

**Sudan University of science and technology**  
**College of graduate studies**

**Association of Placental Thickness and Estimated Fetal Weight**  
**in pregnant Women in Gezira state**

علاقة سمك المشيمة ووزن الجنين المتوقع لدي النساء الحوامل بولاية الجزيرة

**A Thesis Submitted for Partial Fulfillment of the Requirements**  
**of M.Sc. Degree in Medical Diagnostic Ultrasound**

By

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**2017**

## **Dedication**

*- To my father and my mother*

*-To my wife and my daughter*

*-To my brothers and my sisters*

*-To my friends in Group Omdurman almawogaty*

## **Acknowledgement**

I would like to express my deepest gratitude and sincere appreciation to my supervisor **Dr . Afraa siddig Hassan Omer** for her help, support ,advise and encouragement to complete this work. Without her supervision and constant help this dissertation would not have been possible.

## **Abstract**

The purpose of this descriptive study is to investigate the relationship between the placenta thickness and estimated fetal weight in normal pregnancy women in Gezira state .The data collected in Wad Wadni Teaching Hospital and Abo osher Teaching Hospital from May 2016 to November 2016 .Fifty pregnant women in second and third trimesters were scanned by ultrasound machine Toshiba -Power . Fetal weight was estimated by measurement of biparietal diameter (BPD) and abdominal circumference (AC). Placenta thickness was measured in alongitudinal section at the point of insertion of the umbilical cord.

The data is analyzed by using Package Statistical for Social Sciences (SPSS). Results of the study showed that there is strong positive correlation between placenta thickness and estimated fetal weight ( $r=0.873$ ) and ( $p=0.01$ ) and both are firmly increase with fetal age .The results also showed linear regression between them. The study showed that the fetal weight increase by 60 gm/mm of the placenta thickness. Researcher noticed that with same placenta thickness there were different fetal weights. However, the normality of fetal weight and fetal development can followed by measuring Placenta thickness.

## ملخص الدراسة

يهدف هذا البحث الوصفي لدراسة العلاقة بين سمك المشيمة ووزن الجنين المتوقع في الحمل الطبيعي عند النساء بولاية الجزيرة , جمعت بيانات هذه الدراسة من مستشفى ودمدنى التعليمى ومستشفى ابوعشر فى الفترة بين مايو 2016 الى نوفمبر 2016 شملت الدراسة 50 سيده حامل فى الثلثين الثانى والثالث من الحمل .تم الكشف على السيدات بالموجات فوق الصوتية لاجراء الفحص الروتينى للحمل ومن ثم لاجراء هذه الدراسة .تم تقدير وزن الجنين عن طريق قياس القطر الجانبي للراس ومحيط البطن . سمك المشيمة ثم قياسه فى نقطة انغراس الحبل السرى فيها .

نتائج الدراسة التى استعمل فيها برنامج التحليل الاحصائى للعلوم الاجتماعية (SPSS) اظهرت ان هناك ارتباط قوى وموجب بين سمك المشيمة والوزن المقدر للجنين (معامل الارتباط  $r=0.873$ ) حيث ان الاثنتين يزيدان باطراد بزيادة عمر الجنين كما ان الرسم البيانى وضح العلاقة الخطية بينهما . الدراسة اظهرت ان وزن الجنين يزيد 60 جم عند زيادة سمك المشيمة 1م . الباحث لاحظ من خلال الدراسة انه عند السمك المعين للمشيمة يمكن ان تتعدد الاوزان المقدره للجنين. الدراسة خلصت الى انه من خلال قياس سمك المشيمه يمكن متابعة وزن الجنين والتطور الطبيعى لنمو الحمل ويمكن اثبات فعالية هذه الدراسة بزيادة عدد الحالات ومتابعة الجنين بعد الولاده .

## **List of Abbreviations**

SSPS:.....Statistical Package for Social Science

GA:.....Gestional Age

IUGR:.....Intrautrine Growth Retardation

FL:.....Femur Length

BPD:.....Biparietal Diameter

AC:.....Abdominal Circuference

HCG:.....Human Chorionic Gonadotropin

HC:.....Head Circuference

GTD:.....Gestional Trophoplastic Disease

EFW:.....Estimated Fetal Weight

US:.....Ultrasound

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# CHAPTER ONE

## Introduction

### 1-1 Introduction

The placenta is a vascular structure by which an unborn child is attached to its mother uterine wall and through which respiratory gas and metabolic exchange occurs. The placenta is formed in part from maternal tissue and in part from embryonic tissue. The embryonic portion of the placenta consists of chorionfrondosum, whereas the maternal portion is composed of the area of the uterine wall called decidua basalis, into which the chorionic villi penetrate. Blood does not flow directly between these two portions, but because their membranes are in close proximity, certain substances diffuse readily. When fully formed, the placenta is a reddish brown oval disc with a diameter of 15 to 20cm and thickness of 2.5cm, It weighs between 500 to 600grams, about one sixth as much as the fetus. (Graafs et al 2001)

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

The use of ultrasound to evaluate the placenta is routine among the majority of pregnant women. A wide range of pregnancy complications result from abnormal placental development, including preeclampsia, intrauterine growth retardation (IUGR) and abruption. Other abnormalities, such as placenta previa, percreta or

vasa previa, may cause major maternal and fetal complications. Timely recognition of these abnormalities of the placenta by ultrasound can lead to improve management of pregnancy and delivery. Thus, careful examination of the placenta by ultrasound can contribute directly to enhance patient care and improve outcomes. ( Rumack et al 2011).

Before the availability of the ultrasound, manual examination of the maternal abdomen was only the approach that could be used to estimate fetal size. The physical examination, however, provides only a general approximation of fetal weight because the palpated dimension of the uterus are affected by several factors other than fetal size, including amniotic fluid volume, placental bulk, presence of fibroids and maternal obesity. Sonographic measurements of the fetus provide information about fetal age and growth. These data are used to assign gestational age, estimated fetal weight and diagnose growth disturbance. The measurements of fetal body parts provide a direct way of assessing fetal size . Numerous formulas have been published for estimating fetal weight from one or more of these fetal body measurements: head ( biparietal diameter BPD or head circumference HC), abdomen ( abdominal diameter AD or abdominal circumference) and femur length(FL). (Rumack et al 2011).

Estimation of fetal weight, on its own and in relation to the gestational age, can influence obstetric management decisions concerning the timing and the route of delivery. Early delivery may benefit the fetus that is small for dates. Such a fetus may be inadequately supplied by its placenta with oxygen and nutrition's and therefore may be better in the care of neonatologist than in uterus. When the fetus is large, cesarean section may be the preferred route of delivery, particularly in pregnancies complicated by maternal diabetes. In view of these considerations , fetal measurements should be a component of every obstetric sonogram.( Rumack et al 2011).

## **1-2 Problem of the Study**

The purpose of this study explicates the relationship between placental thickness and estimated fetal weight in normal pregnancy women in Gezira state (To the best of our knowledge no such studies have been carried out in this aspect of obstetric ultrasonography in Gezira state).

## **1-3 Objectives of the study**

### **1-3-1 General Objectives**

-To assess the association of the placental thickness and estimated fetal weight in pregnancy women in Gezira state.

### **1-3-2 Specific Objectives**

-To measurement of placental thickness and fetal weight.

-To correlate between placental thickness and (biparietal diameter abdominal circumference) and estimated fetal weight.

## **1-4 Significant Of the Study**

Study explains the idea about the relationship between the placental thickness and fetal age and estimated fetal weight.

## **1-5 Overview of the Study**

The study consist from five chapters chapter one include the introduction, problem of the study in addition to objective and overview of study , chapter two is literature review and previous study chapter three is methodology chapter four for results and chapter five deal with discussion conclusion and recommendations.

## CHAPTER TWO

### Litterateur Review

#### 2-1 Anatomy of Placenta

The placenta is a “vascular (supplied with blood vessels) organ in most mammals that unites the fetus to the uterus of the mother. It mediates the metabolic exchanges of the developing individual through an intimate association of embryonic tissues and of certain uterine tissues, serving the functions of nutrition, respiration, and excretion.” (Online Britannica encyclopaedia).

As the fetus is in full development, it requires a certain amount of gases and nutrients to help support its growth. Because the fetus is unable to do so on its own, the placenta provides these gases and nutrients throughout pregnancy.



Fig 2-1: Pacenta (<http://health.allrefer.com/health/placenta-abruptio-placenta.html>)

## Structure

The placenta is an organ of round or oval shape that is relatively flat. It is about 20cm in length and has an average weight of 600g. These numbers can vary according to the weight of the fetus. It is said that the placenta weighs about one sixth of that of the fetus.

The placenta is composed of two different surfaces, the maternal surface, facing towards the outside, and the fetal surface, facing towards the inside, or the fetus. On the fetal surface, we can observe the umbilical cord, the link between the placenta and the fetus (<http://www.siumed.edu/~dking2/~erg/placenta.htm>)

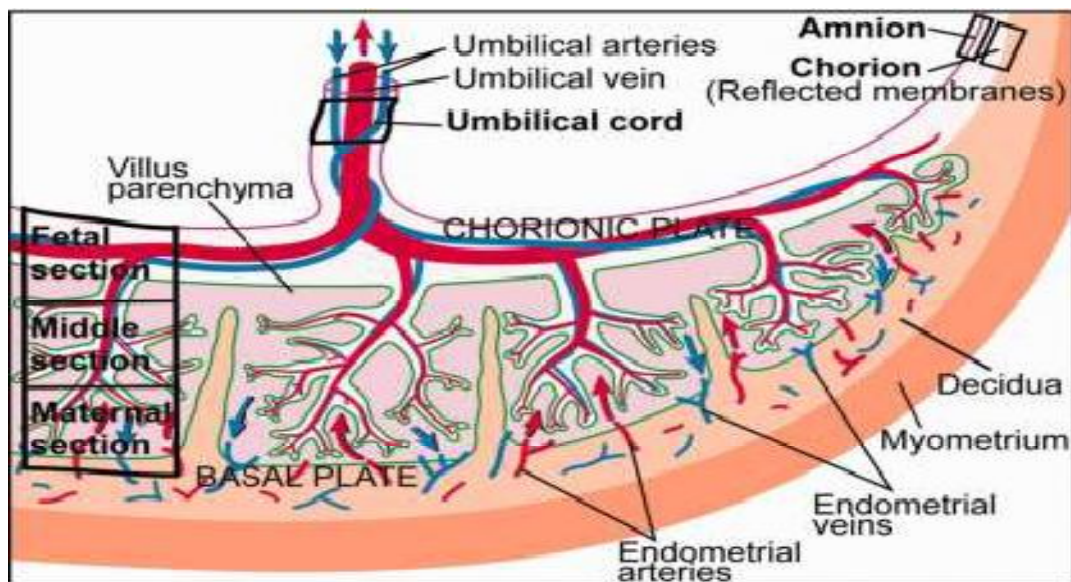


Fig 2-2: structure of the placenta: show the chorionic villi, chorionic plate, umbilical cord maternal blood vessels and intervillous space.

(<http://www.siumed.edu/~dking2/~erg/placenta.htm>)



### **2-1-1 Fetal surface**

The fetal surface of the placenta is covered by a structure called the amnion, or amniotic membrane. The amniotic membrane secretes amniotic fluid, a fluid that is breathed in and out by the fetus and serves as a form of protection and cushion against the walls of the uterus. It also helps maintain constant pressures and temperatures, allows space for fetal growth and protects against infection. It is the amniotic membrane that gives this surface a shiny appearance.

Underlying the amnion is the chorion, a thicker membrane. This structure of the placenta is continuous with the lining of the uterine wall. Emerging from the chorion are the villi where lies a system of fetal capillaries (blood vessels) to allow maximum contact area with the maternal blood (also known as the intervillous space) for gas, nutrient and waste exchange.

Also visible on the fetal surface of the placenta are the umbilical veins and arteries that spread out from where is situated the umbilical cord, near the center of the organ ([http://www.siumed.edu/~dking2/-erg/placenta .htm](http://www.siumed.edu/~dking2/-erg/placenta.htm))

## Fetal surface

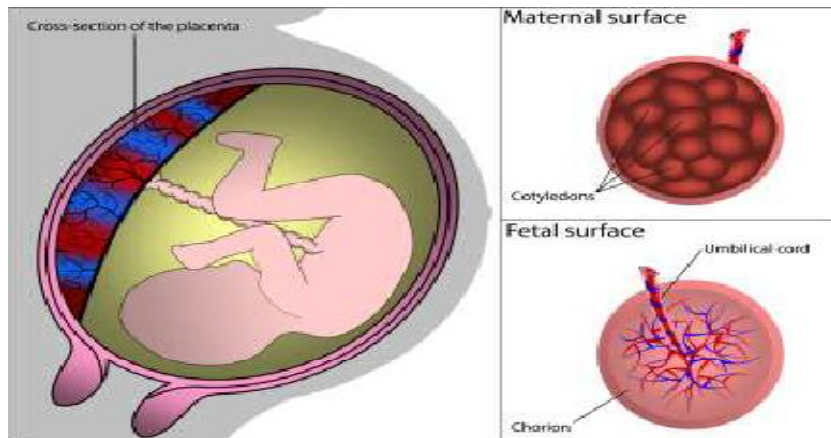


Fig 2-3: the full term placenta showing fetal and maternal surface

(<http://www.inharmony.com>)

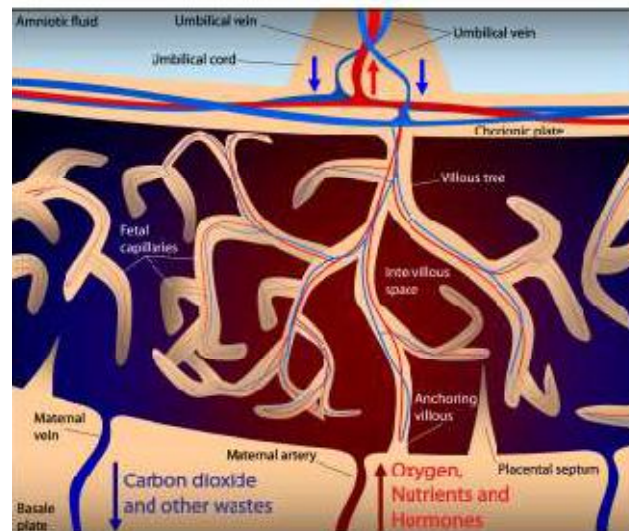


Fig 2-4: showing the Circulation through the placenta

(<http://www.biog1445.org/demo/07/ovaryplacenta.html>)

### 2-1-2 Maternal surface

The maternal surface of the placenta is composed of the decidua, what is known as the uterine lining during pregnancy. Previous to pregnancy the

decidua is more commonly known as the endometrial lining of the uterus. It is this portion that gives this structure a dark red, blood like appearance. There are different portions to the decidua that have specific names according to where they are located and what their function is:

- Decidua capsularis, decidua basalis, decidua placentalis, decidua vera, decidua parietalis
- Also visible on the maternal surface are lobules, approximately 15 to 20 called cotyledons. They are divided by deep channels more commonly known as sulci. Each individual lobule is divided into smaller sections containing one villi. These villi are the same ones emerging from the chorion, containing fetal capillaries, which bathe in the intervillous space (it is important to note that fetal and maternal blood never mixes).
- Embedded in the decidua are maternal veins and arteries that end in the intervillous space. They are also in continuous with the maternal circulation (<http://www.biog1445.org/demo/07/ovaryplacenta.html>)

### **Maternal surface**



Fig 2-5: show the Surface of the placenta on the mother's side

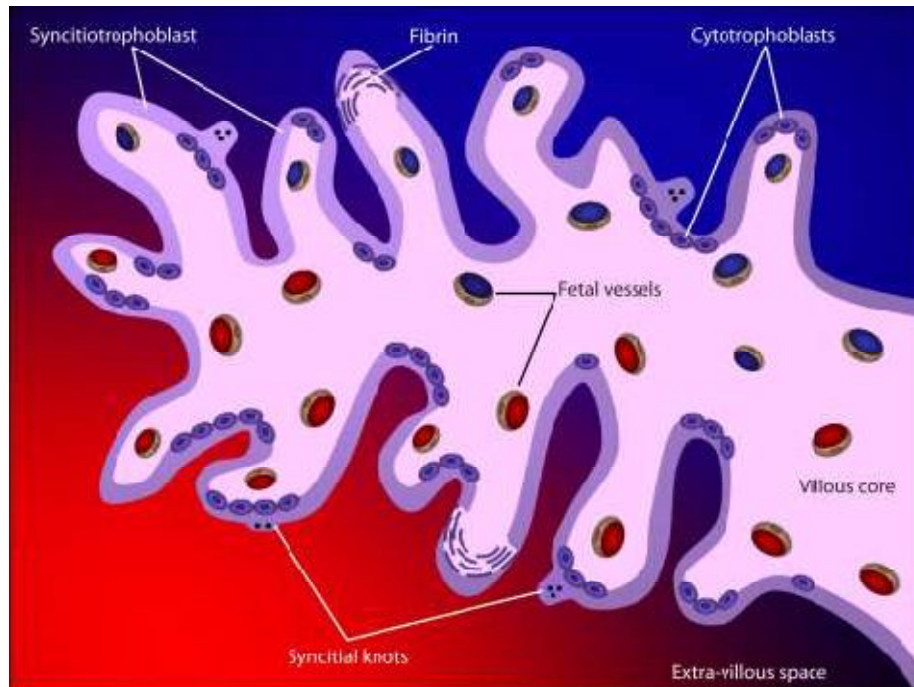


Fig 2-6: show the Functional unit of the placenta called villous  
(Chudleigh &Thilaganathan 2004)

### 2-1-3 Umbilical cord

- The umbilical cord emerges from the fetal side of the placenta to the belly button region of the fetus. At its full length, the cord has an average length of about 50 to 60 cm and can have a width of 2 to 3 cm.
- The cord contains 2 arteries and 1 vein that are in continuation with the fetal circulation. These vessels are longer than the cord and tend to twist and spiral to add strength and protect against entanglement, compression and tension.
- The cord itself is composed of a jelly substance known as wharton's jelly. This substance helps to protect the vessels within the cord.
- The whole of the umbilical cord is encased by the continuous layer of the amnion that is also covering the fetal surface of the placenta (Scanlon and Sanders 2007).

