

ORIGINAL RESEARCH ARTICLE

## ROLE OF PLACENTAL THICKNESS AS A PREDICTOR OF LOW BIRTH WEIGHT INFANT

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### ABSTRACT

#### INTRODUCTION

The placenta is a multifunctional organ of mainly foetal in origin with pleiotropic roles during foetal growth. The health of the mother, the placenta, and the fetus's predefined genetic development potential all affect intrauterine growth; of these, placental illness has been demonstrated to be the most significant clinically relevant risk factor. Placental weight is one-fifth of the fetal weight, and aberrant variance is linked to poor perinatal outcomes, as has historically been established. Our study was done to measure the role of placental thickness in predicting low birth weight.

#### METHODS

200 cases were recruited for study who came for antenatal check up to department of OBG, JJMMC, Davangere, at 32 weeks of gestation and were followed up at 36 weeks and after delivery. Placental thickness measured at the site of umbilical cord insertion by two dimensional ultrasonography, at 32 and 36 weeks and correlated with post-delivery birth weight of the fetus.

#### RESULTS

Study subjects had thick and thin placenta at 32 weeks and at 36 weeks, had maximum birth weight < 2.5 kg, whereas subjects having normal placental thickness had more birth weight above 2.5 kg.

#### CONCLUSION

The placenta, an organ that connects the mother and fetus, is in charge of facilitating material exchange. Therefore, placental thickness can be used to gauge fetal growth; a greater or lower placental thickness at a certain gestational age may increase the risk of low birth weight babies.

**KEYWORDS**

Placenta, Placental Thickness, Low Birth Weight, Ultrasonography.

**INTRODUCTION**

The placenta, sometimes known as "the sprightliness of the foetus in utero," interacts with the developing foetus and the mother while performing a variety of activities to support the foetus's maturation. The placenta's main job is to supply the fetus with nutrition and oxygen.<sup>1</sup> The health of the mother, the placenta, and the fetus's predefined genetic development potential all affect intrauterine growth; of these, placental illness has been demonstrated to be the most significant clinically relevant risk for fetal growth restriction.<sup>2</sup>

Estimates of the fetal birth weight are crucial since low birth weight is linked to poor postnatal outcomes.<sup>3</sup> It is easy to assess placental thickness sonographically. Placental weight is one-fifth of the fetal weight, and aberrant variance is linked to poor perinatal outcomes, as has historically been established.<sup>4</sup> The purpose of the study was to measure placental thickness in order to aid in the prediction of low birth weight babies.

**MATERIALS AND METHOD****Source of Data**

Patients from the teaching hospital affiliated with J.J.M. Medical College, Davangere, supply the majority of the study's data.

**Sample Size**

200

**Procedure of Study**

Over the course of 1.5 years, this prospective observational longitudinal study was carried out in the OBG Department at J.J.M. Medical College. Clearance from the Ethics Committee obtained. At 32 weeks, pregnant women who provided informed consent and were certain of their due dates will be selected from the Antenatal Clinic. They will then be followed up with at 36 weeks and following birth. Obstetric ultrasound will be carried out utilizing a 3.5-MHz curvilinear transducer following the acquisition of informed permission. The placenta will be confined to a segment that is longitudinal. The longitudinal measurement of placental thickness will be conducted from the lateral chorionic plate to the cord insertion, omitting the retro placental area, at the level of umbilical cord insertion. Pregnant women whose placental thickness falls between the 10th and 95th percentiles will be considered to have a normal placental thickness; those whose thickness falls between the 10th and 95th percentiles will be considered to have an abnormally thin or thick placenta and will be categorized into a different group that will be monitored until delivery. We will record the baby's post-delivery birth weight, maturity, and gender. Placental thickness correlated with age parity and birth weight.

