# Placental thickness and Trans cerebellar diameter in the second trimester for accurate estimation of gestational age
# (A cross sectional study)

## Thesis

Submitted for Partial fulfillment of Master Degree
in Obstetrics and Gynecology

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بِسْمِ اللَّهِ الرَّحْمَٰنِ الرَّحِيمِ

قَالُوا

سُبْحَانَكَ لَا عِلْمَ لَنَا

إِلَّا مَا عَلَّمْتَنَا إِنَّكَ أَنْتَ

الْعَلِيمُ الْحَكِيمُ

صدق الله العظيم

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✍ *Samar Amin Saleh*

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# List of Abbreviations

| Abbr. | Full-term |
|-------|-----------|
| **AC** | **:** Abdominal circumference |
| **BPD** | **:** Bi-parital diameter |
| **CRL** | **:** Crown rump length |
| **CSP** | **:** Cavum Septum Pellucidum |
| **D.M** | **:** Diabetes mellitus |
| **EDD** | **:** Estimated date of delivery |
| **EFW** | **:** Estimated Fetal Weight |
| **FL** | **:** Femur Length |
| **FW** | **:** Fetal weight |
| **G.A** | **:** Gestational age |
| **G.S** | **:** Gestational sac |
| **H.C** | **:** Head circumference |
| **HCG** | **:** Human chorionic gonadotrophin |
| **ICC** | **:** Intra-class correlation |
| **IUGR** | **:** Intra uterine growth retardation |
| **L.M.P** | **:** Last menstrual period |
| **MSD** | **:** Mean sac diameter |
| **PT** | **:** Placental thickness |
| **SD** | **:** Standard deviation |
| **SPSS** | **:** Statistical package for social science |
| **TAS** | **:** Trans abdominal sonography |
| **TCD** | : Transverse Cerebellar Diameter |
| **TVS** | : Transvaginal sonography |
| **US** | : Ultrasound |

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PROTOCOL OF A THESIS FOR PARTIAL FULFILMENT OF MASTER DEGREE IN OBSTETRICS AND GYNAECOLOGY

**Title of the Protocol:** **Placental thickness and Trans cerebellar diameter in the second trimester for accurate estimation of gestational age (A cross sectional study).**

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## What is already known on this subject?

**Ismail *et al.,* 2017** found positive correlation between placental thickness and average gestational age. Placental thickness measured at the level of umbilical cord insertion can be used as an accurate sonographic indicator in the assessment of gestational age in singleton pregnancies because of its linear correlation. Therefore, it can be used as an additional sonographic tool in correlating gestational age in cases where LMP is not known **(Betty *et al.,* 2013***).*

Transcerebellar diameter is the most accurate biometric measurement in both uncomplicated pregnancies and in complicated pregnancies with medical disorders such as D.M and hypertension especially when associated with macrosomic or IUGR fetuses and in structural abnormalities affecting organs other than cerebellum as the cerebellar growth is not affected by these circumstances **(Alalfy *et al.,* 2017).**

## What does this study add?

The study aims to detect the role of combined measurement of placental thickness and transcerebellar diameter in estimation of fetal gestational age in second trimester.

# 1.INTRODUCTION/ REVIEW

The placenta develops from chorionic villi at the implantation site at about the 5th week of gestation and by the 9th or 10th weeks of the diffuse granular, echo texture of the placenta is clearly apparent at sonography **(Ahmed et al., 2014).** The placenta is a maternal-fetal organ with metabolic, endocrine and immunological functions and also has a role in protecting the fetus from noxious agents **(Venkateswarlu and Rao, 2016).**

The human placenta plays the main role in supplying the fetus with nutrients and oxygen **(Suri et al., 2013).** Sufficient delivery of those essentials from the mother to the fetus through normally developed placenta guarantees healthy development of the fetus **(Azpurua et al., 2010).**

The placenta is the vital support organ for the developing fetus .The fetal nutritional status is dependent on the ability of the mother to provide oxygenated blood to the uterine circulation and maternal surface of the placenta and the ability of the fetus to extract nutrients form the placenta and deliver them to the fetal tissues **(Moran and Mcauliffe, 2011).**

Ultrasound (US) is considered the most feasible and reliable tool used for placental evaluation. Normally, the ultrasound has the ability to identify the definitive placenta approximately at 9–10 weeks of gestation as a uniformly granular echogenic pattern **(Jauniauxe et al., 1991).**

Moreover, US may use different parameters as placental thickness and volume to detect placental abnormalities **(Afrakhteh et al., 2013).**

The measurement of placental thickness is relatively simple and clinically useful. Abnormal thickness of placenta is well recognized as a diagnostic harbinger in a wide spectrum of pathologic events. Placental thickness can contribute to the management of fetus at risk placental thickness measurement, in relation to gestational age can differentiate normal from abnormal pregnancy **(Venkateswarlu and Rao, 2016).**

It was observed that the placental thickness gradually increased from 15mm at 11 weeks of gestation to 37.5mm at 39 weeks. From the 22nd week to the 35th week of gestation the placental thickness coincide almost exactly with the gestational age in weeks **(Ahmed et al., 2014).**

At term, placenta is approximatly 3cm thick and measure 15-25 cm in diameter **(Sadler et al., 2003).**

Small placentas are associated with preeclampsia, chromosomal abnormalities, severe maternal diabetes mellitus, chronic fetal infections and intrauterine growth restriction **(Baghel et al., 2015).**

The placentas over 4cm thick at term have been observed in conditions like diabetes mellitus, perinatal infection, hydropes fetalis (both immune &non immune) **(Habib, 2002).**

The incidence of perinatal morbidity and mortality was considerably higher among gravid a with thick placenta, related to higher rates of fetal anomalies and higher rates of both small for gestational age and large for gestational age neonates at term **(Baghel et al., 2015).**

Ismail et al., 2017 showed that linear relationship and strong positive correlation between placental thickness and estimated fetal weight and both increase with fetal age. They

found in every 1 cm increase in placental thickness increase fetal weight by 0.888 kg. So fetal weight and age can be follow by measuring placental thickness.