#### 2-1-4 Placental circulation

- Placental circulation encompasses two different circulation systems, the maternal and the fetal. Although these two come in very close contact with each other, they will never mix together, they are separated by what is known as the placental barrier. This organisation keeps the mothers body from rejecting the fetus as an object of foreign origin.
  - These two independent blood flows can be influenced by different factors such as blood pressure, medication, uterine contractions, hormones, etc.
  - It is the nutrients, gases, wastes and hormones that flow through these circulation which can then switch systems (fetal to maternal or vice versa) by mainly diffusion.
  - Diffusion is the process by which particles flow from areas of higher concentration to areas of lower concentrations.
  - These nutrient particles, gases, hormones and wastes can cross directly through the placental membrane by diffusion in either direction to alter fetal or maternal blood concentrations.
- (<http://finleystciencep8.blogspot.com/2010/12/december21diffusionad-osmosis.html>)

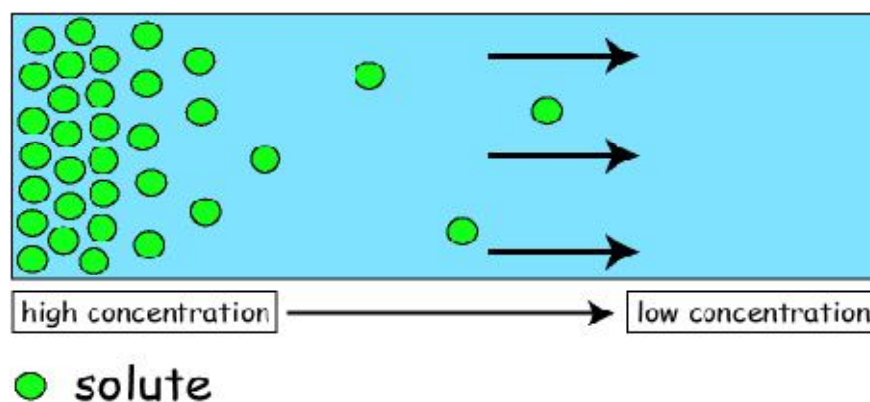


Fig 2-7: show diffusion in placenta circulation

(<http://finleystciencep8.blogspot.com/2010/12/december-21-diffusion-and-osmosis.html>)

### 2-1-5 Fetal circulation

- This circulation system takes place in the fetus, umbilical cord and villi located in the placenta.
- Deoxygenated blood (low oxygen content in blood) from the fetus goes through the two umbilical arteries into the fetal capillaries located in the villi of the placenta. In this section, waste and carbon dioxide (CO<sub>2</sub>) are eliminated from the fetus by diffusing into the maternal circulation and leave the placenta by the maternal vein.

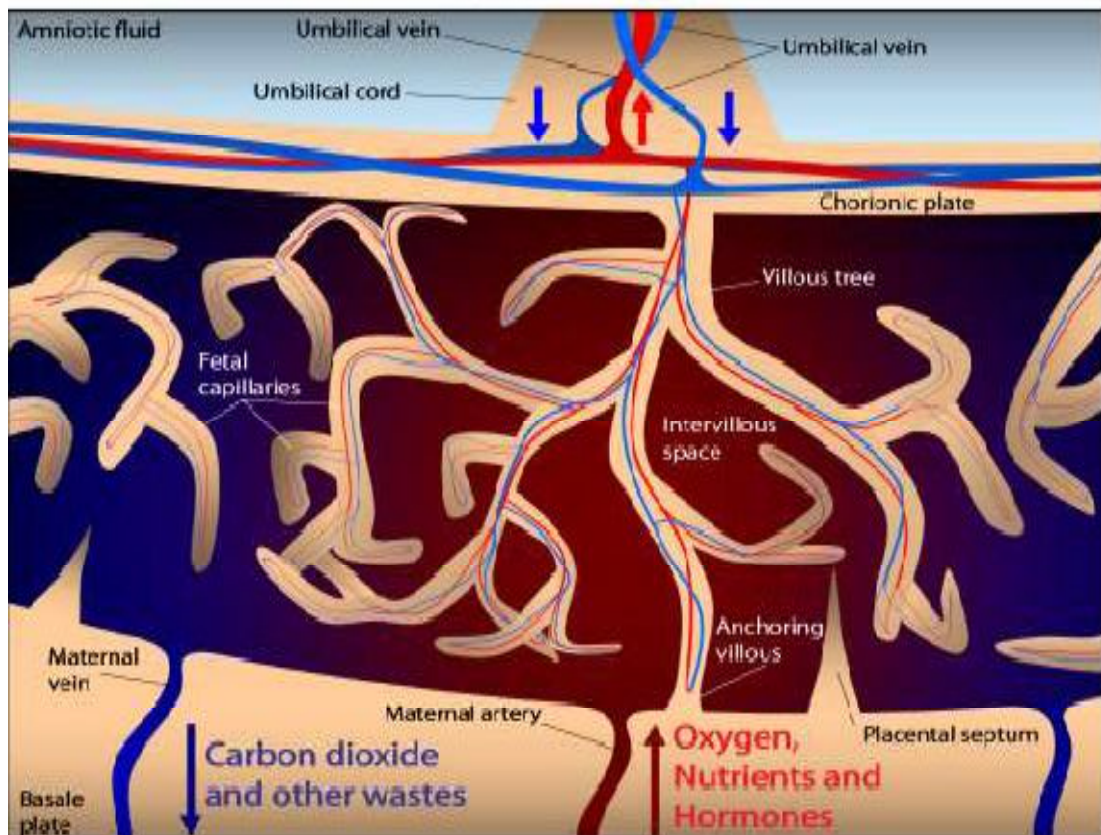


Fig 2-8: showing the placenta circulation gas, nutrient, and waste exchanges between the mother and the fetus

### **2-1-6 Maternal circulation**

- This circulation takes place in the mother and the intervillous space of the placenta.

This circulation is constantly changing to meet the needs of the growing fetus.

- Oxygenated blood (high oxygen content in blood) arriving from the mother enters the placenta through the maternal arteries into the intervillous space. From here, oxygen, nutrients and hormones diffuse into the villi, then into fetal capillaries, where they are now delivered to the baby via the umbilical vein

### **2-1-7 Stages of development**

In order to explain and understand the development and formation of the placenta, it is important to know what happens before in order to get to that stage of the pregnancy. Listed below is a brief description of the different stages during pregnancy:

- First off there is ovulation. Ovulation is when the egg leaves the ovary to make its way through the fallopian tubes in order to be fertilized. Day 0.
- Next, there is fertilization. Fertilization is when there is the fusion of a spermatozoid with the ovulated egg to begin the formation a new baby. The egg is now known as a zygote. Day 1.
- In the next few days, this newly fertilized egg completes many cell divisions in the fallopian tube to end up with a total of 32 cells. All these cells are known as totipotent, which means that they can each become an individual baby. Day 2-4.
- Once the zygote reaches the uterus cell divisions continues and the zygote becomes a blastocyst. At this stage, the cells are no longer totipotent and begin to differentiate into either the developing baby, or the placenta. Day 5.
- The next step is implantation. Implantation is known as the stage where the blastocyst embeds itself in the endometrium, the inner membrane of the

uterus. This usually occurs near the top of the uterus. Day 6-8 (<http://www.biog1445.org/demo/07/ovaryplacenta.html>).

- The process of implantation is complete at about 9-10 days after ovulation.

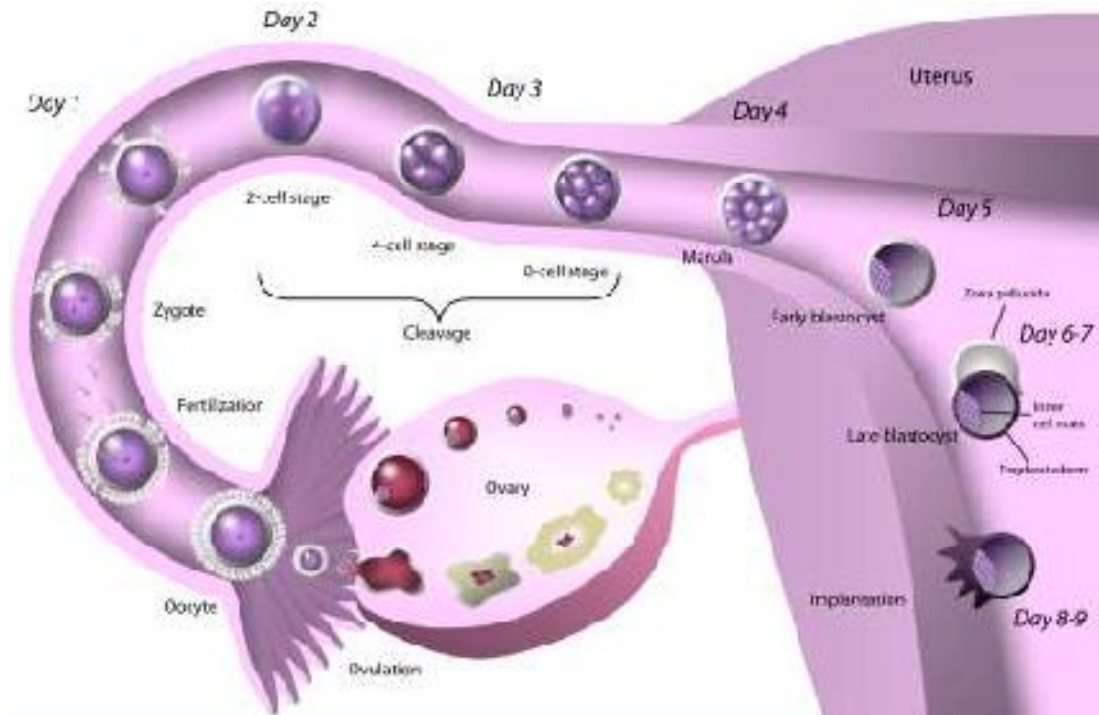


Fig 2-9: show the Ovulation stage

- The formation of the placenta starts off when the baby is a blastocyst. At this stage, it was mentioned that the cells are no longer totipotent and have begun to differentiate. There are 2 different types of cells that can be found, the trophoblast cells and the inner cell mass.
- The trophoblast cells are a layer on the outside of the blastocyst and will become the placenta as well as other membranes while the inner cell mass is located on the inside and will give rise to the baby.



- While the blastocyst is growing, the uterine wall is preparing to accept it and once the blastocyst is in the uterus, implantation can occur, the embedding into the endometrium.
- Because the trophoblast cells are sticky, they will tend to stick to the uterine wall to initiate the implantation. Following this, there is a rapid cell division of the trophoblast to make sure that that the blastocyst can penetrate the endometrium(<http://www.allthingsstemcell.com/tag/regenerative-medicine/>)

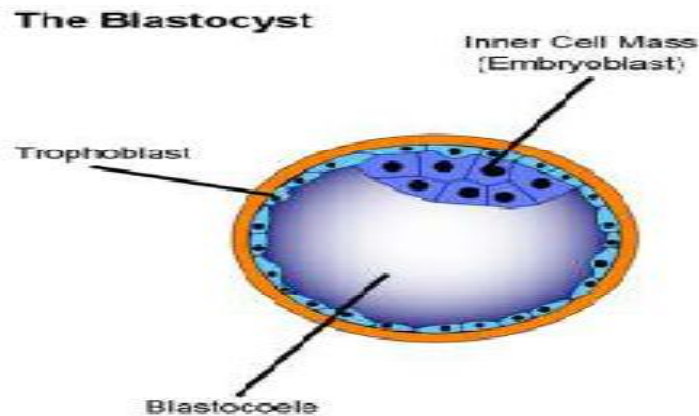


Fig 2-10: showing the Blastocyst

(<http://www.allthingsstemcell.com/tag/regenerative-medicine/>)

- Eventually, the blastocyst is entirely covered by cells of the uterine wall. This completes implantation.
- It is important to keep in mind that during the whole process of development, the fetal cells are always separated from the mothers uterine cells and blood. This separating is done by the trophoblast cells that have differentiated into two different cell types. The layer of cells closest to the baby are known as the chorion.

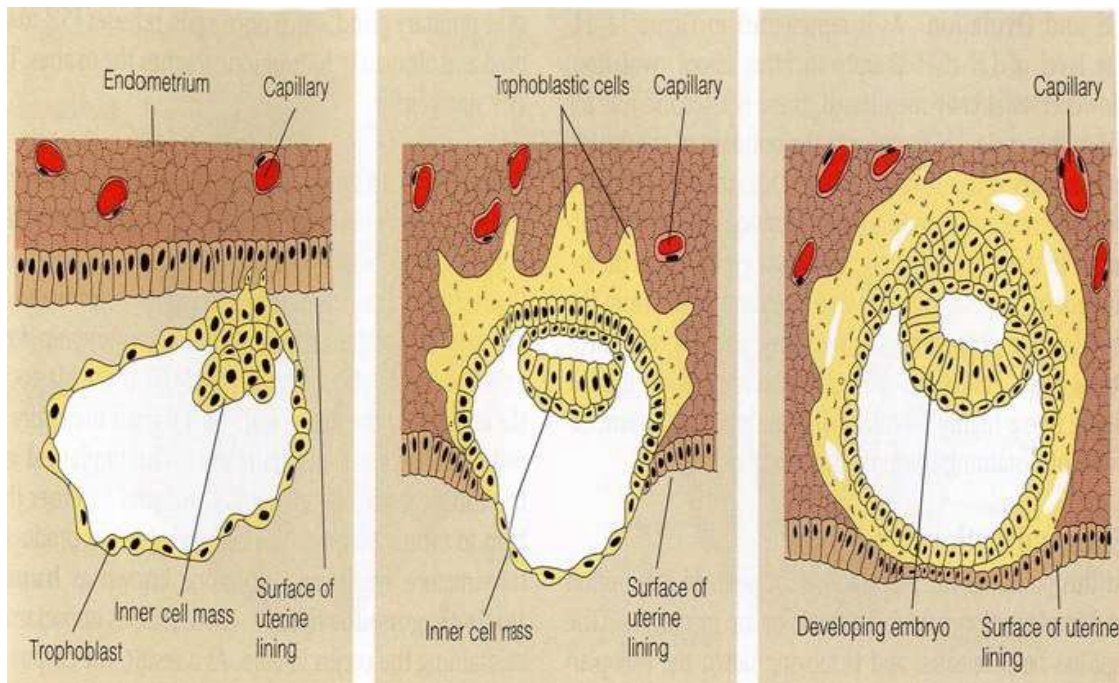


Fig 2-11: show the implantation trophoblast

(<http://mcb.berkeley.edu/courses/mcb135e/Difficult%20Slides/Implantation%203.jpg>)

- During the next few days, the trophoblast cells that are invading the maternal tissue, also known as finger like projections, penetrate maternal blood vessels and start to form pools of blood. Together, these two structures become the chorionic villi (projections of the chorion) and the sinuses. This portion of the

placenta is where all the nutrient, gas and waste exchange occurs without the mixing of blood.

- At this stage, the basic structure of the placenta is formed.
- Finally, the last thing that should be mentioned is the amnion, the membrane that covers the fetal part of the placenta.
- While the placenta is forming, an empty space, the amniotic cavity, has formed between the inner cell mass and the chorion. The cells that are lining this cavity are derived from the inner cell mass and are called the amnion. Therefore, the amnion does not develop from the trophoblast cells but rather from the inner cell mass.
- After a few more weeks, when the baby is bigger, the amnion will fuse with the chorion to form one combined external membrane that will envelop the fetus. (<http://mcb.berkeley.edu/courses/mcb135e/Difficult%20Slides/Implantation%203.jpg>).

## **2-2 Physiology**

- The placenta provides the connection between fetus and mother in order to help carry out many different functions that the growing baby is incapable to do so alone. During pregnancy, the placenta has 6 main roles to maintain good health and a good environment for the growing child:

- Respiration
- Nutrition
- Excretion
- Protection
- Endocrine
- Immunity

### **2-2-1 Respiration**

- Early in pregnancy, the fetus does not have adequate developed lungs to breath on its own, therefore, one of the main functions of the placenta is to help the fetus breathe. It is only after delivery that the child can breath with its own lungs.

- When we breathe, we inhale oxygen and exhale carbon dioxide. This is the same principal with the fetus.

- In response to a pressure gradient between the mothers circulation and the placenta circulation, oxygen rich blood coming from the mother enters the placenta by the maternal artery and diffuses into the fetal blood. The oxygen will travel along the umbilical vein and finally reach the fetus.

- On the other hand, the fetus produces more carbon dioxide then the mother which needs to be eliminated. The carbone dioxide will thus make it's way through the umbilical arteries to the placenta and diffuse from the villi into the intervillous space to be added to the maternal circulation and eliminated by the mothers lungs. . (<http://www.biog1445.org/demo/07/ovaryplacenta.html>).

- This demonstrates the first of many very important roles of the placenta.

### **2-2-2 Nutrition and excretion**

- A good supply of nutrients for the fetus is needed for energy and a healthy growth. Nutrients such as glucose, amino acids and fatty acids are essential to life and are mostly found in the foods we eat. Because the fetus is not physically eating, it is the mother that supplies these nutrients via the placenta.
- Different foods that the mother eats are broken down and transported by the blood to the uterine wall. These nutrients found in the maternal circulation are absorbed by the placenta and can be broken down into smaller particles to facilitate the uptake of these molecules by fetal cells. Some of these nutrients can also be stored in the placenta and used later on when they are needed. The placenta is once again essential to the life of the fetus.
- When we eat, we also produce waste that is eventually excreted. The fetus also produces waste which needs to be eliminated. These fetal wastes cross over into the maternal circulation via the placenta to be also eventually excreted by the mother. (<http://en.wikipedia.org/wiki/placenta>).

