

## Efficacy of Placental Thickness for Gestational Age Assessment and Its Comparison with Other Ultrasonographic Parameters of Fetal Biometry

Dantam Hymavathi Devi<sup>1</sup>, Sivaraju Madhumitha<sup>2</sup>

<sup>1</sup>associate Professor, Department of Obstetrics & Gynaecology, Katuri Medical College & Hospital, Guntur, India.

<sup>2</sup> Postgraduate, Department of Obstetrics & Gynaecology, Katuri Medical College & Hospital, Guntur, India.

### Abstract:

**Objective:** To determine the efficacy of placental thickness for gestational age assessment. To compare placental thickness with other ultra-sonographic parameters of fetal biometry for gestational age assessment.

**Material and methods:** A cross sectional prospective study was done during the period of June 2018 to Oct 2020 among antenatal cases attending OPD of OBG department, KMCH Guntur.

**Results:** The mean placental thickness was 26.964. Placental thickness increased as gestational age advances. Mean placental thickness has a linear relationship with mean BPD in the 2<sup>nd</sup> trimester and mean femur length in the 3<sup>rd</sup> trimester. Pearson correlation value is 0.961 which indicates it is positively correlated and correlation is significant.

**Conclusion:** The placental thickness can be used as a parameter for assessing the gestational age, along with other ultrasonographic parameters.

**Keywords:** Biparietal diameter (BPD), femur length (FL), fetal biometry, gestational age (GA), Placental thickness (PT), Ultrasonographic parameters.

Date of Submission: 28-07-2021

Date of Acceptance: 12-08-2021

### I. Introduction

The placenta is a fetal organ that enables it to take oxygen and nutrients from maternal blood and to excrete CO<sub>2</sub> and other waste products of metabolism. <sup>1</sup> Placenta develops from chorionic villi at the implantation site at about the 5th week of gestation. The placenta can be identified in sonography as early as 9<sup>th</sup> or 10<sup>th</sup> week of pregnancy. The placenta assumes a relatively homogeneous pebble grey appearance between 8 - 20 weeks of pregnancy. <sup>2-3</sup>

The fetal portion of placenta is represented by the echogenic chorionic plate, the maternal portion by basal plate at the junction of myometrium and placental substance.

After 20 weeks of gestation the intraplacental venous lakes and placental calcification may begin to appear. The placental growth results from multiplication and branching of chorionic villi. The size and growth pattern of the placenta also have an impact on pregnancy outcomes. <sup>4</sup>

Considering the limitations in the use of the common fetal parameters for estimation of gestational age, the use of placental thickness was evaluated based on the observation that placental thickness increases with advancing gestational age. <sup>5-9</sup> The placenta grows throughout the pregnancy with the initial growth being much more rapid than that of the fetus. <sup>10</sup>

Placental and fetal weights are closely correlated with most circumstances, and it follows nearly a linear pattern except during the first few weeks of gestation. <sup>11</sup> Placental growth can be estimated by measuring the placental thickness or volume.

Sonographically thick placenta is seen in maternal diabetes mellitus, non-immunes' and immune hydrops, aneuploidy (trisomy), fetal or maternal anemia, fetal macrosomia, placental tumor and placental abruption.

Small placenta is seen in Hypertensive disorders of pregnancy, intra uterine growth restriction (IUGR) and chromosomal anomalies.

Placental grading done by Grannum scale: Grannum classified placental maturity into 4 grades, grade 0 to grade 3 based on ultrasound visualized changes in the chorionic plate, placental substance, and basal layer.

Grade 0 placenta-uniform moderate echogenicity, smooth chorionic plate without indentation seen in late 1<sup>st</sup> trimester-early 2<sup>nd</sup> trimester.

Grade 1 placenta-subtle-indentation of chorionic plate, small, diffused calcifications mid-2<sup>nd</sup> trimester -early 3<sup>rd</sup> trimester (18-29 weeks)

Grade 2 placenta-chorionic plate showing marked indentations creating comma like densities which extend into the placental substance but do not reach basal plate seen in late third trimester (>30 weeks)

Grade 3 placenta-complete indentation of chorionic plate through basal plate creating cotyledons seen >39 weeks to post dates.