Placental thickness is an effective ultrasonographic parameter to calculate gestational age at any period of gestation and it can be used with certainty among women with unreliable last menstrual period or not having early dating scans**(Sharma and Gupta 2017).**

The cerebellum is normally dumb-bell-shaped in fetal sonographic views and composed of 2 cerebellar hemispheres connected centrally by a triangular-shaped vermis. Suboccipitobregmatic view is used for TCD measurement (Uikey et al.,2016 .Second trimester measurement of TCD is in millimeters and is numerically equivalent to gestational age weeks **(Joshi BR 2010).**

Transcerebellar diameter measurement is a very crucial parameter in estimating and calculating the gestational age of fetuses better and even more precise than other fetal biometric measurements (BPD, HC, AC, FL) which are routinely used in pregnant women with no medical disorders

TCD in clinical scenarios and obstetric conditions where other biometric parameters are significantly affected causing false estimation and improper calculation of the GA as in hypertensive gestations that have IUGR fetuses, diabetic mothers with macrosomic fetuses, in fetuses with congenital abnormalities but the only pitfall and significant sonographic drawback of TCD measurement is in existence of cerebellar morphologic and developmental abnormalities as it becomes small and not accurate with fetal gestational age giving a false

estimation in the form of lower value than the actual gestational age( Alalfy et al.,2017).

**Iram** *et al.* **(2018)** mentioned that TCD is the most reliable parameter for the determination of GA in 2nd and 3$^{rd}$ trimesters and it has strong association with biparietal diameter and femur lengtgh. Standard measurements of TCD can also be used in the diagnosis of cerebellar hypoplasia when the GA is known and TCD percentile charts can be used to assess cerebellar growth in preterm infants.

Trans cerebellar diameter is the most accurate method for assessment of gestational age in third trimester followed by FL, and the least accurate is the BPD. Also, by combining accuracy of TCD (89%) and that of FL (81%), we can be near certain of gestational age in most of our patients even if they are unsure of their dates(**Zakaria** *et al.***,2019**)

## 2.AIM / OBJECTIVES

The aim of the present study is to detect accuracy of combined measurement of placental thickness and transcerebellar diameter in estimation of fetal gestational age in second trimester in Egyptian people.

The use of two ultrasound measurements as another method for accurate estimation of gestational of gestational age in absence of accurate pregnancy dating.

**3.METHODOLOGY:**

**Patients and Methods/ Subjects and Methods/ Material and N**

Type of Study: A Cross sectional study.

Study Setting: The study will be conducted in Ain shams University, maternity hospital.

Study Population: Pregnant ladies attending Out patient clinics in the second trimester for antenatal care.

Who will do the measurement: ultrasound will be done at ultrasound unit in maternity hospital.

## Inclusion criteria:

1- All women with confirmed last menstrual period, regular cycles and not used hormonal pills 3 months prior to conception.

2- Second trimester (14-27).

3- Singleton pregnancy.

4- Low risk pregnancy.

## Exclusion criteria:

Patients with any disorder that might affect the size of the placenta will be excluded from the study

1- Maternal medical disorder: may alter fetal growth.

2- Fetal anomaly

3- Iiquor abnormality

4- Abnormal placentation

**Sampling Method:** Simple random sample.

**Sample Size:** 161 cases of pregnant female.

**Sample Justification :** Sample size was calculated using

STATA program, setting the type-1 error (α) at 0.05 and the power (1-β) at 0.8.Result from previous study (**Lin and Williamson 2015**) showed that there was a positive correlation between placental thickness and gestational age (r=0.90) and between transcrebellar diameter and gestational age (r=0.95). sample size of 161women achives 80%power to detect this difference at 0.05 significance level (α error). **Tongsong and Boonyanurak** (2004)did a regression analysis which yielded the following linear **equation of the relationship:**

placental thickness (in mm) = gestational age (in weeks) × 1.4-5.6 (r=0.82).

**Prssad and Likhitha (2014)** studied an equation that correlates between the GA and the TCD and detected a good correlation between the GA and TCD throughout the third trimester and even in the case of intra uterine growth retardation (IUGR).

Finally the analysis showed good correlation between TCD and GA($R^2$=0.98) and the relationship was curvilinear best described by a polynomial equation of the second order

**GA=-0.007(TCD)²+1.1032(TCD)+0.2463**

**CONSENT:**

Oral consent will be taken from each patient.

**Study Procedures:**

1-History

A full detailed history including personal, menstrual, obstetric, present and past history and family history will be obtained.

Accurate last menstrual period date will be obtained and gestational age will be calculated using Neagle`s rule or first