**Statistical Analysis**

Data was entered in Microsoft Excel and analysis were done using Statistical Software for Social Sciences (SPSS) version 20 (IBM SPASS statistics, 18M corp. released 2011). Data were represented in the form of percentages, frequencies and descriptive statistics (Mean and Standard deviation), placental thickness between 10 and 95 percentile were calculated and Pearson's correlation between birth weight, maternal age and placental thickness at 32 and 36 weeks with r and p values were analysed.

**Inclusion Criteria**

Singleton pregnancy between 18 to 40 years of age, normal BMI, gestational age from 32 – 36 weeks, known last menstrual period, history of regular menstruation.

**Exclusion Criteria**

Hypertension, Diabetes mellitus, Intrauterine growth restriction, Hydrops fetalis, Congenital malformations, Twins, Polyhydramnios, Last menstrual period not known, Irregular menstrual period, Abnormal Placenta and poor visualization of placenta, Placentas with variations in insertions of umbilical cord, Chronic Renal Diseases, Low lying placenta or placenta previa.

**RESULTS**

The study population's mean age was  $23.425 \pm 2.9201$  years. Most of them were in the age range of 18 to 35. Table 1 displays the placental thickness mean values as well as the 10th and 95th percentiles.

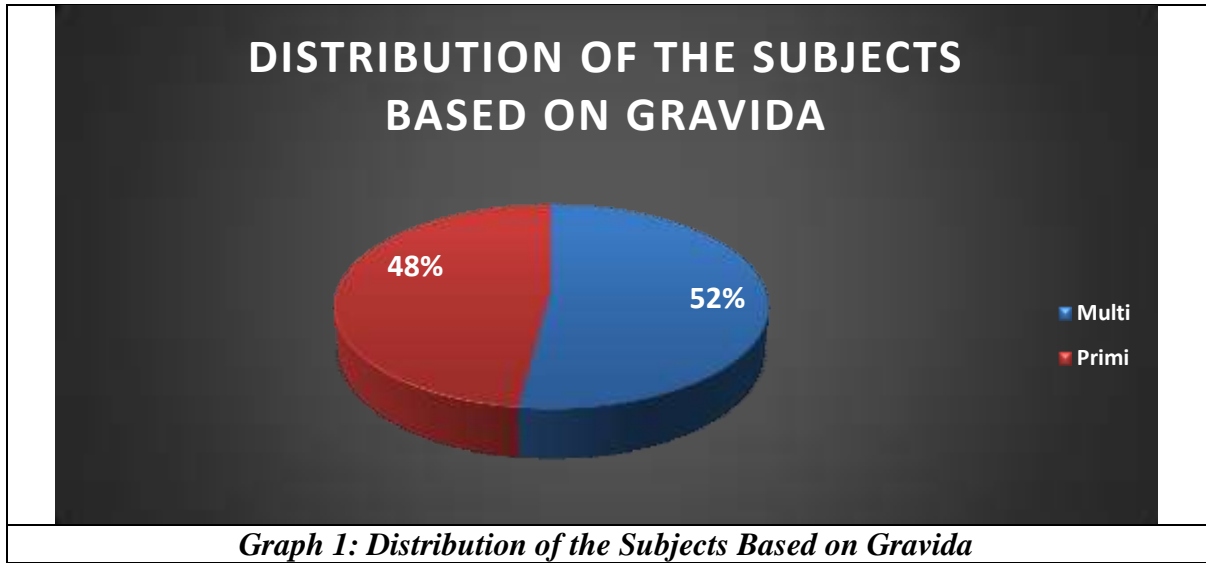
<b>Placental Thickness</b>	<b>32 Weeks</b>	<b>36 Weeks</b>
Mean	2.89	3.25
10 Percentiles	2.2	2.5
95TH Percentile	3.5	4.19

*Table 1: Mean, 10th and 95th percentile of placental thickness at 32 and 36 weeks*

<b>Gravida</b>	<b>Frequency</b>	<b>Per cent</b>
Multi	104	52.0
Primi	96	48.0
Total	200	100.0

*Table 2: Distribution of the subjects based on gravida*

The distribution of the study subjects based on the gravida status was represented in table 2. The results depicted that out of 200 (100%) study subjects, 104 (52%) study subjects had multigravida and 96 (48%) study subjects had primi.