More irregular calcification with significant shadowing may signify placental dysmaturity.

### **Objectives of the study**

1. To determine the efficacy of measurement of placental thickness by ultrasound in estimation of the gestational age.
2. To compare placental thickness with other ultrasound parameters of fetal biometry for assessment of gestational age.

## **II. Materials And Methods**

**Study design:** Cross-sectional prospective study.

**Study duration:** December 2018-October 2020.

**Study location:** KMCH OPD (OBG DEPT), GUNTUR.

**Sample size:** Antenatal women visiting OPD of Obstetrics & Gynecology Department, KMCH, Guntur, during the period from December 2018-October 2020, a total of 333 antenatal women from 11 weeks - 40 weeks were studied.

### **Selection method:**

#### **Inclusion criteria:**

1. Antenatal women of gestational age of 11- 40 weeks.
2. Women with known Last menstrual period (LMP) and regular menstrual cycles.
3. Women with singleton pregnancy.

#### **Exclusion criteria:**

1. Antenatal women of gestational age <11 weeks and > 40 weeks.
2. Women with multiple pregnancies.
3. Women with complications like IUGR, fetal and placental anomalies.
4. Women with irregular menstrual cycles.

## **Materials and Methods**

### **Material used:**

Greyscale real-time ultrasonographic examinations were performed using a Siemens Acuson machine. The transducer used in the study was a 3.5 MHZ convex array transducer.

### **Methodology:**

Regular real- time ultrasound scanning is done in radiology department via trans abdominal route. After estimating the fetal age by Crown rump length (CRL), Biparietal diameter (BPD), Femur length (FL), the placental thickness was measured for women whose fetal biometry corresponds to LMP and clinically assessed gestational age (GA). Placental thickness measurements were taken at a point where the umbilical cord inserts into the placenta, in a longitudinal direction, excluding the uterine myometrium and retroplacental veins. The placental thickness is considered standard throughout 2<sup>nd</sup> & 3<sup>rd</sup> trimesters if between 2 and 4 cms.

We ensured not to measure either obliquely or during uterine contraction because the placental size can be modified creating a false impression of an increase in placental thickness.

### **Calculation of gestational age:**

The gestational age (GA) in the first trimester is calculated by measuring CRL and Hadlock tables. GA in second and third trimesters of pregnancy is calculated using fetal measurements of BPD, FL. GA is computed by ultrasound machine based on Hadlock tables using regression equation from combination of measurements. In this study, ultrasound gestational age (GA) is calculated by measuring:

- CRL (11-12 weeks)
- BPD, FL (14-40 weeks)
- Placental thickness in millimeters at the level of umbilical cord insertion in this longitudinal direction and the mean of three readings were taken.

### III. Results

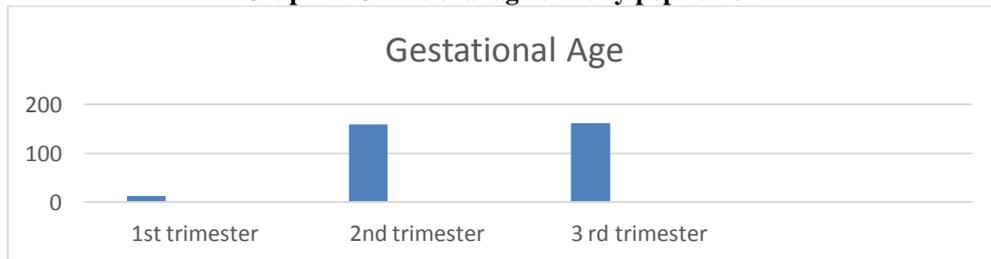
In the present study total of 333 antenatal women data was analyzed, along with routine parameters like CRL, BPD, HC, AC, FL, placental thickness was also measured in these antenatal women. The results were analyzed with respect to gestational age, placental thickness and, fetal parameters like CRL, BPD, FL.

The mean value with a standard deviation of placental thickness was calculated for gestational age from 11-40 weeks. Correlation between placental thickness and fetal parameters like BPD and FL were analyzed using Pearson's correlation. Association between gestational age and other fetal biometry parameters were assessed.

