8-2 Patient Positioning

Supine as basic

other positions as needed

3-8-3 Coupling agents

A coupling agent is necessary to ensure good acoustic contact between the transducer and the skin and allow total transmission of the sound beam.⁽¹¹⁾

3-8-4 Protocol of scanning

After the patients were informed consent they were scanned by transabdominal approach by routine sonographic evaluation following the scanning protocol and the findings were recorded. Scanning was done in room with dim light to minimize the reflected artifact of the screen, the cases were examined in supine position then applying coupling agent to abdomen and begin evaluation with simple sweep of transducer up and down and side to side across the abdomen to get a rough sense of the uterine contents before focusing on specific areas of interest, after getting a rough sense that the observation were made and the pregnancy was evaluated:

(1)Number of fetuses

(2)Cardiac activity

(3)Placenta location

(4)Assessment of amniotic fluid volume

(5) Determination of GA based on various fetal measurements.

(6) Screening for gross abnormalities.

(7) Finally determine fetal gender (Philip N. Baker, 2003).

3-8-4-1 The protocol to evaluate placental location

For the standard (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. Over distention of the bladder distorts the appearance of the cervix and lower uterine segment and may lead to the false positive diagnosis of placenta previa (Carol M. Rumack et al, 2011).

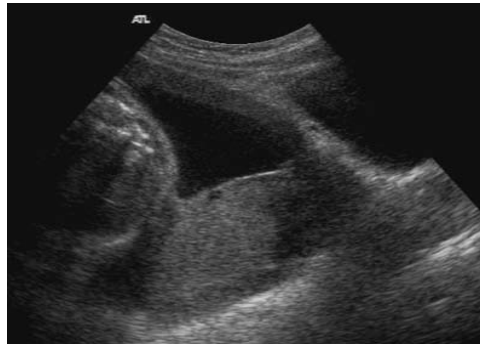


Fig 3-1 identifying the lower segment s posterior placental (BaskyThillanyanathan, 2004).



Fig 3-2 Demonstrate the lower edge of the anterior placenta (BaskyThillanyanathan, 2004).



Fig 3-3 complete placenta previa (AsimKurjak, et al, 2011).

3-8-4-2 The criteria to determine fetal gender

The scanner should follow the long axis of the fetus towards the hips; the bladder is helpful land mark within the pelvis by which to identify the anteriorly located genital organs tangential scanning planes direct between the thighs. Transverse plane used to see the female genital organs, the labia is identified ventral to the bladder, where tangential projection is the entire labial folds, and often the labia minora, are demonstrated. In scans of perineum obtained parallel to the femurs the shape of the genitalia appears rhomboid, the labia appear edematous and swollen. The male genitalia use either longitudinal or transverse plane, the scrotal sac is seen as mass of soft tissue between the hips with the scrotal septum and testicles, and fluid around the testicle (hydroceles) is common benign findings during intra uterine life (<http://hcp.obgyn.org.net/articles>, 2016).

3-8-5 Equipment

Areal time system with 3.5 MHz, TA, convex transducer

(SonoScape C352 made in China, MINDARY4900, MEDISON -SONOACE X4 made in Korea)

Recording system by Sony ultrasound printer up-860

3-9 Validity and reliability

Ultrasound is more reliable to detect fetal gender and placental location to ensure combined validity and reliability, more than one scan had been done (double check) and this may minimize errors in diagnosis of fetal gender.

3-10 Generalizability

To ensure generalizability all patients were scanned by the same protocol for performing ultrasound and with using the same type of transducer.

3-11 Data analysis

The data had been analyzed by using the Statistical Package for Social Sciences {SPSS}.

3-12 Data presentation

The data had been presented as figures, tables and graphs.

3-13 Data storage

The data had been stored in PC and printed in thermal paper.

3-14 Ethical considerations

The moral issues concern whether it is “right” to be determining the sex of a fetus before it is born, and if that knowledge also determines whether or not the baby lives.