At 32 weeks, 178 (89%) subjects had normal placental thickness, out of which 113 (56.5%) belonged to the age group of 21 to 25 yrs. Similarly, at 36 weeks, 172 (86%) subjects had normal placental thickness, out of which 110 (55%) belonged to the age group of 21 to 25 yrs. A Chi-square test was applied to associate the age with placental thickness at 32 and 36 weeks. The Chi-square test showed no statistically significant association with respect to age and placental thickness at 32 weeks ( $\chi^2=3.44$ ,  $p=0.48$ ) and 36 weeks ( $\chi^2=7.08$ ,  $p=0.13$ ). The results of cross-tabulation of age and placental thickness at 32 & 36 weeks was represented in Table 3.

	Placental Thickness		Age			Total	Chi-Square Value	p-Value
			≤ 20 Yrs	21 to 25 yrs	25 to 35 yrs			
At 32 weeks	Normal	Count	32	113	33	178	3.44	0.48
		%	16.0%	56.5%	16.5%	89.0%		
	Thick	Count	1	5	1	7		
		%	0.5%	2.5%	0.5%	3.5%		
	Thin	Count	0	12	3	15		
		%	0.0%	6.0%	1.5%	7.5%		
At 36 weeks	Normal	Count	32	110	30	172	7.08	0.13
		%	16.0%	55.0%	15.0%	86.0%		
	Thick	Count	0	9	1	10		
		%	0.0%	4.5%	.5%	5.0%		
	Thin	Count	1	11	6	18		
		%	0.5%	5.5%	3.0%	9.0%		
Total	Count	33	130	37	200			
	%	16.5%	65.0%	18.5%	100.0%			

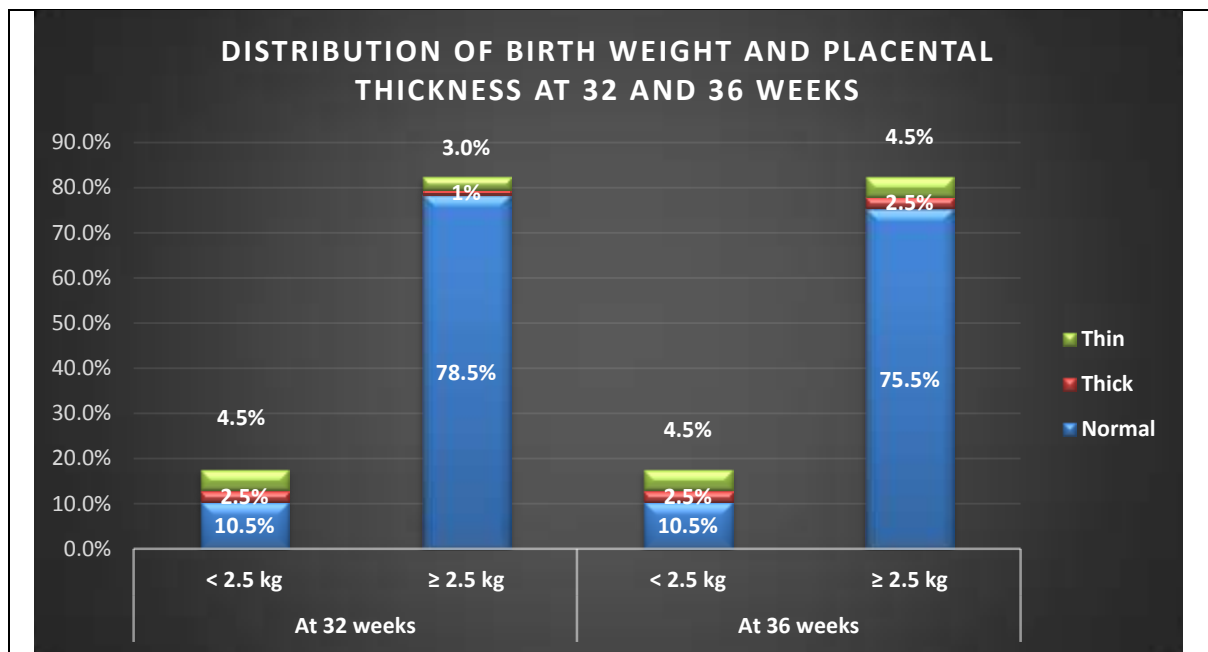
**Table 3: Cross-tabulation of age and placental thickness at 32 and 36 weeks**