### **2-2-3 Protection and immunity**

- The placenta is a very important form of protection. One of its functions is to prevent the mother's body from rejecting the fetus. Because the two can have different chromosomes and blood types, the mother would perceive the fetus as an object of foreign origin and would want to reject it because it is not part of her own tissues. However, this scenario does not happen because the placenta serves as a barrier to prevent the two different circulations from mixing therefore the mother's immune system will not attack the fetus.
- The placenta also plays a role as a protective barrier against bacteria. Most bacteria are too big to cross into the fetal circulation, however, micro-

organisms such as viruses can do so and infect the fetus. Drugs can also cross the barrier and cause harm to the baby. Drugs such as acetaminophen (tylenol) are harmless however others such as warfarin (an anticoagulant) are dangerous to the growing fetus.

- The placenta can also allow certain maternal protective antibodies to cross into the fetal circulation and help protect the fetus from dangerous organisms which can last up to several months after birth. (It is important to consider that not all antibodies are protective and some can be dangerous and cause harm to the fetus.) (<http://en.wikipedia.org/wiki/placenta>)

#### **2-2-4 Hormones**

- Another main function of the placenta is acting as an endocrine gland which is a gland that secretes hormone directly into the blood acting as a regulator for the body. The placenta secretes many different hormones into the blood stream to support pregnancy and fetal growth.
- The 4 main hormones produced by the placenta are human chorionic gonadotropin (hCG), human placental lactogen (hPL), estrogens and progesterone. They all playing a different role and have specific function during pregnancy. few things to know:
  - The corpus luteum is what is left of the follicle once the mother has ovulated. It produces progesterone and helps to thicken the uterine wall for the implantation of the fertilized egg. It will continue to produce this hormone until the placenta can take over. The corpus luteum is also important to maintain a healthy pregnancy. (<http://en.wikipedia.org/wiki/placenta>)

##### **1) Human chorionic gonadotropin (hCG)**

- This hormone, produced by the villi of the placenta, has the essential role of maintaining the corpus luteum during the early stages of pregnancy therefore maintaining adequate levels of progesterone until the placenta can take over. Once the placenta is able to produce the right amount of progesterone on its

own, at about the 8th week of pregnancy, hCG levels drop and stay relatively low.

- When taking a pregnancy test, it is the level of hCG, detected in the urine, that will give the result of a positive pregnancy. ([http://www.glowm.com/?p=glowm.cml/section\\_view&articleid=310](http://www.glowm.com/?p=glowm.cml/section_view&articleid=310))

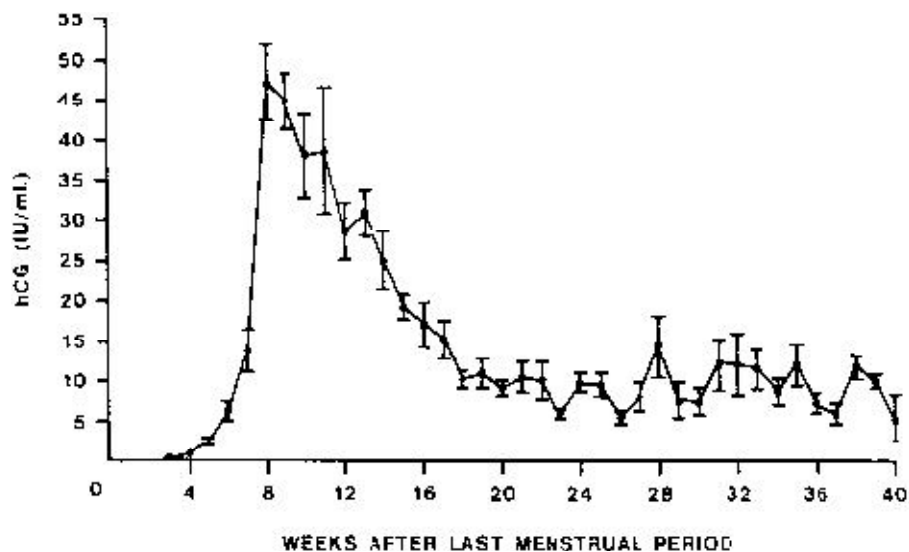


Fig 2-13: showing the human chorionic gonadotropin (hCG)

([http://www.glowm.com/?p=glowm.cml/section\\_view&articleid=310](http://www.glowm.com/?p=glowm.cml/section_view&articleid=310))

## 2) Human placental lactogen (hPL)

- This hormone has an important function in fetal growth by regulating the amount of glucose (sugar) that is available for the baby. As previously mentioned, glucose is a form of food for the fetus in order for it to grow healthy. (<http://.en.wikipedia.org/wiki/plaentas>)

- hPL will cause the mothers body to use more fats to produce her own energy and decrease her use of glucose. As a result, this will increase the amount of sugar available for the baby in order for it to grow. With this said, hPL acts like a growth hormone during pregnancy.
- Human placental lactogen is produced in small quantities at the beginning of pregnancy and increases constantly during the next 9 months to arrive at its peak near term. (Maternal-fetal Medicine: Principles and practices, 5th edition (p.128))

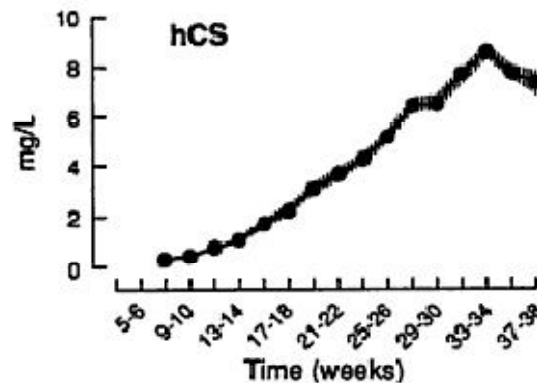


Fig 2-14: show the hPL is also known as hCS (human chorionic somatomammotropin)

(Maternal-fetal Medicine: Principles and practices, 5th edition (p.128))

### 3) Progesterone

- Progesterone is produced by the corpus luteum until the placenta can take over. This hormone plays several different roles throughout pregnancy while its secretion constantly rises until birth of the baby.
- Progesterone plays an important part for decreasing the myometrial activity. The myometrium is a layer in the uterine wall composed of smooth muscle that can contract. Therefore, this hormone decreases uterine contractions to allow for better implantation and growth. This is done by inhibiting the



secretion of prostaglandins, a molecule that regulates the contraction and relaxation of smooth muscle.

- Another role that progesterone plays is to maintain pregnancy by decreasing the immunologic response of the mothers body towards the Baby. This will prevent the rejection of the fetus.
- Progesterone is also important for the baby by acting as a substrate for the production of different molecule usually produced by the adrenal gland, a gland that sits on top of the kidney. Because the baby does not have all the material necessary to make those different molecules, progesterone secreted by the placenta helps achieve these.(<http://www.i-ampregnant.com/encyclopedia/Pregnancy/Progesterone-Levels>)



Fig 2-15: showing the Progesterone Level during Pregnancy

(<http://www.i-ampregnant.com/encyclopedia/Pregnancy/Progesterone-Levels>)

#### **4) Estrogens**

- Estrogen is also produced by the corpus luteum before the placenta can take over. Its secretion also rises constantly during pregnancy and plays different roles throughout this time.
- Estrogen plays a role in child birth and determining when the time is right. This hormone has different functions such as increasing prostaglandin production and increasing myometrial activity to determine the time of labour.
- Estrogen also increases blood flow to the baby which in turn will increase the amount of oxygen and nutrient available to the fetus.
- Another role played by estrogen is to increase the secretion of another hormone, prolactin. Prolactin stimulates the mammary glands (breast) to produce milk during pregnancy and it is only near the end of the 9 months that milk production will start, when progesterone levels drop. In other words, estrogen prepares the breast for lactation. (<http://en.wikipedia.org/wiki/placenta>

### **2-3 Pathology of Placenta**

#### **2-3-1 Hydatidiform Mole**

a- Total Hydatidiform Mole It is abnormal pregnancy where all placental villi change to molar vesicles and fill uterine cavity while there is no embryo fetus nor umbilical cord. Amnion is, however, found in some cases. No capillary vessel is noted in the molar cyst which is covered by proliferated trophoblast. Microscopically found molar cyst of diameter less than 2mm is called microscopic mole.

Trophoblasts are scattered in the decidua and myometrium and are called syncytial endometritis. Molar cysts may spread into blood vessels which is intravascular mole, and rarely metastasis appear in distant organs [Kurjak and Chervenak 2006]. It is partial change of placental villi into the mole, which is

associated with embryo, fetus or fetal parts Fetal anomalies are common  
Capillary vessels are found in molar interstitium [Kurjak and Chevernak 2006]

#### b- Invasive Hydatidiform

It is the invasion of molar cysts into myometrium with destruction and hemorrhage .Intravascular mole and placental polyp are excluded from the invasive mole .The lesion is formed either in total or partial mole usually after the molar evacuation, although the invasive may develop before the termination, The microscopically confirmed where the trophoblast proliferate , hemorrhage and necrosis are found in the myometrium [Kurjak and Chervenak 2006].

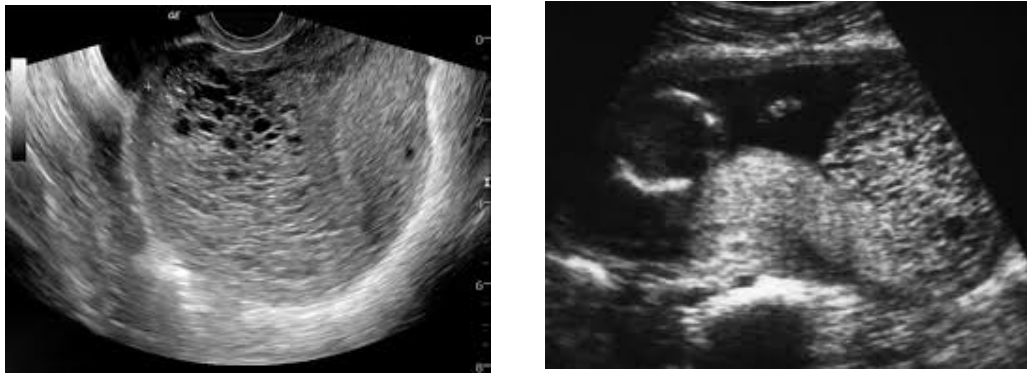


Fig 2-16: Invasive Hydatidiform

(<http://en.wikipedia.org.placenta> image)

#### 2-3-2 Choriocarcinoma

It is solid trophoblastic tumor developed primarily in myometrium or in distant organs and tissues usually after the removal of total or partial hydatidiform mole and also infrequently after the abortion or deliveries. They are gestational choriocarcinoma or gestational trophoblastic disease {GTD}. Non-gestartional choricacinoma develops from germ cells or other cancer cells in children Choriocarcinoma is constructed of syncio-and cyto-

trophoblast and shows no villus pattern at all .Since villus pattern is characteristic sign of invasive mole and its outcome is less ominous than choriocarcinoma. microscopic studies should be detailed on whole specimen after hysterectomy Wide spread distant metastases of choriocarcinoma were common before the introduction of effective chemotherapy in this field,The interval of its diagnosis and metastases was about half to one year ,subsequent frequent was the lung .Any organs or tissues were affected after pulmonary metastasis e.g. skin , subcutaneous tissue, intestine ,liver,spleen ,kidney, heart ,and brain .Tumor cells were found also in blood vessels .Every organ is damaged by the trophoblasts and hemorrhage .Patients died from brain metastasis and multiple metastases due to the damage and dysfunction.[Kurjak and Chervenak 2006]

### **2-3-3 Intervillous Thrombosis**

Intervillous thrombosis represents bleeding from fetal vessels. It is characterized as intraplacental areas of hemorrhage with variable appearance dependant on the age of lesion .Fresh lesions are dark red ,with aging become brown ,yellow and finally white .Intervillous thrombosis may found in up to 50 of the term placentas .Ultrasound appearance of intervillous thrombosis is an .They can be as small as few millimeters up to few centimeters in subchorionic space or basal plate ,The clinical significance of intervillous thrombosis is in the possible presence of fetal maternal hemorrhage .Microscopically, fetal and maternal red blood cells may be present and the incidence in the Rh isoimmunisation [Kurjak and Chervenak 2006].

### **2-3-4 Placental Infarcts**

Placental infarction results from disruption of blood supply to the placenta .As placenta is completely dependent on the maternal blood supply , there is underlying problem in maternal blood supply resulting in coagulation

necrosis of villi In the most circumstances infarcts are present on the placental basis, in the close proximity to the basal plate and they are variable in size .Small infarcts found in 1/4 of the placenta without clinical significance ,but they are frequently related preeclampsia and essential hypertension [ Kurjak and Chervenak 2006].



Fig 2-17: show Placental Infarcts

(<http://en.wikipedia.org.placenta> image)

### 2-3-5 Placental Abruption

Placental abruption is acute separation of the placenta from the uterus prior to delivery of the fetus .The symptoms include, pain ,uterine tenderness and abdominal pain and it is usually accompanied with vaginal bleeding such. bleeding ,if excessive may cause maternal hypovolemia and shock , while severe forms of abruption result in diminish fetoplacental transfer and consequently may cause fetal death in uterus [Kurjak and Chervenak 2006].

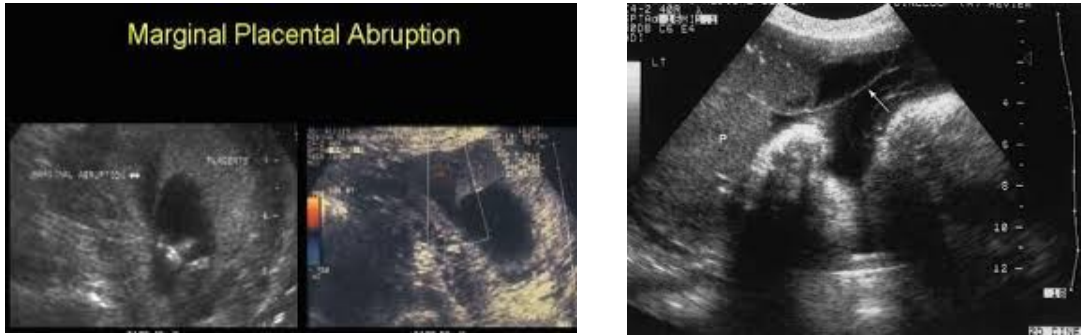


Fig 2-18: show Placental Abruption

([http://en.wikipedia.org.placenta image](http://en.wikipedia.org.placenta_image))

### 2-3-6 Placenta Circumvallata

In the normal placenta , the fetal membranes insert into the edge of the placenta .In placenta circumvallata they insert some distance along the fetal surface, leaving an area of placenta free of membranes .The site of insertion is usually marked by a depression in surface of the placenta .The membrane-free area tends to separate and bleed, but rarely causes more than a little spotting. However, the condition has a high incidence of fetal growth restriction .It is probably responsible for small proportion of all antepartum hemorrhage. [Chudleigh and Thilaganathan 2004]



Fig 2-19: show Placenta Circumvallata

([http://en.wikipedia.org.placenta image](http://en.wikipedia.org.placenta_image))

### 2-3-7 Placenta Previa

The term [placenta previa] refer to a placenta that [previous] to the fetus in the birth canal, Bleeding in second and third trimesters in the hallmark of placenta previa. This bleeding can be life threatening to mather and fetus . Accurate diagnosis of placenta previa is vital to improve the outcome for mother and neonate. The placenta is classified to;

- a- complete placenta previa; describes the situation in which the internacervical os is totally covered by the placenta.
- b- Marginal placenta previa; denotes placenta tissue at the edge of or encroaching on the internal os.
- c- Low placenta; is one in which the placenta edge is within 2cm, but not covering any portion the internal cervical os. [Rumach et al 2011]

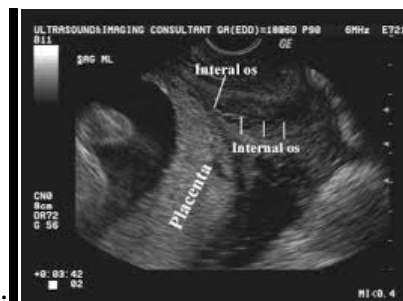


Fig 2-20: show Placenta Previa

(<http://en.wikipen.ord.placenta image>)

### 2-3-8 Placenta Accrete

Placenta accrete is defined as abnormal adherence of part or all of the placenta to the underllyng uterine wall. A deficiency of decidua at the implantation site may result from implantation of the placenta close to or cover the cervix [placenta previa]. A similar ay situation arise when implantation occurs on

scars from a previous cesarean section .Owing to the absence of decidua, the placenta does not separate normally from the underlying uterine wall following parturition , an event that can result in life -threatening bleeding ,[Rubin -Farber1999] .

Placenta accrete is sub classified according to the depth that the villi invade in to the myometrium;

a- placenta accrete ; refers to the attachment of villi to the with out further invasion . myometrium .

c- placenta precreta; is a condition in which the villi penetrate the full thickness of the uterine wall [ Rubin - Farber 1999] .

The placenta villi in all these placental disorders are normal and show no evidence of trophoblastic proliferation [Rubin &Farber1999]. The placenta villi in all these placental disorders are normal and show no evidence of trophoblastic prolifration (Robin & Farber 1999) .

Most patients with placenta accreta have a normal pregnancy and delivery .How ever complications may occur during pregnancy ,delivery, or specially in the immediate postpartum state. Bleeding in the third trimester the most common presenting sign before delivery. Utrine rupture, before, during, or after labor occurs in 15% of the patients with placenta accreta . Substantial fragments of placenta may remain adherent following delivery and are a source of postpatum hemorrhage . Placenta accreta is aserouis complications and is associated with) maternal death (Robin & Farber 1999).