In this study all patients were give oral consent prior to the examinations. Ethical approval had been obtained from the ethics committees of medical centers

CHAPTER FOUR

CHAPTER FOUR: RESULTS

TABLE (4-1) shows Proportion of study based on age groups

Age	Number	percentage
15-20	3	1.7%
21-25	15	25%
26-35	32	53.3%
36-45	10	10
Total	60	100%

Figure No (4-1) show the Proportion of study based on age groups

Table No(4-2) show the Proportion of study based on resident area

resident	Number	percentage
south Khartoum	50	83.3%
East Khartoum	3	5%
East Nile	7	11.7%
Total	60	100%

Figure No (4-2) show the Proportion of study based on resident area

Table No (4-3) show the Proportion of study based on occupation status

occupation	Number	percentage
Not working	58	96.7%
working	2	3.3%
Total	60	100%

Figure No (4-3) show the Proportion of study based on occupation status

Table No (4-4) show the Proportion of fetal gender in the study

Gender	Number	percentage
Male	35	58.3%
Female	25	41.7%
Total	60	100%

Figure No(4-4) show the Proportion of fetal gender in the study

Table No (4-5) show the Proportion of patients have history of abnormal placenta location

H.o.abno.Pla. Loc	Number	percentage
Yes	2	3.3%
No	58	96.7%
Total	60	100%

Figure No(4-5) show the Proportion of patients have history of abnormal placenta location

Table No (4-6) show the Proportion of patients have history of C/S

History of C/S	Number	percentage
Yes	7	11.7%
No	53	88.3%
Total	60	100%

Figure No (4-6) show the Proportion of patients have history of C/S

Table No (4-7) show Number and proportion of cases in each GA per week

GA	Number	percentage
15-25	15	25%
26-36	33	55%
37 above	12	20%
Total	60	100%

Figure No (4-7) show Number and proportion of cases in each GA per week

Table No(4-8) show the Placenta location

Placenta location	Number	percentage
anterior	11	18.3%
posterior	16	26.7%
Fundal anterior	12	20%
Fundal posterior	20	33.3
Low lying	1	1.7
Total	60	100%

Figure No(4-8) show the Placental location

Table No(4-9) show the amniotic fluid

Amniotic fluid	Number	percentage
increase	1	1.7%
Decrease	0	0%
Average	59	98.3%
Total	60	100%

Figure No(4-9) show the amniotic fluid

Table No(4-10) show the placenta location according to Female and Male Gender

Placental location	Female	Male	F.percentage	M.percentage
--------------------	--------	------	--------------	--------------

anterior	4	7	6.7%	11.7%
posterior	2	14	3.3%	23.3%
Fundal anterior	6	6	10%	10%
Fundal posterior	12	8	20%	13.3%
Low lying	1	0	1.7	0%
Sub total	25	35	41.7%	58.3%
Total	60		100%	

Figure No(4-10) show the patient age

CHAPTER FIVE

CHAPTER FIVE: DISCUSSION & CONCLUSION AND RECOMMENDATIONS

Discussion

This study focused on viable, singleton fetuses in normal uterus, which agree with other studies.

Total of 60 fetuses were studied in utero in this study.

Different sample volume were studied in other studies, first study carried out on 5376 fetuses and 277, 172, 117 fetues in second, third and fourth study respectively. (<http://hcp.obgyn/org.net/articles,2016>. fertilitycenter.org/vitro-fertilization-ivf,2016. www.tu.edu.iq,2016.)

Distribution of age

This is analyzed in to four age groups between 15 and 20 years, between 21 and 25 years and between 26 and 35 years and between 36 and 45. The most age group in this study was 26-35 years with percentage of 53.3%

Distribution of patient resident

This analyzed in to three groups Khartoum, Khartoumsouth and Nile east, the most group from Khartoum south, this due to most of the patients were from BashairUniversityl Hospital.

Patient having history of C/S in same time having history of abnormal placental location

This analyzed that most of patients that have no history of abnormal placental location have no history of C/S, it means that no relation between C/S and abnormal placental location.

GA

This analyzed in tothree groups, the most age group proportion (55%) were (26-36) wks, in this age the accuracy to detect fetal gender is high and this agree with second and fourth studies, the third study showed that accuracy of sex determination increased with gestation age from70.3 at 11 wks. To 98.7% at 12wks and 100% at 13wks. (fertilitycenter.org/vitro-fertilization-ivf,2016. www.tu.edu.iq,2016.)

This study was disagree with the first study Ramsi method, the range of group were 6wks and (18-20) wks, because the focused on the early pregnancy for early prediction. (<http://hcp.obgyn.org.net/articles,2016>)

Placenta location

This analyzed in tofive groups anterior, posterior, fundal anterior, fundal posterior, lowlying and.