#### Gestational age:

Most of the women attending the dept. of obstetrics in these two years of study have gestational age of more than 28 weeks. This may indicate women in rural areas become more conscious as their gestational age progresses.

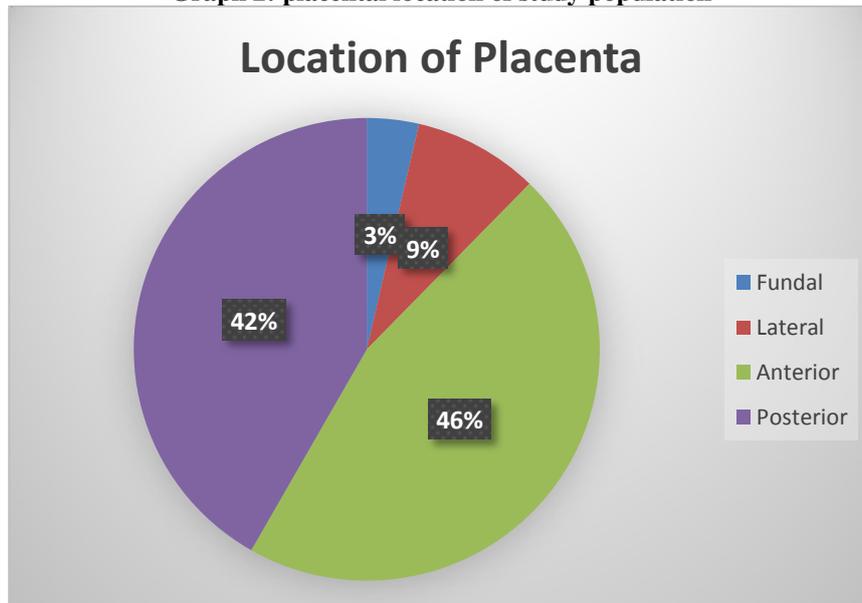
Graph 1: Gestational age of study population:



#### Location of the placenta:

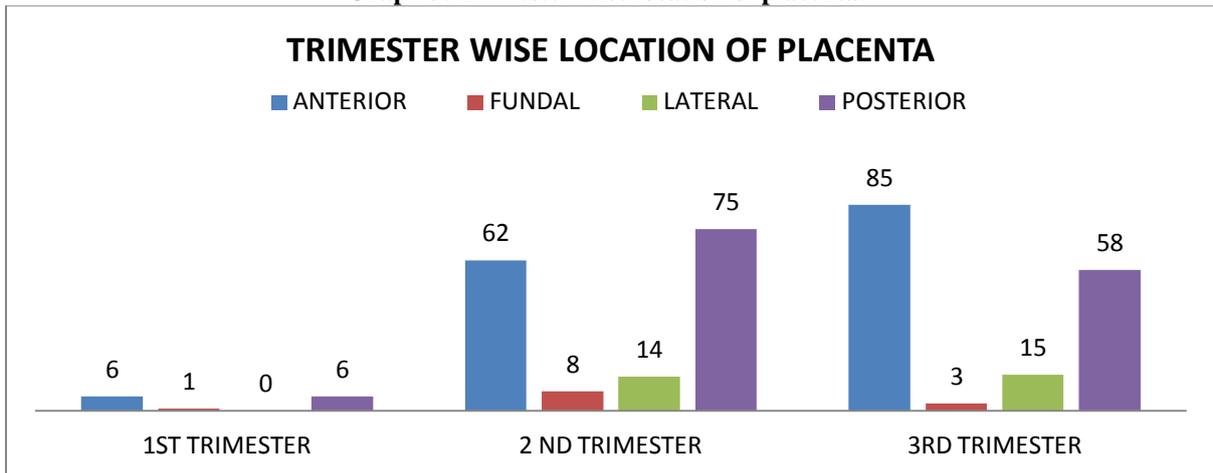
The anterior placenta is seen in 153 women (45.9%), followed by the posterior placenta in 139(42%) women. The fundal placenta is least commonly seen in this study, seen only in 12 women (3.6%) among 333 study population.

Graph 2: placental location of study population



In the second trimester, the common position for the placenta is posterior 47% followed by anterior 38.9%. In the 3<sup>rd</sup> trimester, the placenta is located commonly in the anterior 52% followed by the posterior 36%.