Study subjects had thick and thin placenta at 32 weeks with maximum birth weight < 2.5 kg, whereas subjects having normal placental thickness had more birth weight above 2.5 kg. Results were similar at 36 weeks. The Chi-square test showed a statistically significant association between placental thickness and birth weight at both 32 weeks ( $\chi^2= 36.87$ ,  $p=0.00$ ) and 36 weeks ( $\chi^2= 23.82$ ,  $p=0.00$ ). The cross-tabulation results of birth weight and placental

thickness at 32 and 36 weeks were represented in Table 4 and graph 2.

	Placental Thickness		weight-Classified		Total	Chi-Square Value	p-Value
			< 2.5 kg	≥ 2.5 kg			
At 32 weeks	Normal	Count	21	157	178	36.87	0.00*
		%	10.5%	78.5%	89.0%		
	Thick	Count	5	2	7		
		%	2.5%	1.0%	3.5%		
	Thin	Count	9	6	15		
		%	4.5%	3.0%	7.5%		
At 36 weeks	Normal	Count	21	151	172	23.82	0.00*
		%	10.5%	75.5%	86.0%		
	Thick	Count	5	5	10		
		%	2.5%	2.5%	5.0%		
	Thin	Count	9	9	18		
		%	4.5%	4.5%	9.0%		
Total		Count	35	165	200		
		%	17.5%	82.5%	100.0%		

**Table 4: Cross-tabulation of birth weight and placental thickness at 32 and 36 weeks**



**Graph 2: Cross-Tabulation of Birth Weight and Placental Thickness at 32 And 36 Weeks**

Pearson's correlation was applied to correlate the birth weight, age and gravida with placental thickness at 32 and 36 weeks. A positive, very weak, non-significant correlation was seen between birth weight and placental thickness at 32 weeks ( $r=0.072$ ,  $p=0.314$ ) and 36 weeks ( $r=0.005$ ,  $p=0.94$ ). Negative, very weak, non-significant correlation was seen between age and placental thickness at 32 weeks ( $r= -0.033$ ,  $p=0.64$ ) and 36 weeks ( $r= -0.053$ ,  $p=0.45$ ); between gravida and placental thickness at 32 weeks ( $r= -0.039$ ,  $p=0.58$ ) and 36 weeks ( $r= -0.033$ ,  $p=0.64$ ). The results of mean correlation between birth weight, maternal age, parity, and placental thickness at 32 & 36 weeks is represented in Table 5.

	Placental Thickness	R Value	P Value
Birth Weight	At 32 weeks	0.072	0.314
	At 36 weeks	0.005	0.94
Age	At 32 weeks	-0.033	0.64
	At 36 weeks	-0.053	0.45
Gravida	At 32 weeks	-0.039	0.58
	At 36 weeks	-0.033	0.64

**Table 5: Pearson's Correlation between Birth Weight, Maternal Age, Parity and Placental Thickness at 32 and 36 Weeks**

## DISCUSSION

With its metabolic, endocrine, and immune activities, the placenta is primarily a fetal organ whose size and health are indicative of the fetus. Placenta thickness provides important information regarding the condition of the fetus in gestation. In present study the, study subjects had thick and thin placenta at 32 weeks and at 36 weeks had maximum birth weight < 2.5 kg, whereas subjects having normal placental thickness had more birth weight above 2.5 kg.