The most groups were fundal posterior andposteriorplacenta,and one case of placenta previa or lowlying, for simplified we added the number of cases of fundal anterior to anterior placenta and fundal posterior to posterior placenta

The most common group was posterior placenta, because the normal implantation sites in uterine wall is superior and posterior.

Which agree with third and fourth studies. (fertilitycenter.org/vitro-fertilization-ivf,2016. www.tu.edu.iq,2016.)

In comparison with first study and analyzing of placenta was according to laterality of placenta (right side and left side of the uterus). (<http://hcp.obgyn.org.net/articles,2016>)

Fetal gender

This analyzed in to two groups male and female, the most gender group was male 35 cases (58.3%), because male fetus is always easy to detect by ultrasound than female. This agree with all studies. (<http://hcp.obgyn.org.net/articles.2016>. fertilitycenter.org/vitro-fertilization-ivf,2016. www.tu.edu.iq.2016.)

the relationship between placental location and fetal gender (Cross tabulation)

Finally the result of 60 fetuses 35 were male and 25 were female. Placental location assessment showed that the placenta was located posteriorly in 16 cases (26.6%) and 11 of cases (18.4%) was located anteriorly.

When the placenta was located posteriorly (3.3%) were females, 23.3% were male (the high proportion were male), and when the placenta was located anteriorly (11.7%) of these were male and 6.7% were female (the high proportion were males) analysis confirmed no relation between placental location with fetal gender.

The result of this study agree with the second study, that show there are poor correlation between placenta location and fetal gender.

This result was disagree with the first, third and fourth studies because it can't approve the relation.

Conclusion

Determine the fetal gender and localize placental location by sonography is consider to be accurate in the second and third trimester.

Male fetus is always easy to detect by ultrasound than female.

Anterior placenta is more with male fetus, also posterior placenta is more with male fetus.

This study is not an alternative to other studies that approve there is relation between placenta location and fetal gender, but it's a result of analytical study that failed to approve the relation. In addition to this analysis there are no literatures approves this relation but few studies.

Documentation of fetal gender has medical as well social implications.

Recommendations

- Double check for fetal gender to avoid wrong prediction
- Keep in mind that we are doing a research to help scientists, physicians, and not finding the fetal gender only.
- Use minimum scanning time possible to minimize patient discomfort and to reduce U/S exposure (ALARA principle).
- International guide lines protocol should be followed to localize placental location and to detect fetal gender.
- More training programmed should be planned for Sonographer and sonologist in the field of ultrasound especially in determination of fetal gender to give accurate results.
- More research studies should be done with expanding period of time and include more sample data for more precise and accurate results.

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Appendices

Appendix(1) images

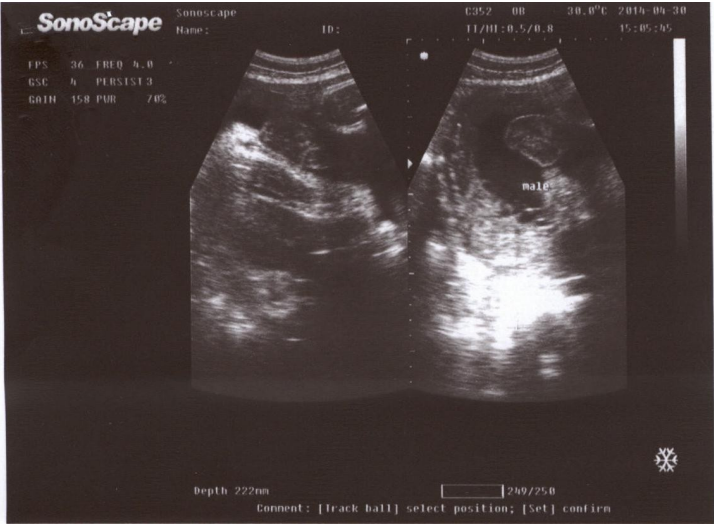


Fig (1) sonogram of male fetus and posterior placenta at 33wks.