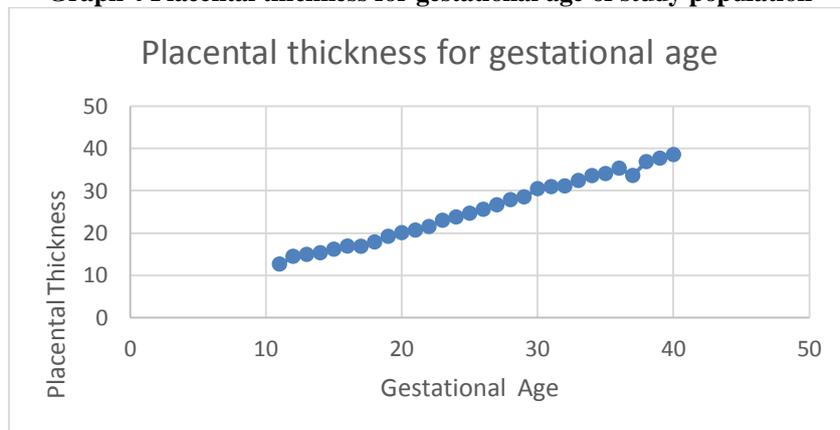
**Graph 3: Trimester wise location of placenta:**



**Placental thickness**

The following graph shows placental thickness mean and SD at various weeks of gestational age. The mean placental thickness increased as gestational age progressed, it declined after 35 weeks and again raised at 40 weeks of gestation.

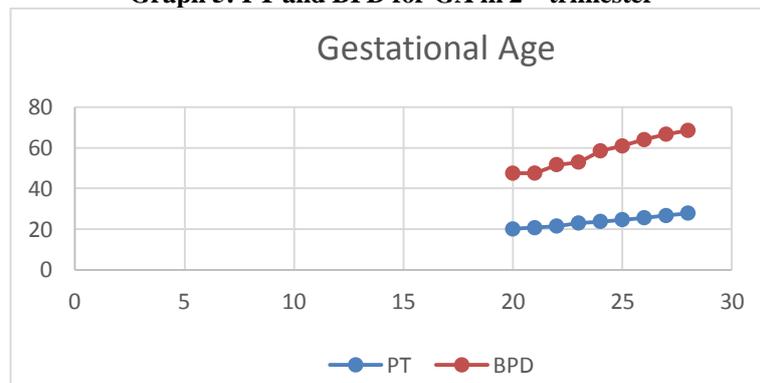
**Graph 4 Placental thickness for gestational age of study population**



**Fetal parameters:**

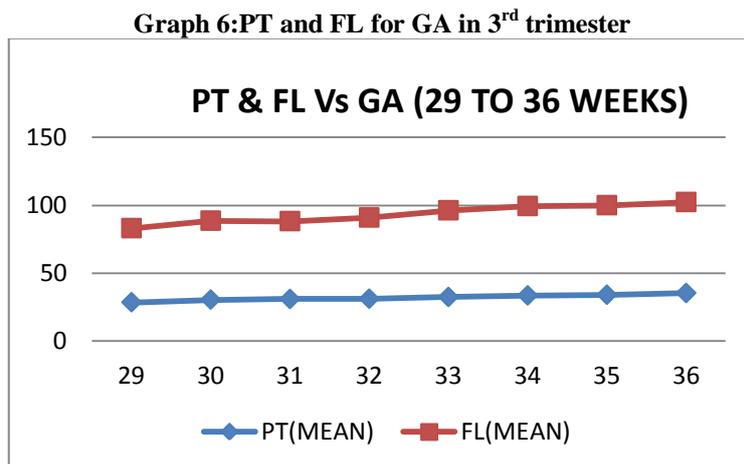
According to the below line diagram, mean placental thickness is running parallel to mean BPD for gestational age during the 2<sup>nd</sup> trimester.

**Graph 5: PT and BPD for GA in 2<sup>nd</sup> trimester**



**BPD and PT in 2<sup>nd</sup> trimester = 0.988; <0.001\*S**

According to the below line diagram, mean placental thickness is running parallel to the mean FL for gestation age during 3<sup>rd</sup> trimester.