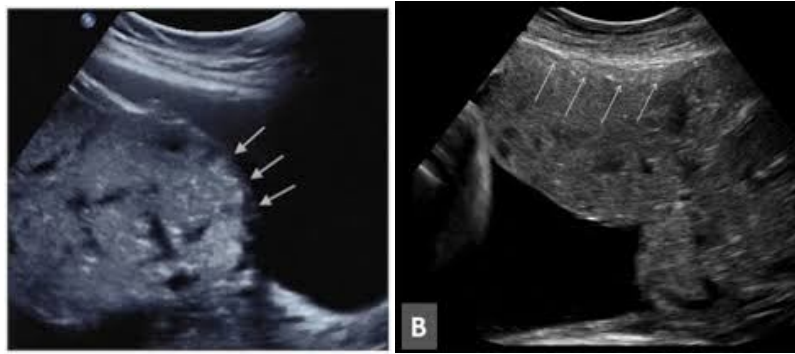


Fig 2-21: show Placenta Accrete

(<http://en.wikipen.ord.placenta image>)

### 2-3-9 Villitis

Is inflammations of the villi. Infection of the villi result from endometritis or trans placental passage of organisms deilver by way of the maternal circulation. The processes is frequently focal. While the infection can not be domonstrated in most cases, the micro organisms causing this type of infection include : bacteria , viruses, parasites and protozoa and fungi . The most important sequence of hematogenous placental infection is establishment of an inflamatory focus (Robin & Farber 1999) .



Fig 2-22: show Villitis

(<http://en.wikipen.ord.placenta image>)

### **2-3-10 Chorioamnionitis**

Chorioamnionitis refers to inflammation of the placental amnion and chorion and external placental membrane. It is usually of an ascending infection from the maternal birth canal. In this type of infection, the inflammatory process affects the membranes (chorioamnionitis) rather than the chorionic villi. Acute chorioamnionitis is important because of its occurrence in 20% of placentas and its clear association with preterm labor, fetal and neonatal infections and intra uterine hypoxia. The risks of chorioamnionitis to the fetus include:

- a . Pneumonia after inhalation of infected amniotic fluid .
- b . Skin or eye infections from direct contact with organisms in the fluid .
- c . Neonatal gastritis, enteritis or peritonitis from ingestion of infected fluid .

Major risks to the mother are intrapartum fever, postpartum endometritis, and pelvic sepsis with venous thrombosis .( Robin & Farber 1999) .

### **2-4 Previous Study**

Hammad (2008) investigated the placental thickness in the third trimester, he showed a linear relationship between Placental thickness in mm and gestational age in weeks .He found that Placental thickness increases with the fetal age. His conclusion is that the measurement of placental thickness is an important parameter for estimating gestational age in normal singleton pregnancies along with other parameters.

Elamin (2012) studied the relationship between placental thickness and fetal age in Sudanese women. She found that the placental thickness increases with gestational age. She also found that there is a significant positive correlation between placental thickness and LMP, biparietal diameter (BPD), (AC) and

(FL). Her study show linear regression between placental thickness and last (LMP),(BPD) ,(AC) and(FL).

Younis (2015) explain the relationship between the placental thickness in the( second and third trimester )and fetal weight by measurement the abdomen circumference (AC)and biparietal diameter (BPD),and the placental thickness and studies the correlation between them. He found there is positive significant correlation between placental thickness and fetal age .Also he found there is positive significant correlation between placental thickness and biparietal diameter (BPD) and abdomen circumference(AC) respectively .Also he found that the fetal weight increase with increase placental thickness .

## **CHAPTER THREE**

### **Materials and Method**

#### **3-1 Population of the Study**

This descriptive Study includes fifty pregnant women in second and third trimesters came to the ultrasound department for regular checkup .The selected women were attending with viable singleton and uncomplicated pregnancies.

Patients with pregnancy induced hypertension (PIH); diabetes Mellitus; history of previous intrauterine growth retardation (IUGR); congenital malformation; twin gestation and placental anomalies were excluded from the study.

#### **3-2 Area and duration of the Study**

The study is held in ultrasound department in Wad Medni and Abo osher hospital in Sudan from May 2016 to November 2016.

#### **3-3 Equipments**

Sonography was carried out on each patient include in the study using ultrasound machine Toshiba transabdominal convex transducer with frequency of 3.5 MHz and ultrasound gelee

#### **3-4 Method of Data Collection**

In this study; fifty pregnant women scanned by Transabdominal probe in second and third trimesters. After checking that the pregnancy is normal; the fetal weight was estimated by measuring the biparietal diameter (BPD) and abdomen circumference (AC).The placental thickness was measured in

longitudinal section at the point of umbilical cord insertion . Fetal age was estimated by measuring biparietal diameter (BPD). The date was recorded in the data collecting sheet. Other variables including maternity age, gravidity were also included in the data collecting sheet.

### **3-5 Data Analysis**

After measurements and data collection . the data is analyzed by using Statistical Package for Social Sciences (SPSS).The relation between placental thickness and biparietal diameter(BPD);abdomen circumference (AC); and estimated fetal weight (EFW) is established by Pearson's correlation analysis.

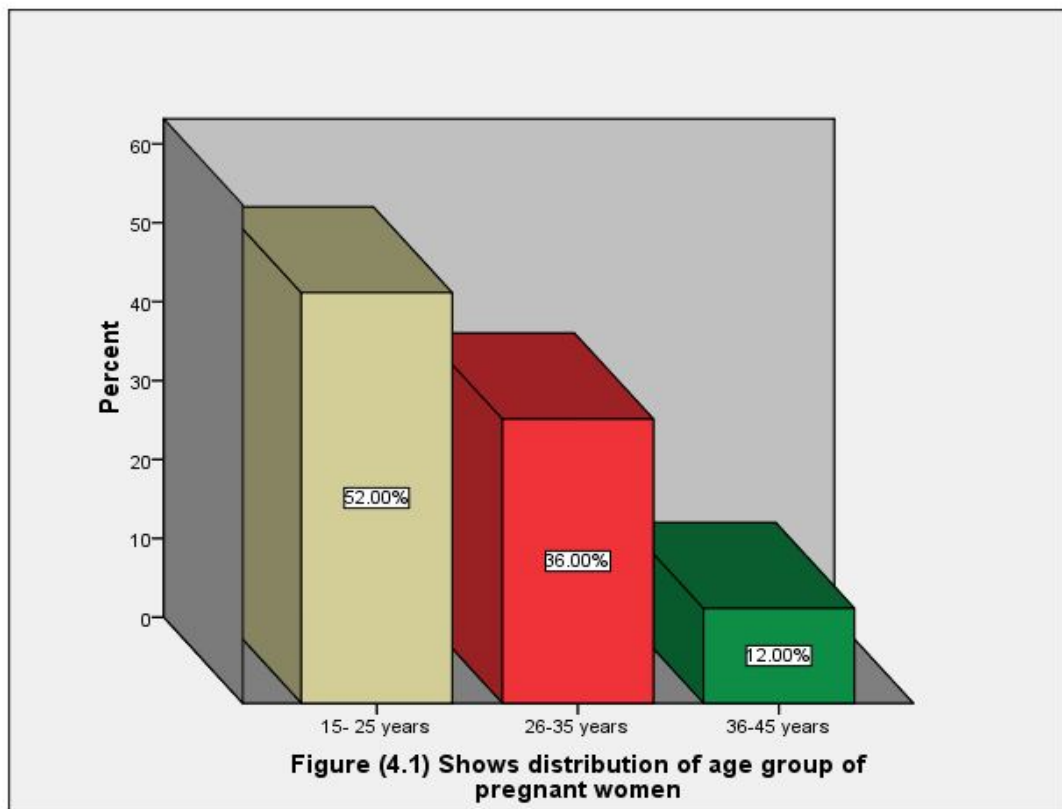
# CHAPTER FOUR

## Results

**Table (4-1):** shows Frequency distribution of age group of pregnant women

| Age group    | Frequency | Percent | Valid Percent | Cumulative Percent |
|--------------|-----------|---------|---------------|--------------------|
| 15- 25 years | 26        | 52.0    | 52.0          | 52.0               |
| 26-35 years  | 18        | 36.0    | 36.0          | 88.0               |
| 36-45 years  | 6         | 12.0    | 12.0          | 100.0              |
| Total        | 50        | 100.0   | 100.0         |                    |

Minimum = 17 years, maximum = 41years,means = 27.04, std=6.63



**Table (4-2): shows minimum , maximum ,means and Std. deviation for mother age, thickness of placenta, HC mm, FL mm, BPD mm, fetal weight per Kg, Gestational age per weeks and placenta thickness per cm**

| <b>Variable</b>           | <b>N</b> | <b>Min</b>        | <b>Max</b> | <b>Mean</b>         | <b>Std. Dev.</b>  |
|---------------------------|----------|-------------------|------------|---------------------|-------------------|
| Age of mother             | 50       | 17.00             | 41.00      | 27.0400             | 6.63313           |
| Thickness of placenta     | 50       | 14                | 54         | 32.94               | 8.821             |
| HC per mm                 | 50       | 144               | 348        | 266.98              | 56.340            |
| AC per mm                 | 50       | 122               | 352        | 254.00              | 66.122            |
| FL per mm                 | 50       | 24                | 79         | 56.08               | 15.034            |
| BPD per mm                | 50       | 39                | 98         | 72.74               | 16.101            |
| Fetal weight per kg       | 50       | .22               | 3.84       | 1.6895              | 1.00049           |
| Gestational age per week  | 50       | 17.43<br>(17w 3d) | 40.00      | 29.9257<br>(29w 6d) | 6.35427<br>(6w2d) |
| Placenta Thickness per cm | 50       | 1.40              | 5.40       | 3.2940              | .88211            |
| Valid N (listwise)        | 50       |                   |            |                     |                   |

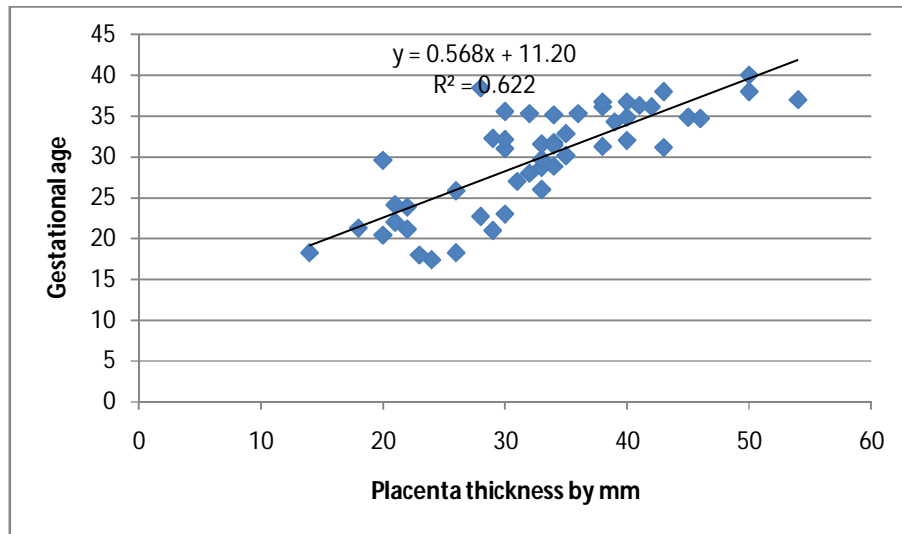


Figure (4.2): scatter plot shows relation between placenta thickness per mm and gestational age per week

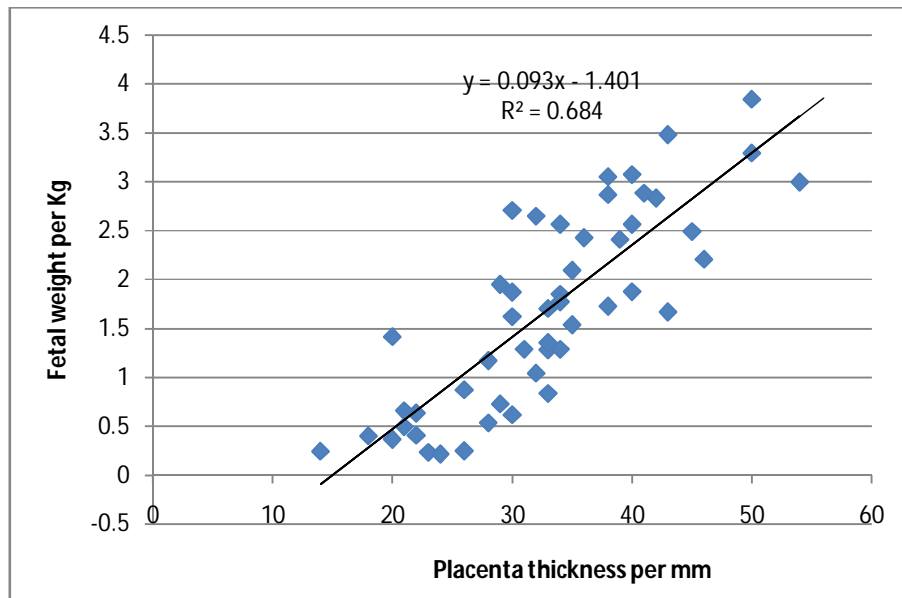


Figure (4.3): scatter plot shows relation between placenta thickness per mm and fetal weight per Kg



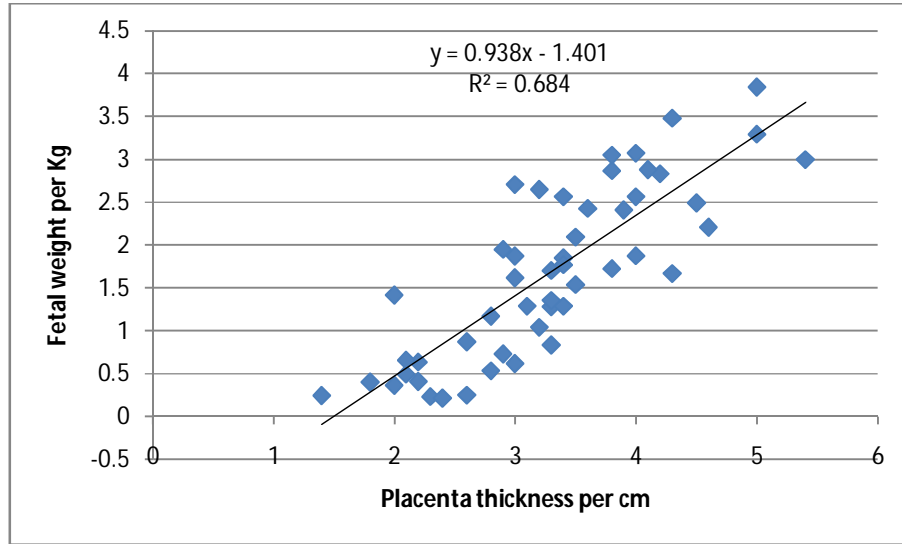


Figure (4.4) scatter plot shows relation between placenta thickness per cm and fetal weight per Kg

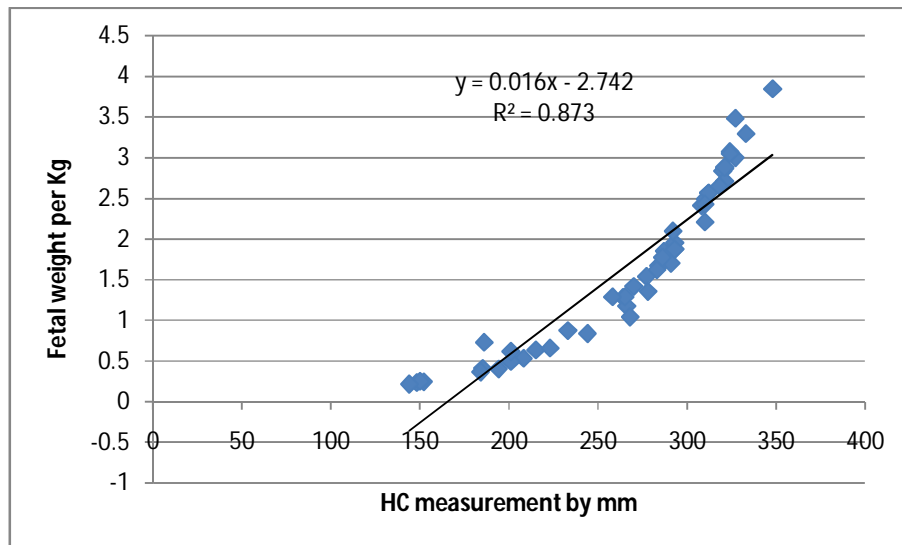


Figure (4.5): scatter plot shows relation between HC measurement per mm and fetal weight per Kg

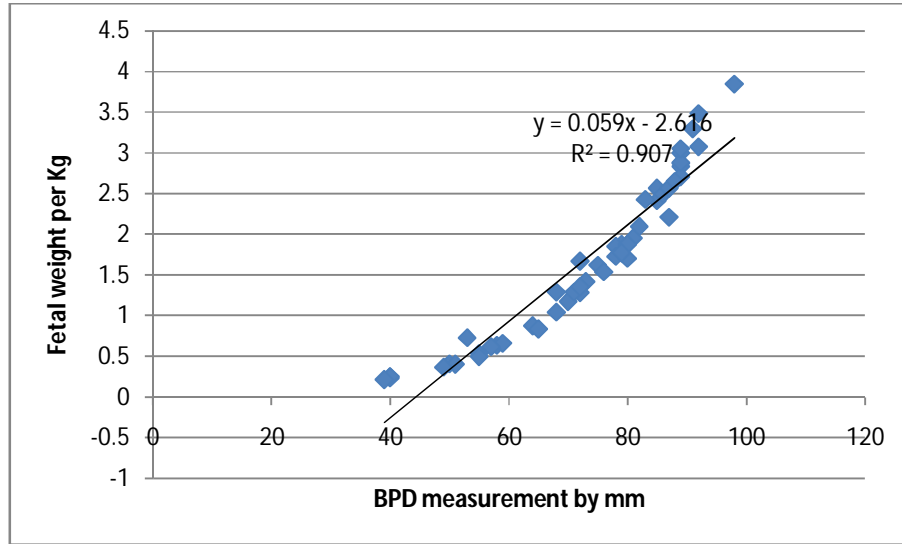


Figure (4.6): scatter plot shows relation between BPD measurement per mm and fetal weight per Kg