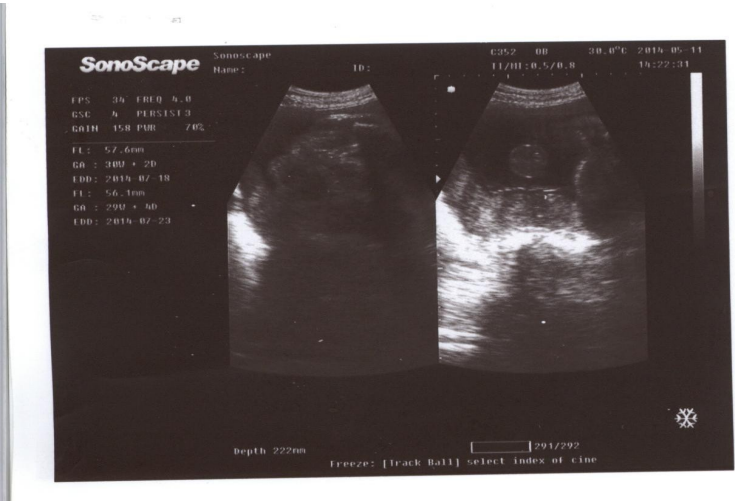


Fig (2) sonogram of male fetus and posterior placenta at 37wks.



Fig (3) sonogram of male fetus and posterior placenta at 34wks.



Fig (4) sonogram of male fetus and posterior placenta at 37wks.

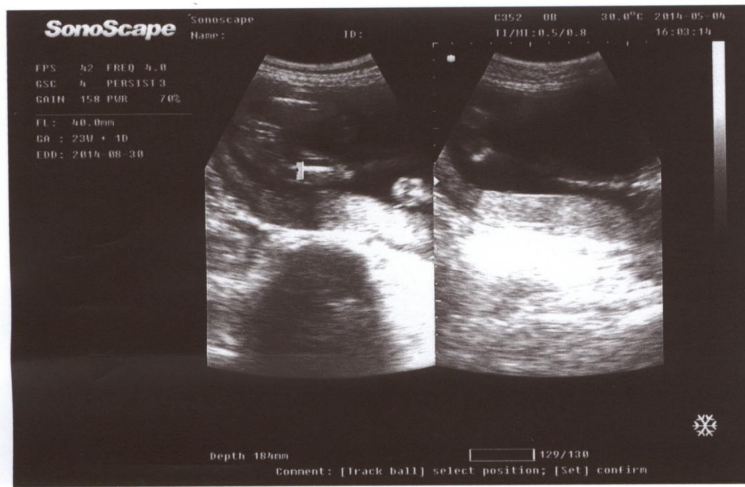


Fig (5) sonogram of female fetus and posterior placenta at 29wks.

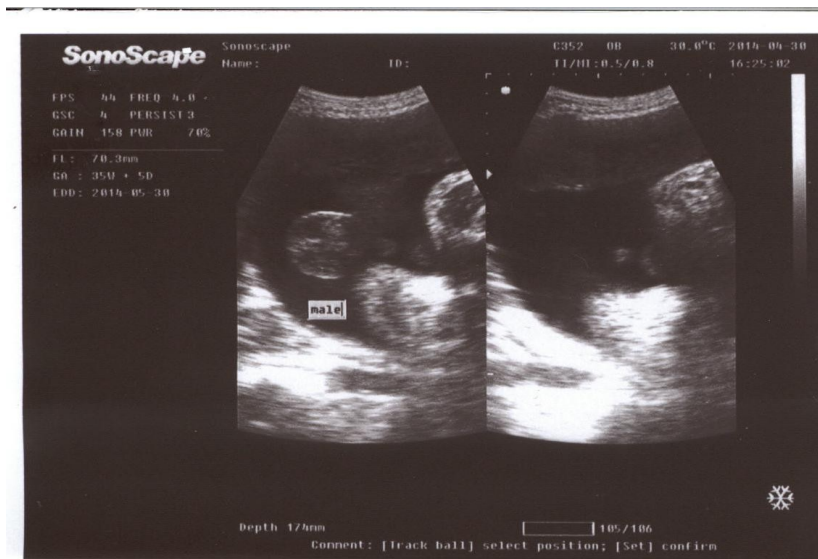


Fig (6) sonogram of male fetus and posterior placenta at 37wks.