**FL & PT IN 3<sup>RD</sup> TRIMESTER = 0.968 ;< 0.0001\*S**  
**GA & PT FROM 20-36 WEEKS = 0.997 ;< 0.0001\*S**

The Pearson correlation value ranges from - 1 to + 1. The Pearson correlation value for PT and GA was 0.961 which indicates, it was positively correlated. The Pearson correlation value for PT and BPD was 0.920 and the Pearson correlation value for PT and FL was 0.697, which indicates all these parameters were positively correlated.

#### IV. Discussion

In this study, the placental thickness was found to be a useful parameter for assessing gestational age. The average placental thickness in the present study was 26.96 mm, it increased as gestational age progressed, it declined after 35 weeks and again it was maximum at 40 weeks of gestation. But, as per the study of Aditi Tiwari et al.<sup>14</sup> the placental thicknesses slowly rose from 15mm to 36.3mm at 39 weeks.

Kathikayan et al.<sup>13</sup> and Nyberg and Finberg.<sup>12</sup> conducted a study, which also concluded that placental thickness acts as an accurate predictor of gestational age.

In the present study, PT has a linear relationship with fetal parameters like BPD and FL in the 2<sup>nd</sup> and 3<sup>rd</sup> trimesters respectively. The placental thickness helps in assessing gestational age. It tends to raise by 1mm per week.

Aditi Tiwari et al.<sup>14</sup> concluded that placental thickness was a useful parameter for estimating gestational age in late 2<sup>nd</sup> trimester and early 3<sup>rd</sup> trimester. In the study by Ohagwu C C et al.<sup>15</sup> on Nigerian women during the second and third trimester, fetal weight was estimated using the biparietal diameter and abdominal circumference and gestational age was assessed by measuring BPD and femur length [FL]. Results proved that both placental thickness and estimated fetal weight increased in a linear manner with gestational age. Regression analysis provided a linear relationship between estimated fetal weight and placental thickness in the second and third trimesters but marked variation in fetal weights corresponding to placental thickness limit this relationship's usefulness.

"Fetal Gestational Age Determination using Ultrasound Placental Thickness" a study by Angus Sunday Azagidi et al.<sup>16</sup> it was concluded that PT has a linear relationship and statistically significant positive correlation with GA (in weeks) in all the trimesters, with the most considerable correlation recorded in the second trimester, results proved that both placental thickness and estimated fetal weight increased in a linear manner with gestational age.

Maya Menon.<sup>17</sup> concluded that the placental thickness was proved to be a reliable indicator to estimate gestational age, especially for mothers whose clinical history is not reliable, who came for antenatal booking in 2<sup>nd</sup> half of pregnancy and in conditions where BPD measurements become less accurate

In the study by R. Rajesh et al.<sup>18</sup> the result shows a strong association between gestational age and placental thickness and between placental thickness and fetal weight. Placental thickness may be used as a reliable indicator for knowing the gestational age and normality of fetal weight.

A study by Ngozi R. Njeze et al.<sup>19</sup> it was concluded that placental thickness and placental diameter can be used to predict gestational age. It is advised to use PT & PD in ultrasound obstetric assessment when LMP is not known.

## V. Conclusion

From the present study, it has been proved that placental thickness can be used for assessing gestational age in women in whom LMP is unreliable or is not known accurately.

Measurement of placental thickness at the level of the umbilical cord insertion site is easy to obtain and clinically useful. It enables the assessment of placental abnormalities that significantly affect the management and outcome of pregnancy. There is a direct and linear relationship between placental thickness and gestational age.

Placental thickness can be a critical and additional parameter for knowing gestational age along with other parameters especially from 11 -35 weeks of gestational age. But in case of abnormal placental thickness, for the corresponding gestational age, the disease which increase (maternal diabetes, aneuploidy, fetal macrosomia, immune hydrops) or decrease (IUGR, hypertensive disorders of pregnancy) the placental thickness should be addressed.

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Dantam Hymavathi Devi, et. al. "Efficacy of Placental Thickness for Gestational Age Assessment and Its Comparison with Other Ultrasonographic Parameters of Fetal Biometry." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 20(08), 2021, pp. 04-09.