**Azpurua H et al**<sup>5</sup> aims to provide an additional estimate of placental volume by a unique technique that makes use of two-spatial sonography. Using linear calculations of placental breadth, height, and thickness, placental volume was measured in 29 third-trimester pregnancies in order to determine the convex-concave shell volume within 24 hours of delivery. To calculate Spearman's rho (rs) and significance, data were resolved. The actual placental weight and assumed placental volume (EPV) showed a significant equivalency (rs = 0.80, p < 0.001). The subgroup analysis of preterm gestations (n = 14) demonstrated a much stronger association between EPV and actual placental weight (rs = 0.89, p < 0.001). When combined with volumetric computations, two-spatial ultrasonography may be able to accurately forecast placental weight. **Nagpal K et al**<sup>4</sup> reported a prospective observational study which included 130 pregnant women. In our study, the mean placental thickness at 32 and 36 weeks were 2.89 and 3.25 cm, respectively. The 10<sup>th</sup> percentile placental thickness at 32 and 36 weeks were 2.2 and 2.5 cm, and at the 95<sup>th</sup> percentile, the placental thickness at 32 and 36 weeks were 3.5 and 4.19 cm. Similar results were found in the study of Nagpal et al. wherein the mean placental thickness was increased from 32 at 36 weeks, and the values were 3.34 and 3.57 cm, the 10<sup>th</sup> percentiles of placental thickness at 32 and 36 weeks were 3.02 and 3.11 cm, and at 95<sup>th</sup> percentiles, the placental thickness at 32 and 36 weeks were 3.57 and 3.99 cm. In our study, subjects had thick and thin placenta at 32 weeks with a maximum birth weight < 2.5 kg, whereas subjects having normal placental thickness had more birth weight above 2.5 kg. At 36 weeks, almost similar birth weight, i.e., <2.5 kg, was seen for study subjects having a thick and thin placental thickness. These findings were comparable with the study reported by Nagpal et al. wherein the mean birth of the newborn weight at 32 weeks was 2.76 kg in study subjects with thick placenta, and at 36 weeks, the mean birth weight of the newborn was 2.71 kg. **Ghosh SK et al**<sup>6</sup> compared placental thickness and fetal weight accompanied by gestational age using ultrasonography in a sane singleton pregnancy. Additionally, the study evaluated the placental thickness's influence on fetal outcome evaluation, including birth weight, APGAR score, NICU admission, and meconium-tainted liquor in 100 antenatal mothers. One hundred prenatal mothers were interviewed by the lead researcher, and authorization was granted for the use of ultrasonography for a fetoplacental profile. Placental thickness and expected fetal weight were also enquired about at 24 weeks, 32 weeks, and 36 weeks after deliveries. One patient, whose biometric limitations indicated IUGR, had placental thickness below the 10th percentile at 24 and 32 weeks. All seven

instances with IUGR at 32 weeks based on biometric characteristics had thick placentas.

**Karami Rasoul et al**<sup>7</sup> claimed that a significant relationship between fetal weight and placental thickness in the second and third trimesters of pregnancy. **A.V.N. Suseela et al**<sup>8</sup> recruited 250 pregnant patients between 36 and weeks of gestation for a prospective observational study to compare placental thickness with the estimated weight of the infant. In this study, a placenta measuring 3.75 cm was regarded thick, 2.5 to 3.75 cm was judged normal, and more than 3.75 cm was considered abnormal. The placenta's average thickness was 3.10 centimeters. Out of 250 patients, 20 had babies weighing less than 2.5 kg at delivery whose thickness was less than 2.5 cm. Out of 250 cases, 40 participants had a thickness greater than 3.75 cm, and 20 of them had birth weights under 2.5 kg. Just five of the remaining 190 cases (placental thickness 2.5–3.75) had babies weighing less than 2.5 kg.

After 28 weeks of gestation, a different study by **Maryam Afrakhteh et al**<sup>9</sup> revealed a favorable correlation between birth weight and placental thickness.