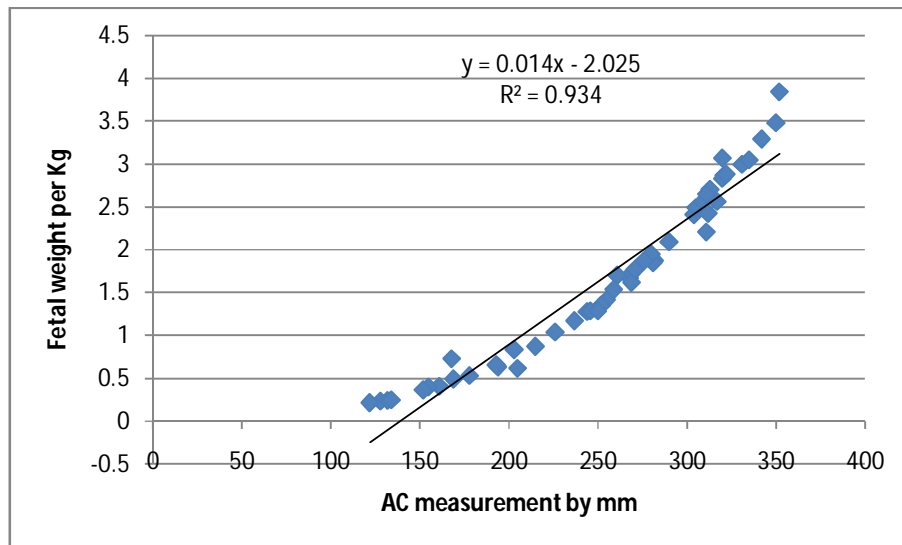


Figure (4.7): scatter plot shows relation between AC measurement per mm and fetal weight per Kg

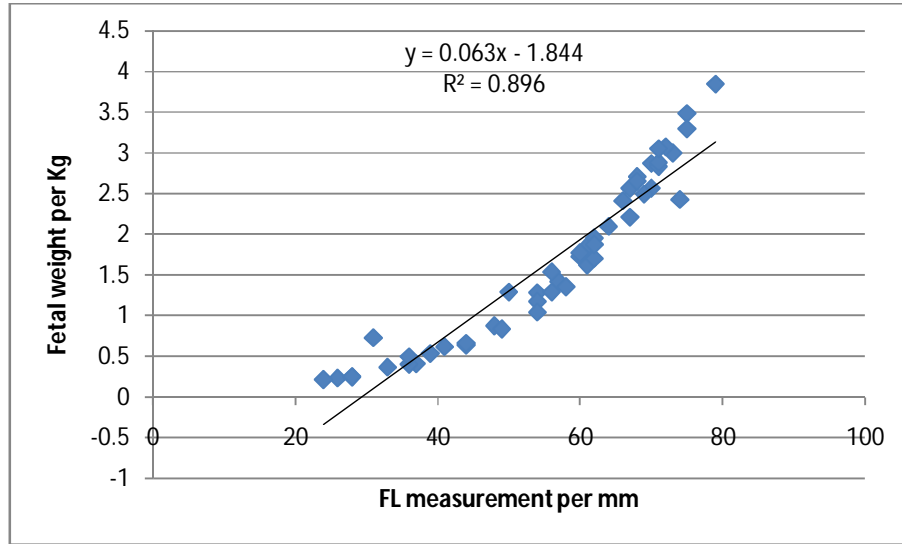


Figure (4.8): scatter plot shows relation between FL measurement per mm and fetal weight per Kg

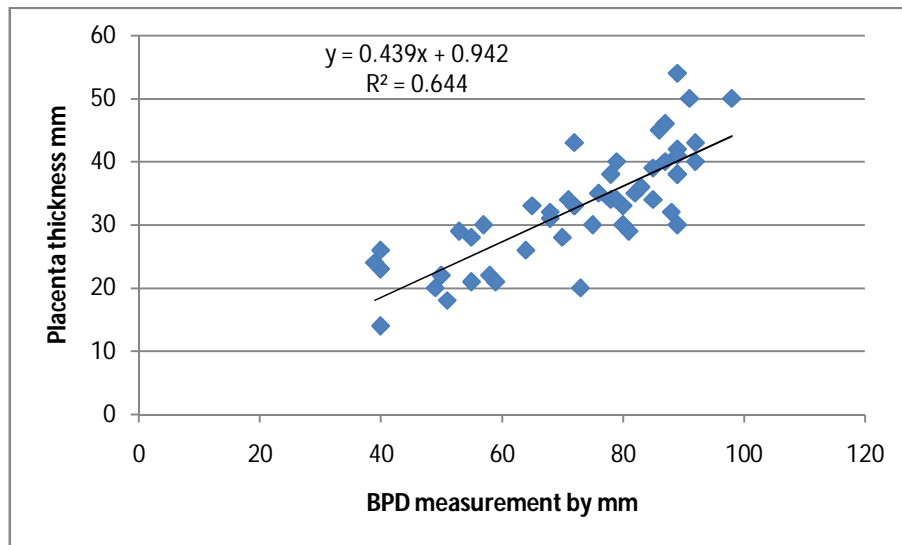


Figure (4.9): scatter plot shows relation between placenta thickness measurement per mm and BPD by mm

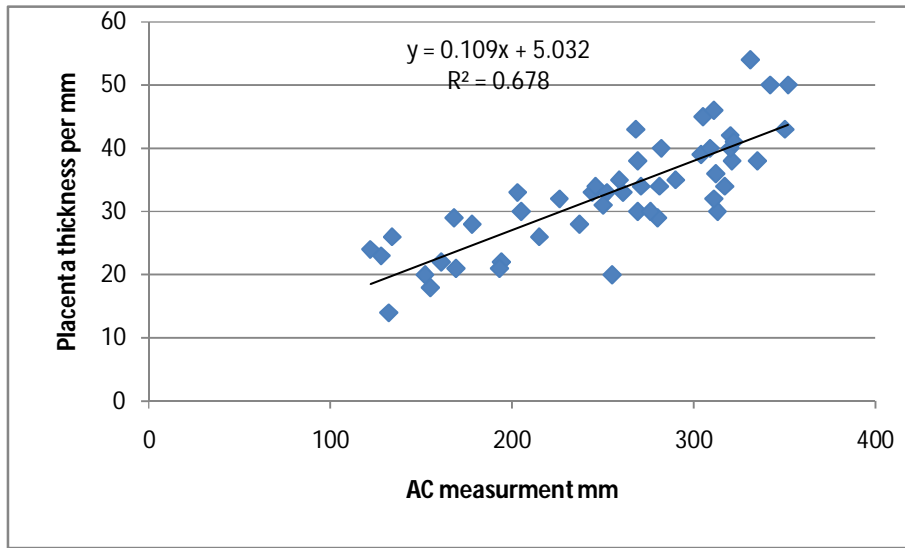


Figure (4.10): scatter plot shows relation between placenta thickness measurement per mm and BPD by mm

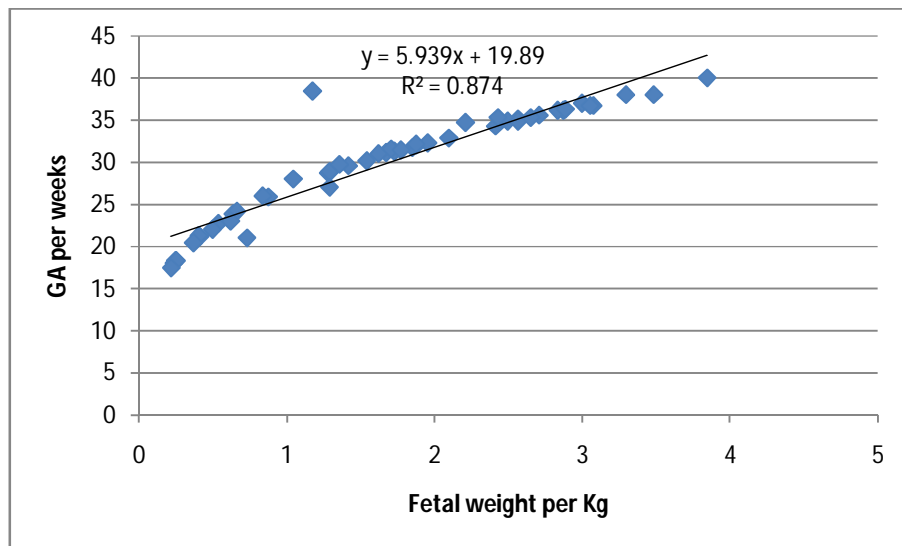


Figure (4.11): scatter plot shows relation between GA per weeks and fetal weight per Kg

**Table (4-3): shows Prediction for estimation of fetal weight by using of Placenta thickness cm, AC mm, FL mm, HC mm**

| Model                 | Unstandardized Coefficients |            | Standardized Coefficients | T      | Sig. |
|-----------------------|-----------------------------|------------|---------------------------|--------|------|
|                       | B                           | Std. Error | Beta                      |        |      |
| (Constant)            | -1.434                      | .321       |                           | -4.473 | .000 |
| Placenta Thickness cm | .085                        | .069       | .075                      | 1.220  | .229 |
| AC mm                 | .022                        | .004       | 1.425                     | 5.640  | .000 |
| FL mm                 | .008                        | .022       | .127                      | .392   | .697 |
| Hc mm                 | -.012                       | .005       | -.655                     | -2.327 | .025 |

a. Dependent Variable: weight

Estimated Fetal weight per Kg =  $-1.434 + 0.085 \times \text{placenta thickness per cm} + 0.22 \times \text{ACmm} + 0.008 \times \text{FLmm} - 0.012 \times \text{HCmm}$

**Table (4-4): shows Prediction for estimation of fetal weight by using of Placenta thickness cm, AC mm, BPD mm**

| Coefficients <sup>a</sup> |                             |            |                           |        |      |
|---------------------------|-----------------------------|------------|---------------------------|--------|------|
| Model                     | Unstandardized Coefficients |            | Standardized Coefficients | T      | Sig. |
|                           | B                           | Std. Error | Beta                      |        |      |
| (Constant)                | -1.993                      | .243       |                           | -8.213 | .000 |
| Placenta Thickness cm     | .106                        | .075       | .093                      | 1.417  | .163 |
| AC mm                     | .015                        | .004       | 1.007                     | 3.721  | .001 |
| BPD mm                    | -.007                       | .016       | -.118                     | -.459  | .648 |

a. Dependent Variable: weight

Estimated fetal weight per Kg =  $-1.993 + 0.106 \times \text{placenta thickness cm} + 0.015 \times \text{ACmm} - 0.007 \times \text{BPDmm}$

**Table (4-5): shows Prediction for estimation of fetal weight by using of Placenta thickness cm, AC mm, BPD mm**

| <b>Coefficients</b>   |                                    |                   |                                  |          |             |
|-----------------------|------------------------------------|-------------------|----------------------------------|----------|-------------|
|                       | <b>Unstandardized Coefficients</b> |                   | <b>Standardized Coefficients</b> | <b>T</b> | <b>Sig.</b> |
|                       | <b>B</b>                           | <b>Std. Error</b> | <b>Beta</b>                      |          |             |
| (Constant)            | 19.170                             | 1.505             |                                  | 12.740   | .000        |
| Placenta Thickness cm | .350                               | .660              | .049                             | .529     | .599        |
| Weight                | 5.685                              | .582              | .895                             | 9.762    | .000        |

Dependent Variable: gestational age

$$\text{gestational age per week} = .350 \times \text{placenta thickness} + 5.685 \times \text{fetal weight} + 19.170$$

**Table (4.6): shows correlation between placenta thickness, weight, AC, FL, BPD and gestational age**

| Variables  |                     | thickness | weight | HC     | AC     | FL     | BPD    | GA     |
|--|---------------------|-----------|--------|--------|--------|--------|--------|--------|
| Thickness  | Pearson Correlation | 1         | .827** | .799** | .824** | .807** | .803** | .789** |
|  | Sig. (2-tailed)     |           | .000   | .000   | .000   | .000   | .000   | .000   |
|  | N                   | 50        | 50     | 50     | 50     | 50     | 50     | 50     |
| Weight   | Pearson Correlation | .827**    | 1      | .935** | .967** | .947** | .953** | .935** |
|  | Sig. (2-tailed)     | .000      |        | .000   | .000   | .000   | .000   | .000   |
|  | N                   | 50        | 50     | 50     | 50     | 50     | 50     | 50     |
| HC   | Pearson Correlation | .799**    | .935** | 1      | .985** | .992** | .994** | .973** |
|  | Sig. (2-tailed)     | .000      | .000   |        | .000   | .000   | .000   | .000   |
|  | N                   | 50        | 50     | 50     | 50     | 50     | 50     | 50     |
| AC   | Pearson Correlation | .824**    | .967** | .985** | 1      | .989** | .989** | .968** |
|  | Sig. (2-tailed)     | .000      | .000   | .000   |        | .000   | .000   | .000   |
|  | N                   | 50        | 50     | 50     | 50     | 50     | 50     | 50     |
| FL   | Pearson Correlation | .807**    | .947** | .992** | .989** | 1      | .987** | .972** |
|  | Sig. (2-tailed)     | .000      | .000   | .000   | .000   |        | .000   | .000   |
|  | N                   | 50        | 50     | 50     | 50     | 50     | 50     | 50     |
| BPD  | Pearson Correlation | .803**    | .953** | .994** | .989** | .987** | 1      | .970** |
|  | Sig. (2-tailed)     | .000      | .000   | .000   | .000   | .000   |        | .000   |
|  | N                   | 50        | 50     | 50     | 50     | 50     | 50     | 50     |
| GA   | Pearson Correlation | .789**    | .935** | .973** | .968** | .972** | .970** | 1      |
|  | Sig. (2-tailed)     | .000      | .000   | .000   | .000   | .000   | .000   |        |
|  | N                   | 50        | 50     | 50     | 50     | 50     | 50     | 50     |
| **. Correlation is significant at the 0.01 level (2-tailed). |                     |           |        |        |        |        |        |        |

Dependent Variable: gestational age

Gestational age per weeks=0.350xplacenta thickness+5.685x fetal weight+19.170

## CHAPTER FIVE

### Discussion, Conclusion and Recommendations

#### 5-1 Discussion

The study includes 50 pregnant women in second and third trimester of pregnancy in Gezira state scanned by ultrasound to correlate between placenta thickness and estimation of fetal weight. Concerning the age of pregnant women the minimum age =17years, maximum = 41years, mean =27.04years with more than halve of them lies in the age group from (15-25 years) (52%). Regarding the gestational age the minimum gestational age was 17weeks 3days, maximum age 40 weeks, means of GA 29weeks 6days+\_6.3 weeks. The study found that the minimum placenta thickness 1.4 cm. max5.4 cm, std 0.88211.

The study found that there was linear relationship between placenta thickness and GA per week, placenta thickness and fetal weight per kg ( $r^2 = 0.62, 0.68$ ) respectively this mean that the placenta thickness more linearly associated with fetal weight than with gestational age, this result agree with (Hammad 2008) who found that the placenta thickness associated linearly with estimated fetal weight ( $r^2=0.62,0.68$ ). There is strong significant correlation between placenta thickness and estimation of fetal weight , FL,BPD ,HC,GA (p value = 0.01 for all ) , this result agree with ( Younis 2015 ) who found that (p=0.01) .

The study found that there was relation between placenta thickness per mm and fetal weight per Kg ( $r^2=0.684$ ) figure 4.4.The study shows relation between HC measurement per mm and fetal weight per Kg ( $r^2=0.873$ ) figure 4.5



The study found that there was relation between BPD measurement per mm and fetal weight per Kg ( $r^2=0.907$ ) figure. 4.6. The study shows relation between AC measurement per mm and fetal weight per Kg ( $r^2=0.934$ ) figure 4.6. The study found that there was relation between GA per weeks and fetal weight per Kg ( $r^2=0.896$ ) figure 4-11.

The study found the placenta thickness increase with gestational age this agree with (Alamin 2012).

## **5-2 Conclusion**

The placenta is an important organ that connects the developing fetus to the uterine wall to allow nutrients uptake, wastes elimination and gas exchange via the mother blood. estimation of fetal weight is very important during obstetric ultrasound ,it can influences obstetric management dicession concerning the timing and root of delivery.

Method of the study is based on estimation of the fetal weight by measuring the abdominal circumference (AC) and biparietal diameter (BPD),and measuring the placental thickness and studies the correlation between them using Statistical Package for Social Sciences (SPSS).

The study found that there was positive correlation between placenta thickness and fetal age.

Also the study showed that there is positive correlation significant placental thickness and biprietal diameter (BPD) and abdominal circumference (AC) respectively. Study showed that there is positive correlation between placental thickness and estimated fetal weight and both are increasing with fetal age. The study found that the fetal weight increases by 60 gm/mm of placenta thickness. Thus placental thickness can a promising parameter in obstetric ultrasound .The study found that with the same placental thickness there are different estimations of fetal weight, however the normality of the fetal weight and fetal development can be followed by measuring the placental thickness.

### **5-3 Recommendations**

- 1) This study is limited and it can be as a guideline for further studies.
- 2) for further studies to correlate the blood supply of placenta with fetal weight using Doppler Ultrasound.