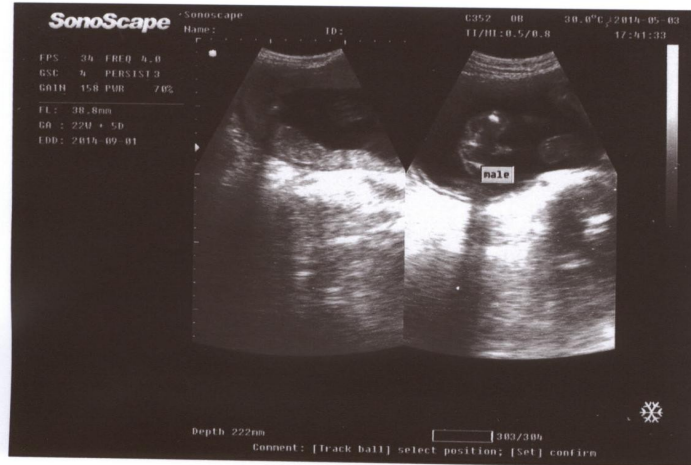


Fig (7) sonogram of male fetus and posterior placenta at 22wks.

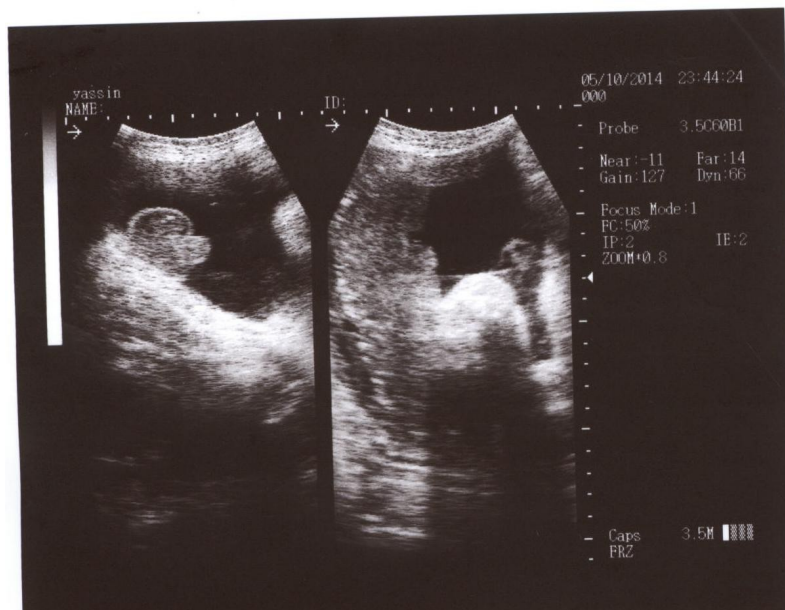


Fig (8) sonogram of male fetus and posterior placenta at 36wks.



Fig (9) sonogram of male fetus and posterior placenta at 34wks.

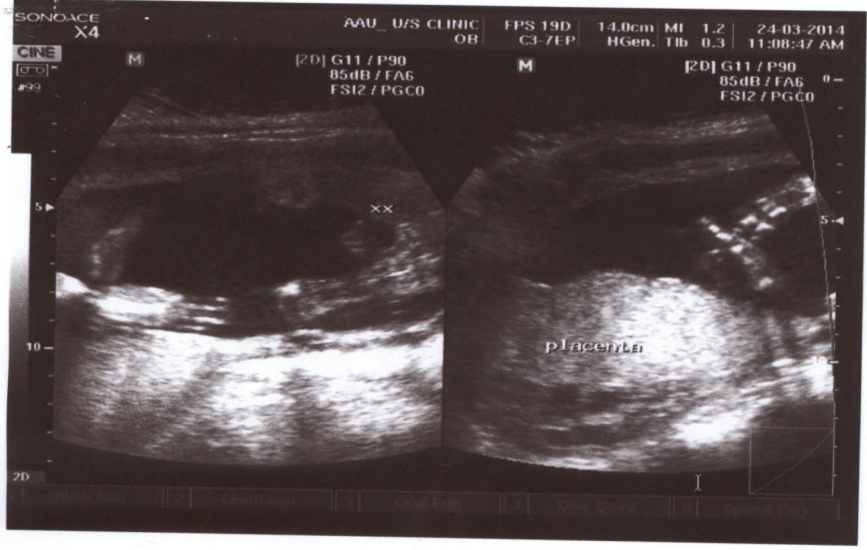


Fig (10) sonogram of female fetus and posterior placenta at 28wks.