According to a study by **Ademola A. Adeyekun et al**,<sup>10</sup> there was a possible linear link between the PT and EFW, with a Spearman's correlation value of 0.668 and a P = 0.000. At P = 0.000, the regression value was 0.586.

In A study conducted by **Shakir RF et al**,<sup>11</sup> 100 pregnant women's PT was measured from 11 weeks to 40 weeks and compared with the fetus's weight and gestational age. The fetus's average anticipated weight was  $1275.75 \pm 982.29$  gm, and its average PT was  $25.50 \pm 6.52$  mm. As a result, PT and the baby's predicted birth weight showed a significant positive correlation (p-0.000).

At 18 to 40 weeks, **Nasreen Noor et al**<sup>12</sup> did a study ultrasonography assessment of the fetal weight and placental thickness in 152 expectant moms. There was a substantial positive connection (p-<0.001) between the mean estimated birth weight ( $2145.86 \pm 121.24$  grams) and the mean placental thickness ( $31.63 \pm 4.79$  mm).

**Ashmawy NE et al**<sup>13</sup> measured the placental thickness (PT) and assessed the fetal weight in 200 healthy pregnant women in their third trimester of a cross-sectional prospective observational study. The results of the study showed that there were strong positive associations (p-value <0.001) between placental thickness and actual birth weight (r=0.933) and between placental thickness and estimated fetal birth weight (r=0.899). According to this study, placental thickness is a potentially useful measure for estimating the anticipated fetal birth weight (EFBW).

A Sudanese study by **Khairy S Ismail et al**<sup>14</sup> also demonstrated the substantial relationship between placental thickness and femur length, biparietal diameter, abdominal circumference, and estimated weight of the baby at birth.

**Hussein AH et al**<sup>15</sup> did a study to establish the normal placental thickness as determined by sonography starting at 18 weeks of gestation and to ascertain the relationship between the measurement and the estimated weight of the fetus. According to the study's findings, the average placental thickness during the second trimester was  $24.67 \pm 3.3$ , and the average birth weight (g) fell between 2200 and 4000. The study came to the conclusion that because of its linear correlation, placental thickness evaluated at the position of umbilical cord insertion might be utilized as a reliable sonographic indicator in the evaluation of fetal weight.

**Ismail KS et al**<sup>16</sup> carried out a prospective descriptive hospital-based study to determine the correlation between 207 third-trimester pregnant women's estimated fetal weight and placental thickness. The measurements of placental thickness revealed a maximum thickness of 4.3 cm, a minimum thickness of 1.5 cm, a mean thickness of 3.1 cm, a median thickness of 3.1 cm, a standard deviation of 0.64111, and an increase in fetal weight of 0.88 kg for every 1 cm of placental thickness.

**Ogbochuwu O et al**<sup>17</sup> carried out a cross-sectional investigation to ascertain the association between PT and PD with fetal biometric parameters and estimated weight in 400 pregnant women who were in the third trimester of normal, singleton pregnancies. There was a strong significant connection ( $P < 0.001$ ) between PD and PT and EFW. There was a strong positive association between PD and PT and fetal weight.

In order to ascertain the correlation between the placental weight and birth weight of the neonates delivered at term, **Olaleye AA et al**<sup>18</sup> carried out a retrospective investigation. The current study's findings showed that the average placental weight was  $617 \pm 78$  g and the average birth weight was  $3344 \pm 488$  g.  $19.94 \pm 4.2\%$  was the mean placental weight to birth weight ratio (PBWR X 100). At a strong statistical significance level ( $P=0.968$ ), there was a direct correlation between an increase in the neonate's birth weight and an increase in the placental weight.

### Limitations

The sample size was small and there was only a single observer, there was a chance for an observer bias (inter observer variability), an instrumental bias etc.

### CONCLUSION

The placenta, an organ that connects the mother and fetus, is in charge of facilitating material exchange. Therefore, placental thickness can be used to gauge fetal growth; a greater or lower placental thickness at a certain gestational age may increase the risk of low birth weight babies.

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