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## Appendix 1

### The Images of the Research

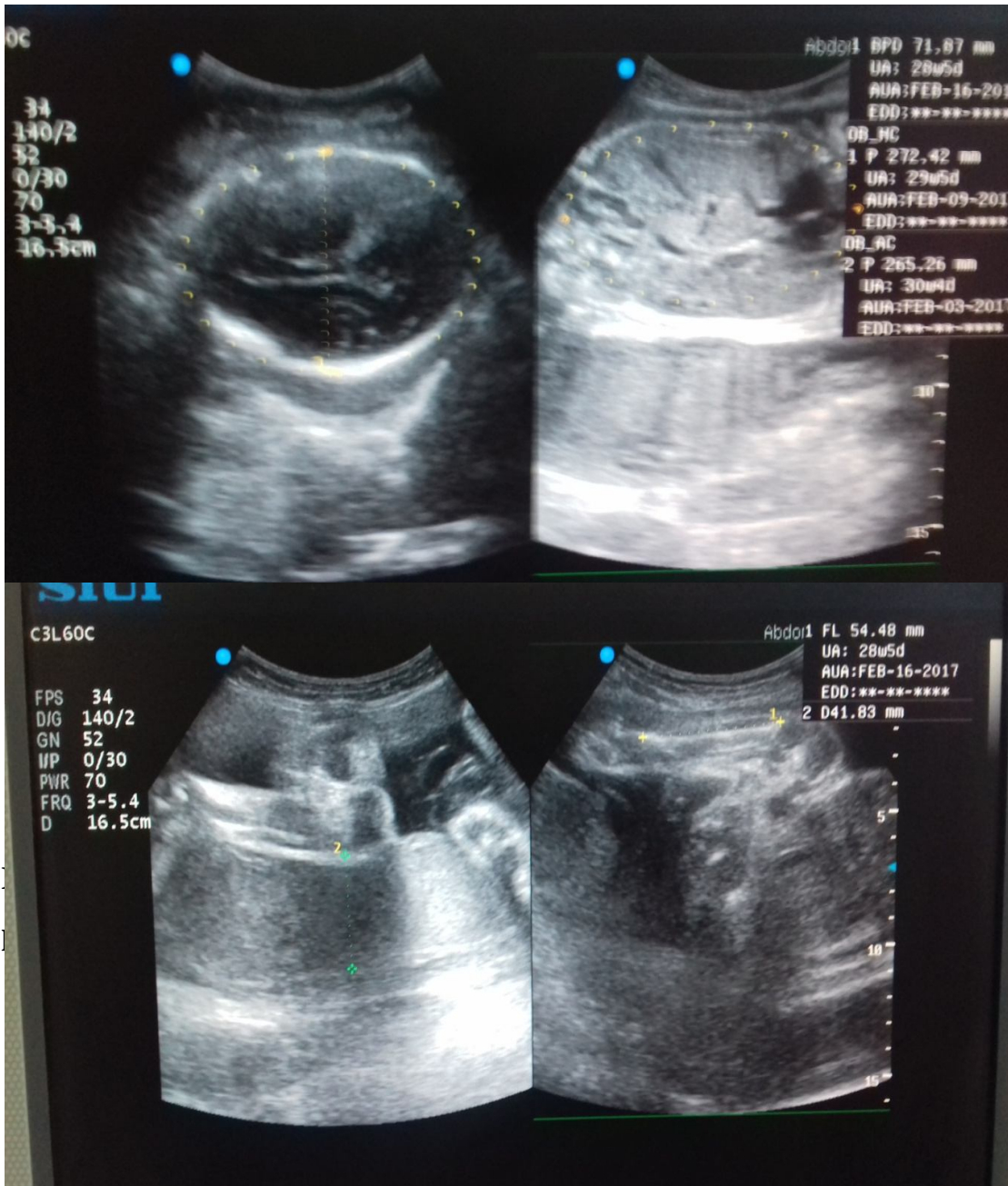


Image 1 :Transabdominal image for 36 years pregnant women placenta thickness= 273 mm, gestational age= 28 week 5days, BPD= 71 mm, FL=54.48 mm

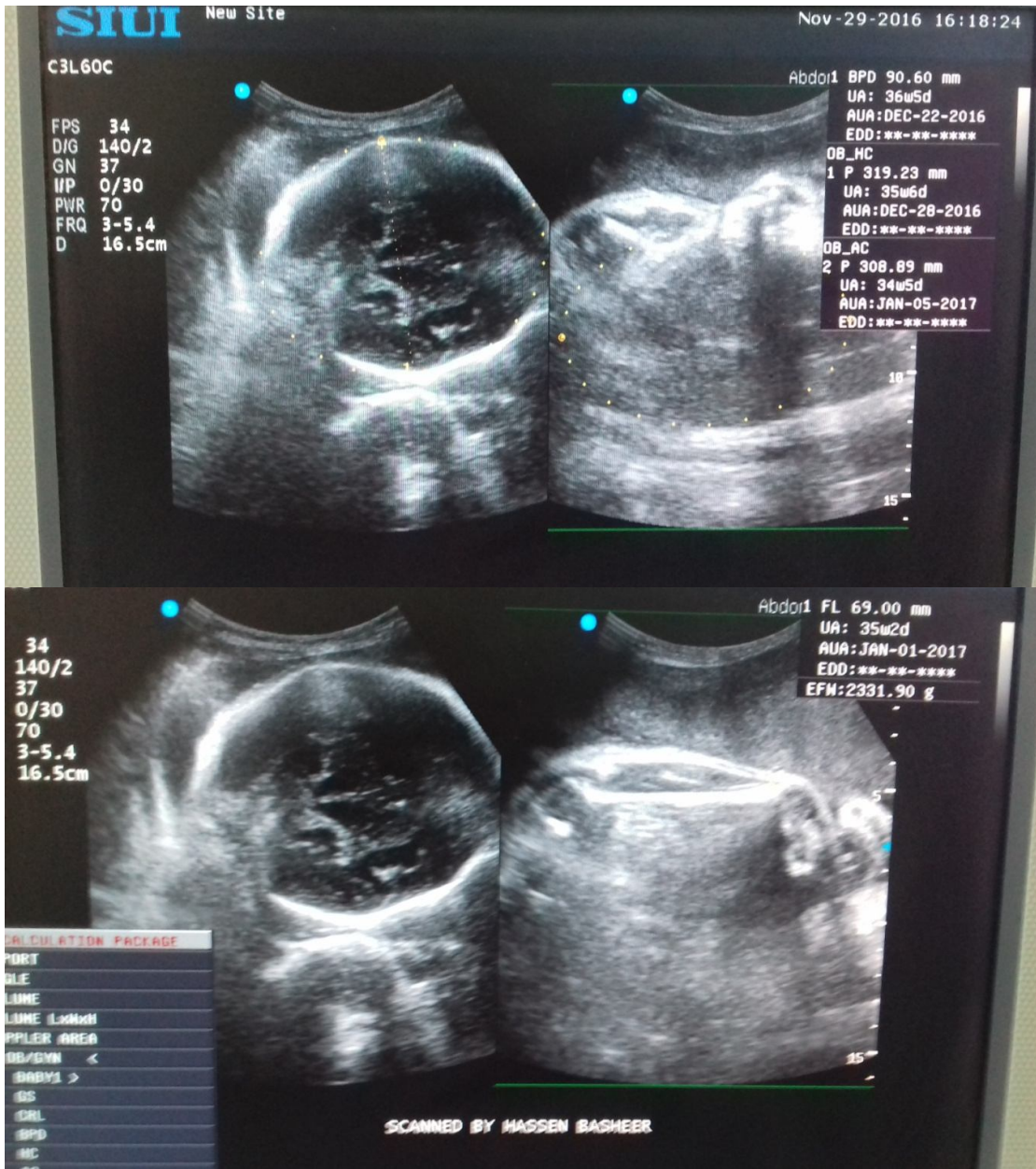


Image 2 :Transabdominal image for 25 years pregnant women placenta thickness= 273 mm, gestational age= 36 week 5days, BPD= 90.60 mm, FL=69 mm

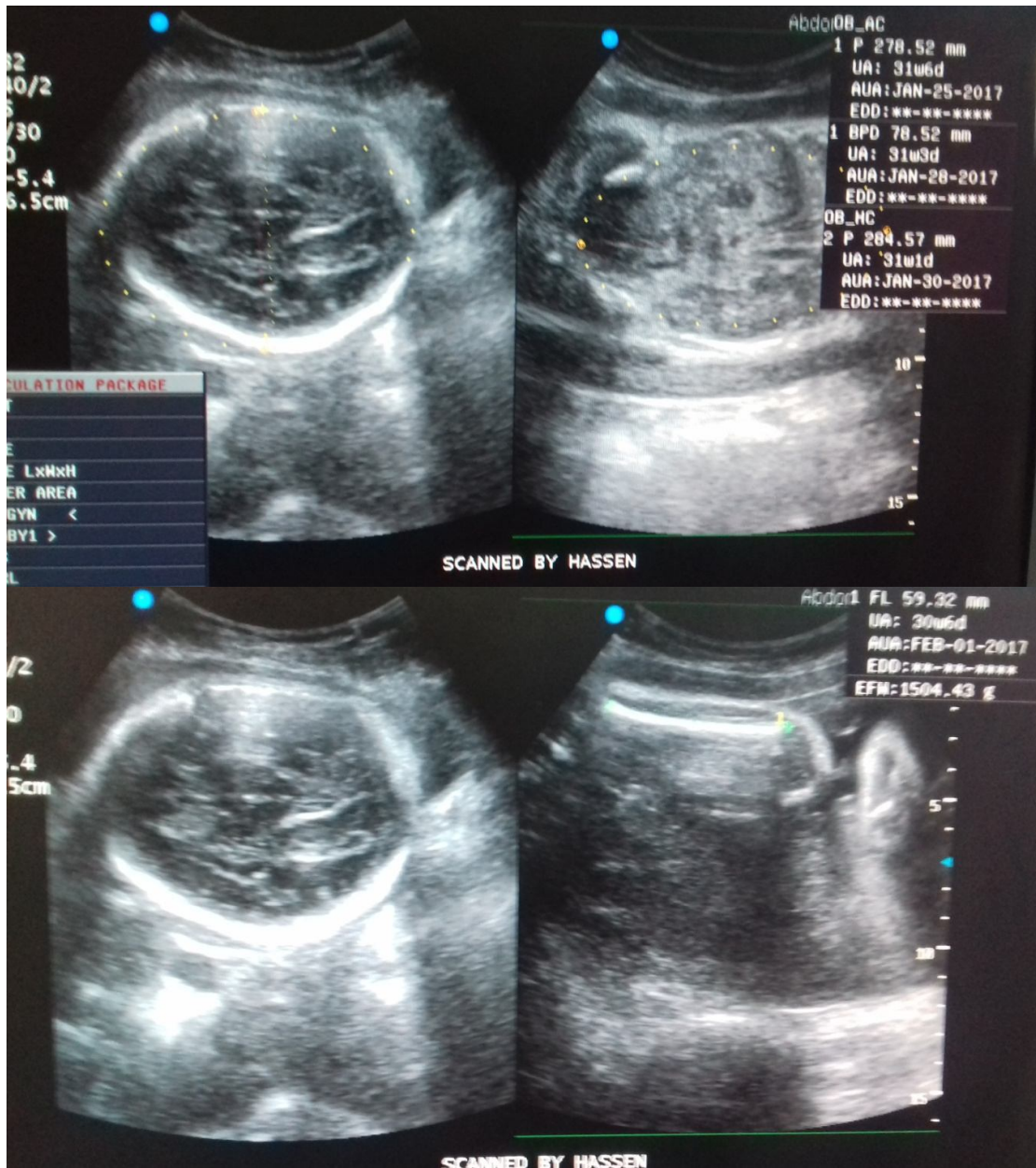


Image 3 :Transabdominal image for 30 years pregnant women placenta thickness= 278.52 mm, gestational age= 31 week 6 days, BPD= 78.52 mm, FL=59.32 mm



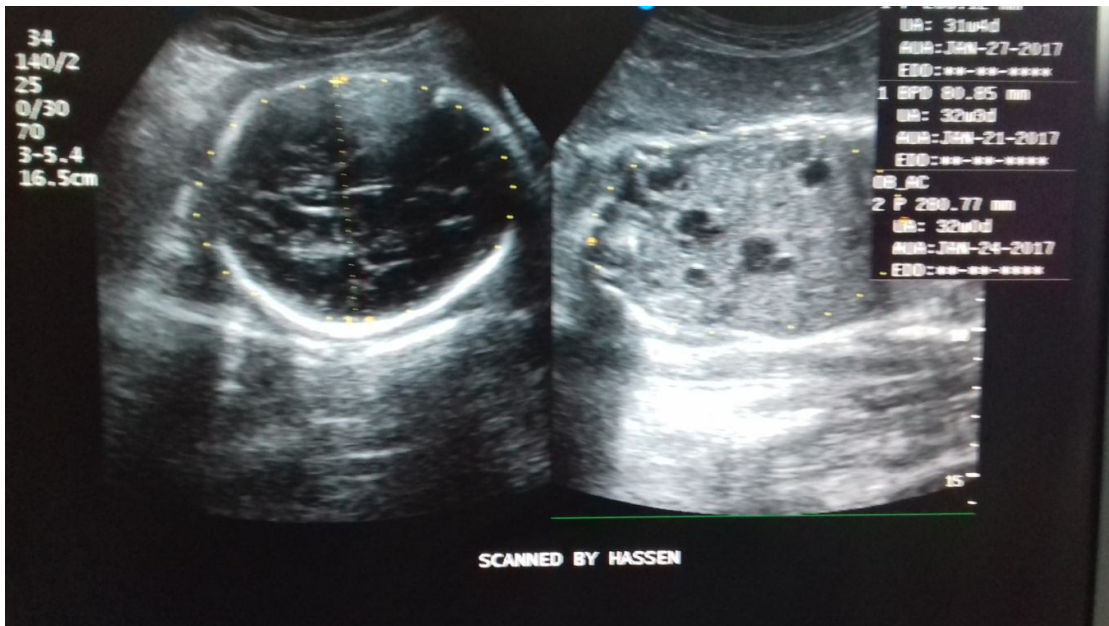


Image 4 :Transabdominal image for 36 years pregnant women placenta thickness= 280.77 mm, gestational age= 31 week 4 days, BPD= 80.85 mm, FL=69.41 mm



Image 5 :Transabdominal image for 40 years pregnant women placenta thickness=196.47 mm, gestational age= 21 week 6 days, BPD= 54.22 mm, FL=34.80 mm

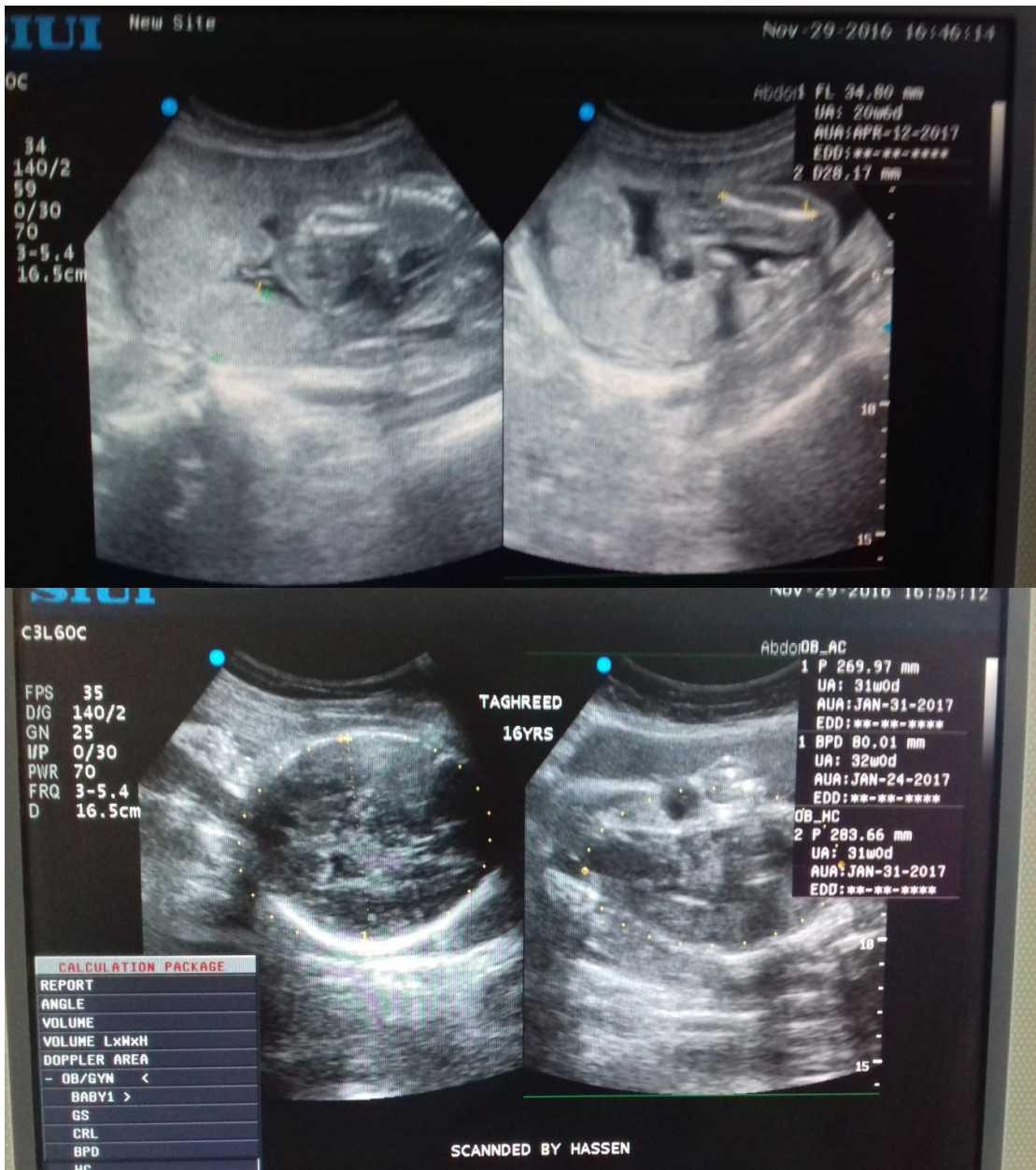


Image 6 :Transabdominal image for 16 years pregnant women placenta thickness=283.66 mm, gestitational age= 32 week 0 days, BPD= 80.01 mm, FL=34.80 mm