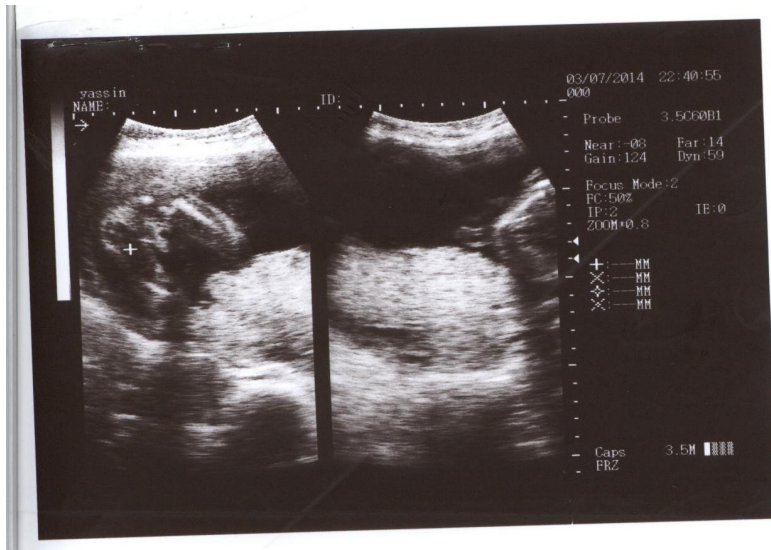


Fig (11) sonogram of fetus male and posterior placenta at 18wks.

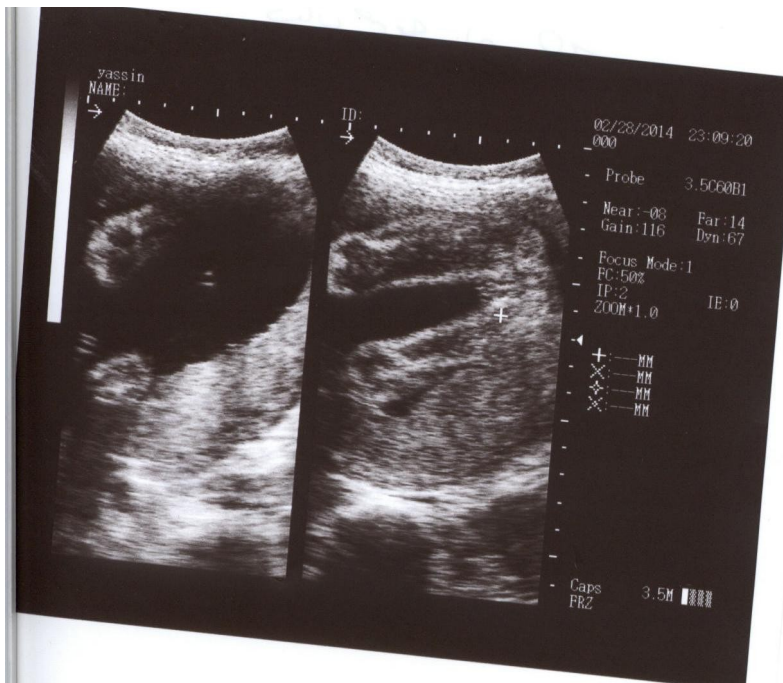


Fig (12) sonogram of female fetus and posterior placenta at 30wks.



Fig (13) sonogram of male fetus and posterior placenta at 35wks.



Fig (14) sonogram of female fetus and anterior placenta at 29wks.



Fig (15) sonogram of male fetus and posterior placenta at 23wks.

Appendix (2) data collection sheet

Sudan University of science and technology

The Role of ultrasound in relationship between placenta location and fetal gender

1-patient General information

Patient code () Patient Age ()

Patient resident () Patient occupation spouse ()

Working ()

History of abnormal placenta location

Yes () No ()

History of CLS

2-ultrasound findings

GA () weeks

Placenta location Anterior () Posterior ()

Fundal anterior () fundal posterior () low lying

Amniotic fluid increased () Decrease () Average ()

Fetal gender Male () Female () Not Clear ()