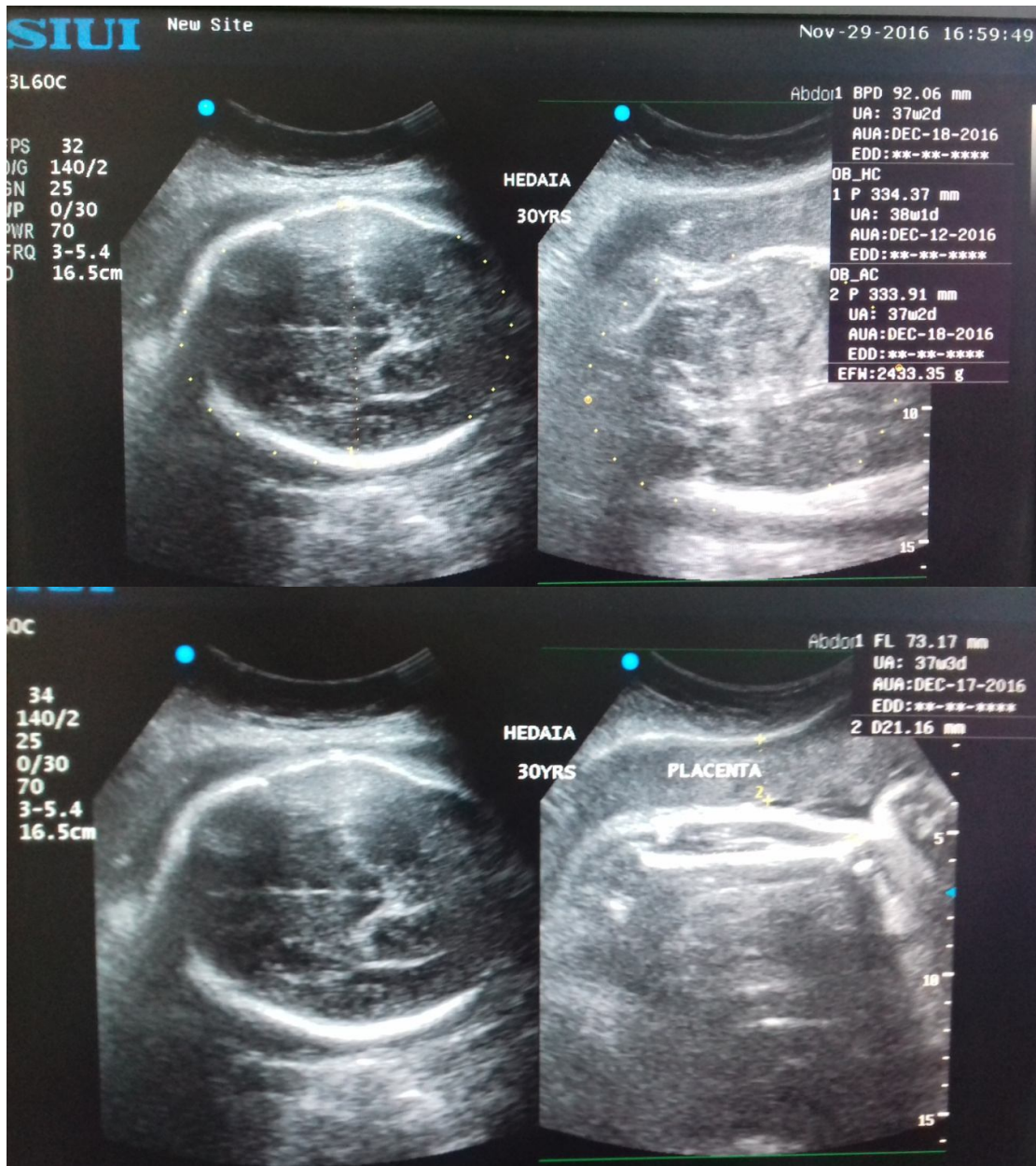


Image 7 :Transabdominal image for 30 years pregnant women placenta thickness= 334.37 mm, gestational age= 37 week 2 days, BPD= 92.06 mm, FL=73.31 mm

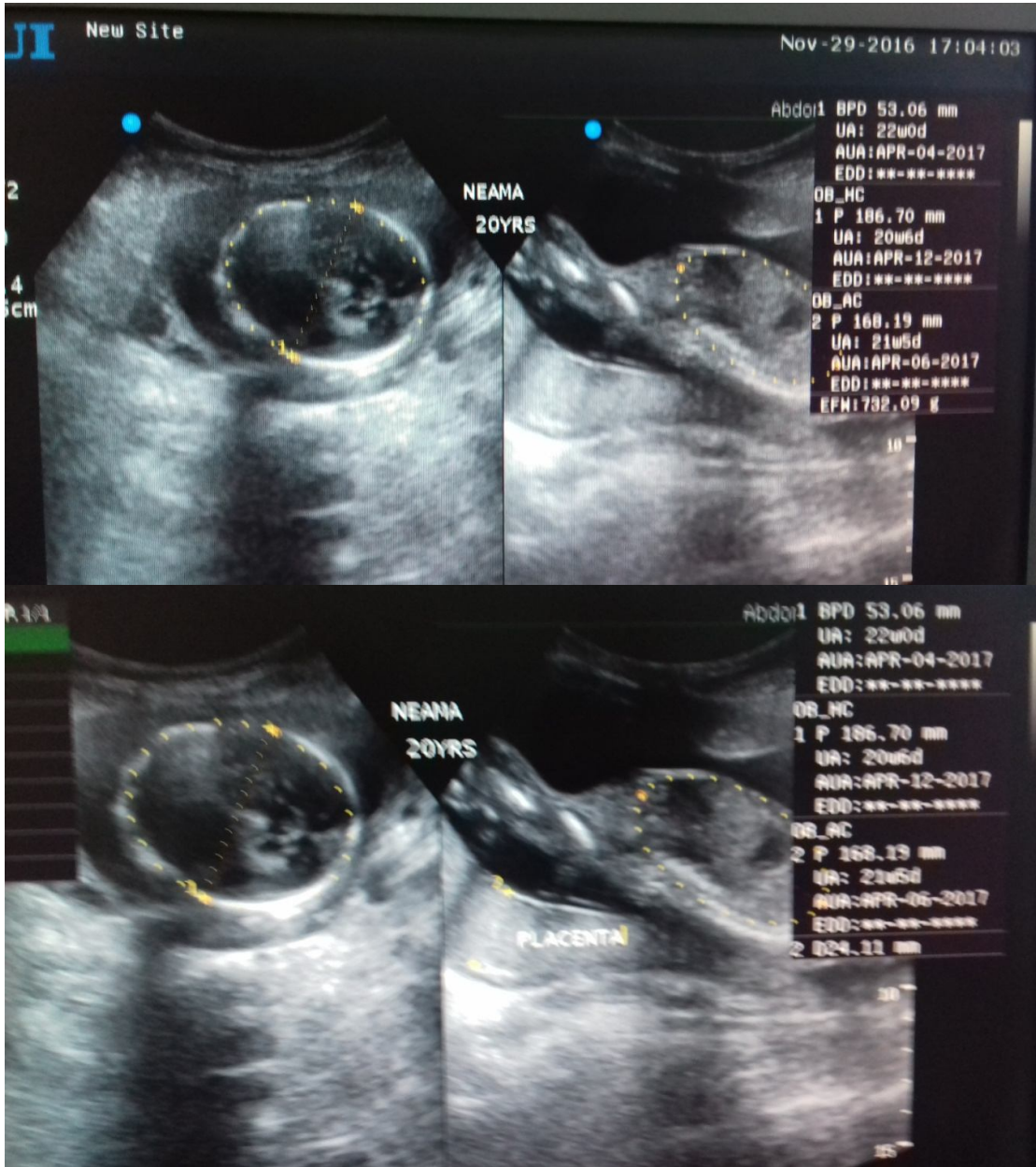


Image 8 :Transabdominal image for 20 years pregnant women placenta thickness= 168.19 mm, gestational age= 22 weeks 0 days, BPD= 53.06 mm,

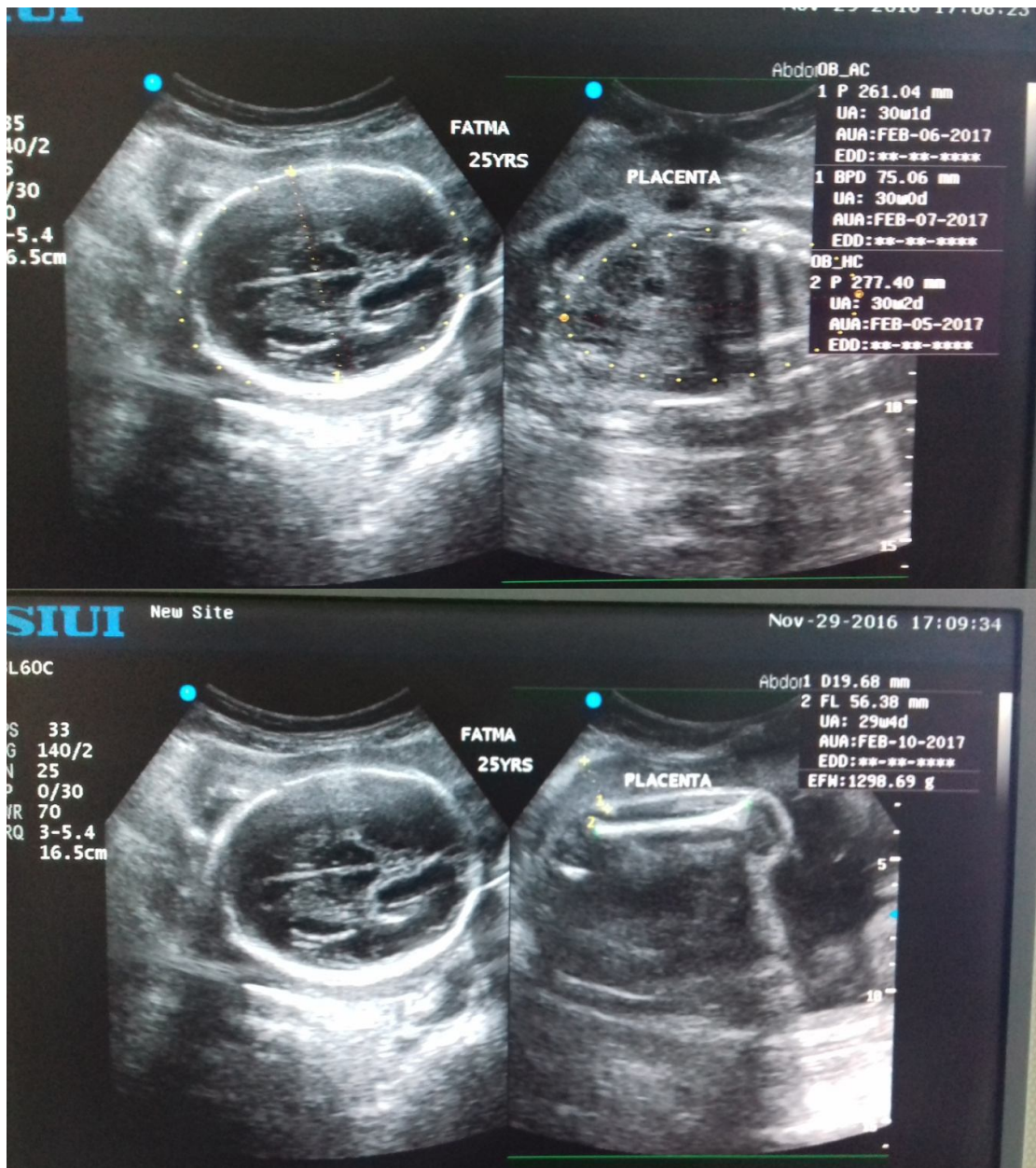


Image 9 :Transabdominal image for 25 years pregnant women placenta thickness= 277.40 mm, gestational age= 29 week 4 days, BPD= 75.06 mm, FL=56.38 mm

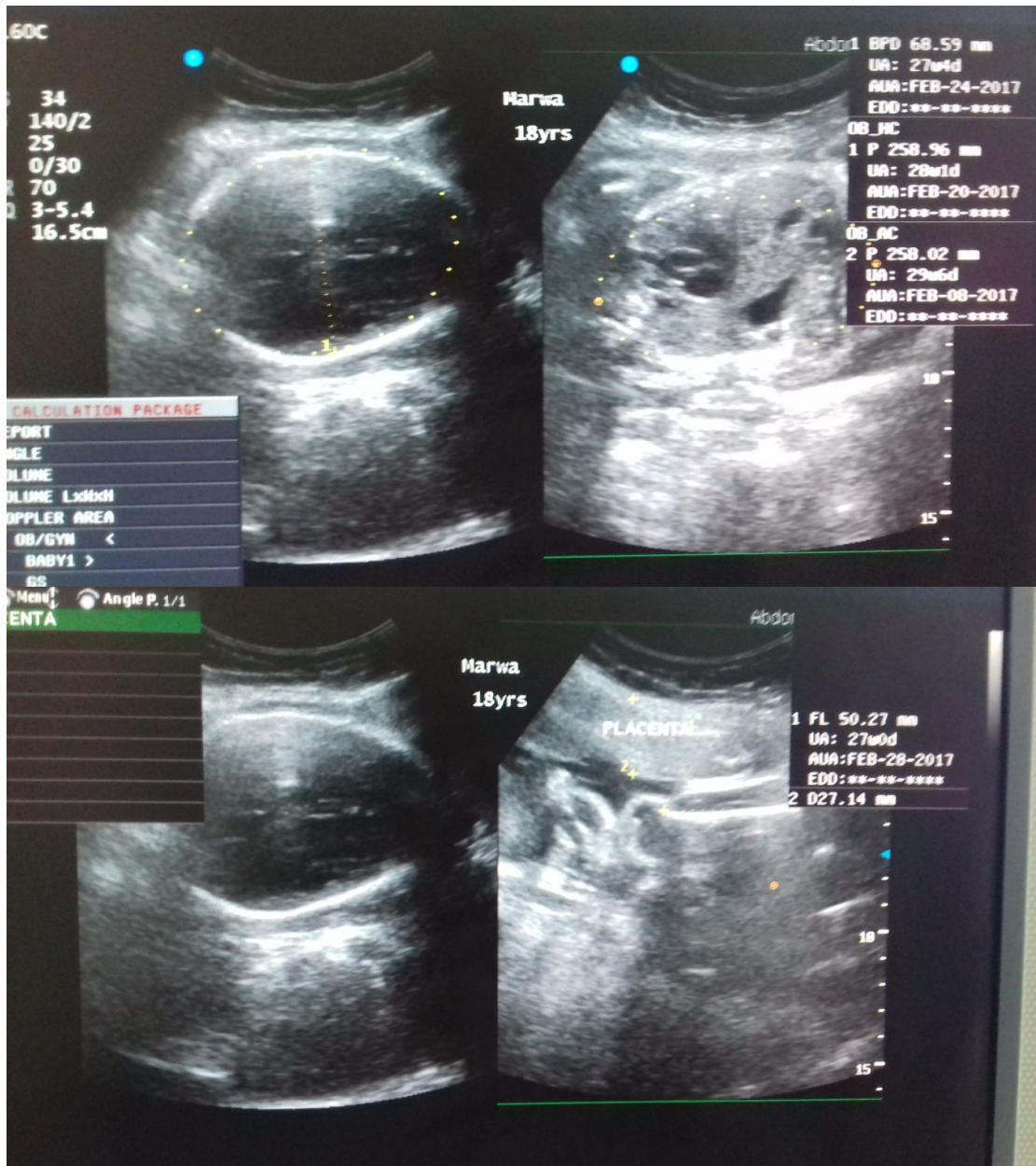


Image 10 : Transabdominal image for 18 years pregnant women placenta thickness= 258.02 mm, gestational age= 27 week 0 days, FL=50.22 mm

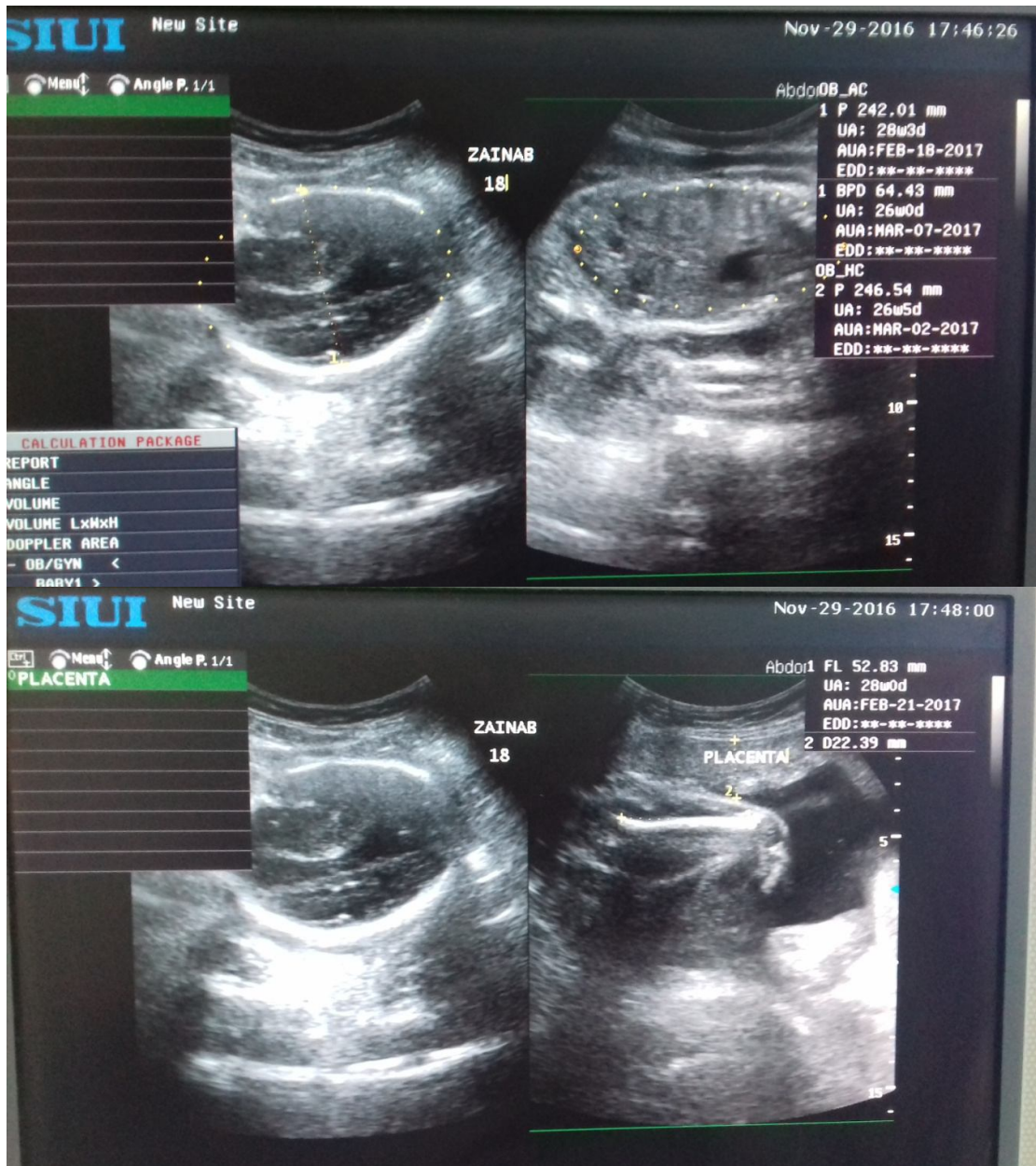


Image 11 : Transabdominal image for 18 years pregnant women placenta thickness= 246.54 mm, gestitonal age= 28 week 0 days, BPD= 64.43 mm, FL=52.83 mm



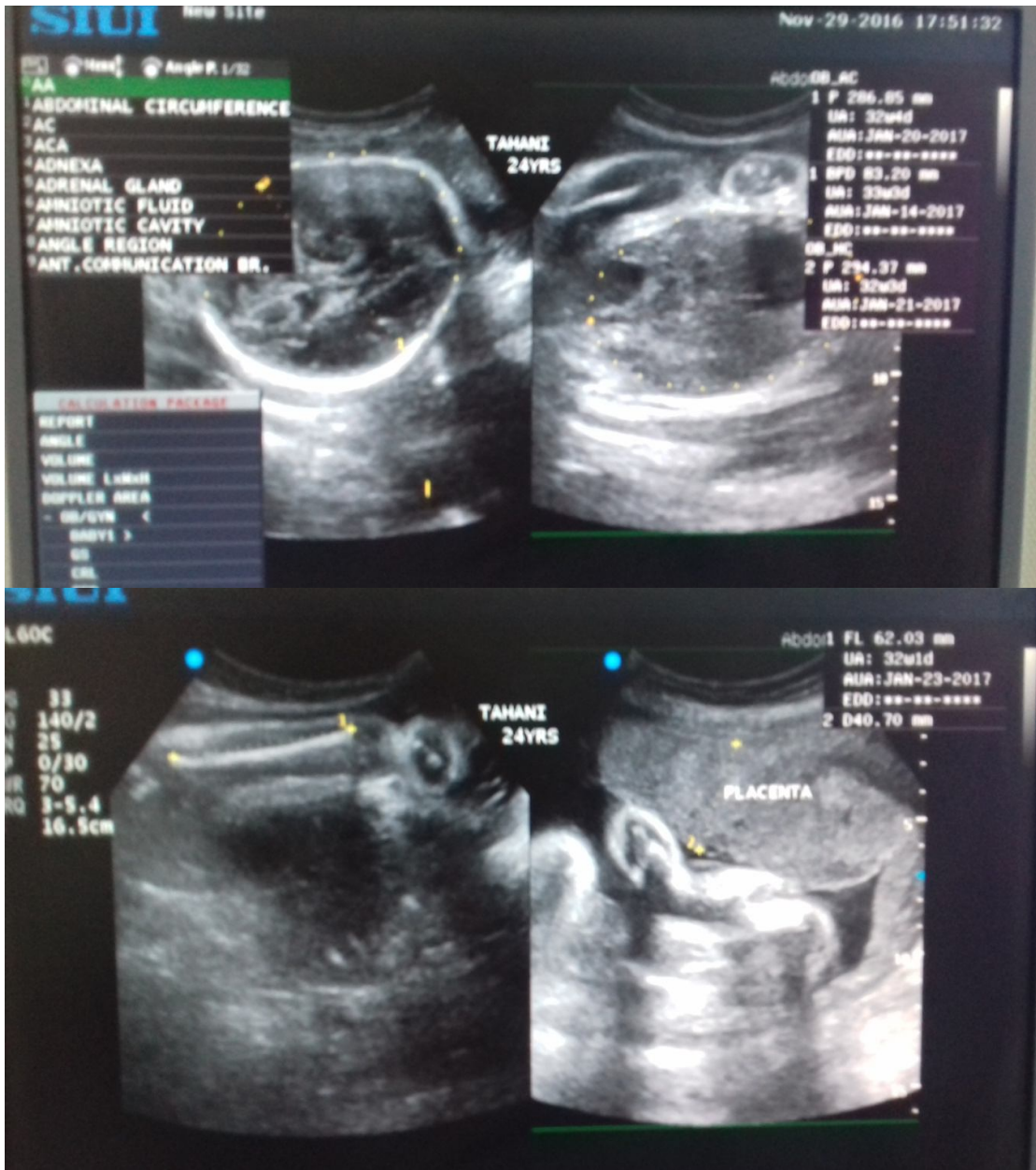


Image 12 : Transabdominal image for 24 years pregnant women placenta thickness= 274.37 mm, gestational age= 32 week 1 days, BPD= 83.20 mm, FL=62.43 mm

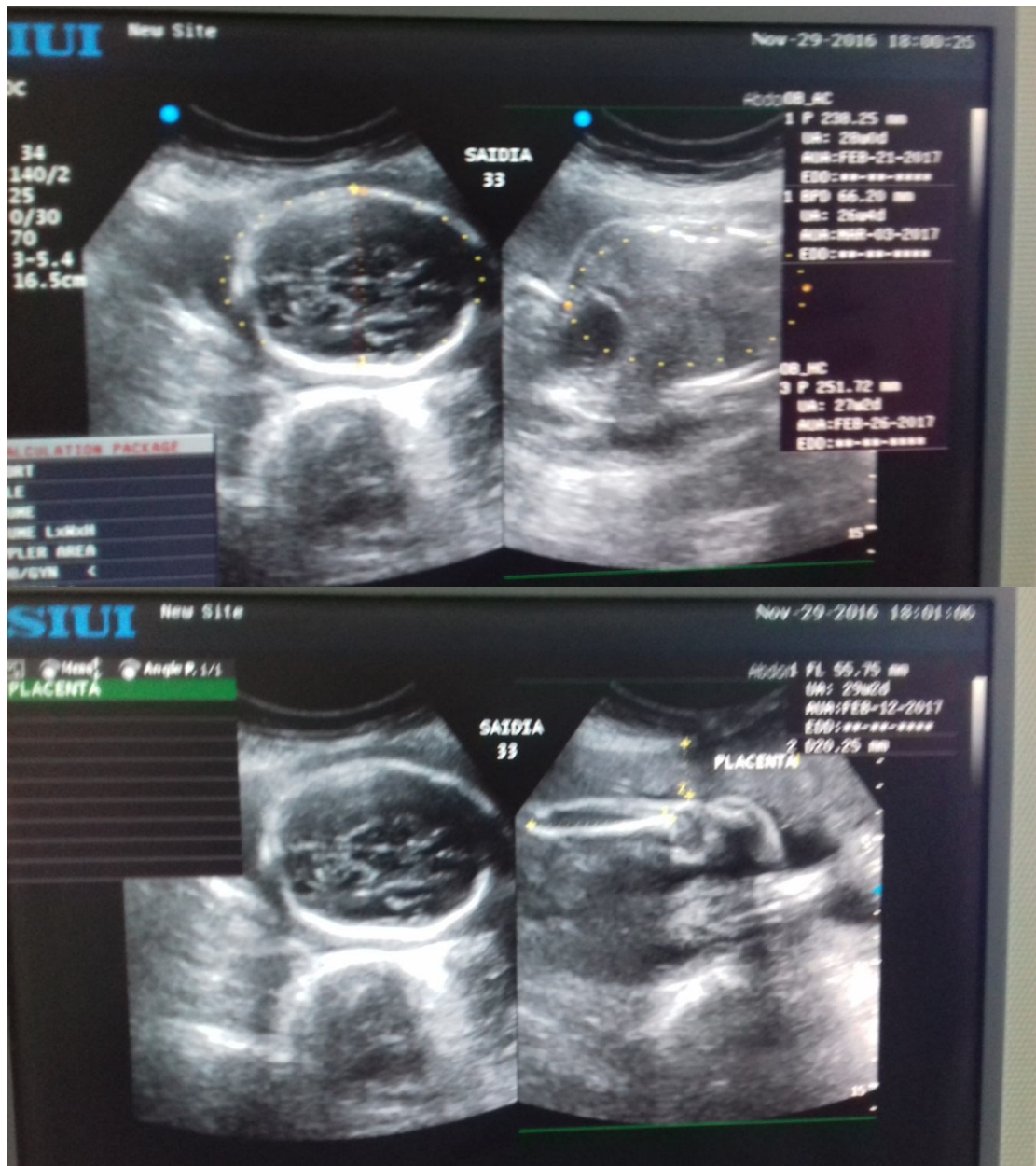


Image 13 : Transabdominal image for 33 years pregnant women placenta thickness= 251.12 mm, gestational age= 29 week 2 days, BPD= 66.20 mm, FL=59.75 mm

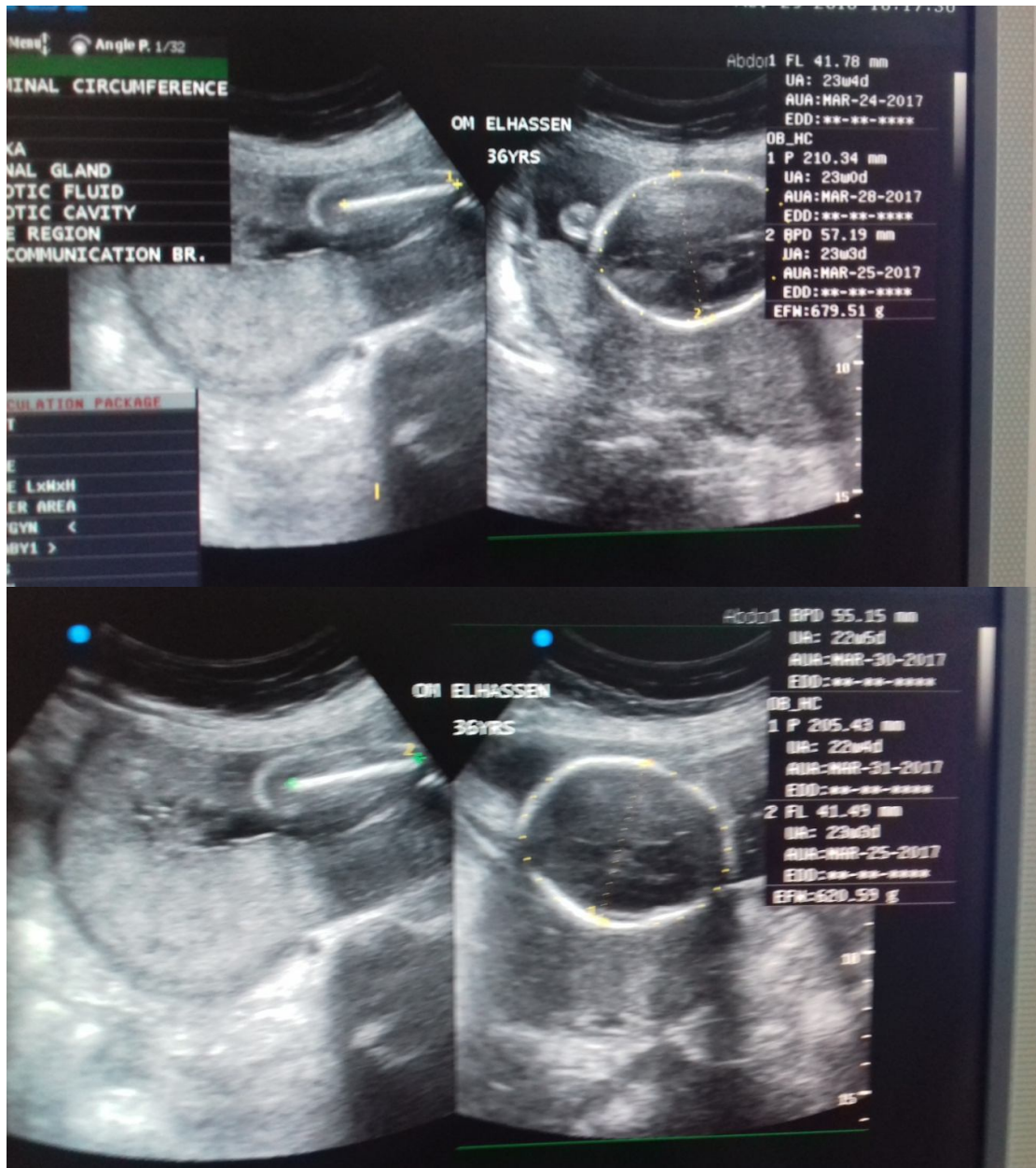


Image 14 : Transabdominal image for 36 years pregnant women placenta thickness= 295.43 mm, gestational age= 23 week 4 days, BPD= 55.15 mm, FL=41.78 mm

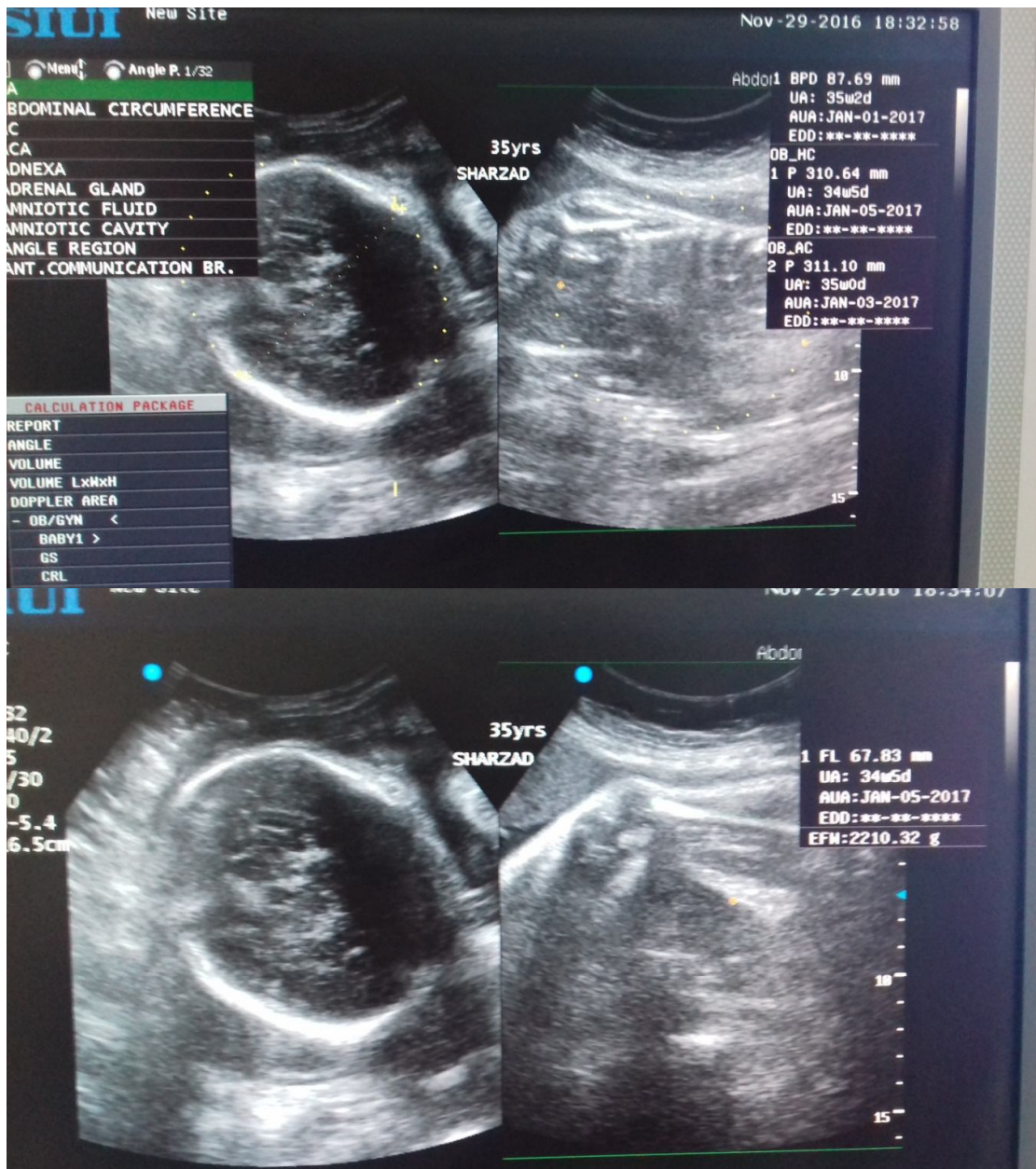


Image 15 : Transabdominal image for 35 years pregnant women placenta thickness= 310.64 mm, gestational age= 34 week 5 days, BPD= 87.69 mm, FL=67.83 mm