

**Correlation Between Placental Thickness and Estimated Fetal Weight and actual birth weight–prospective study at tertiary care centre.**

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**Abstract**

The aim of this study was to investigate the relationship between placental thickness and estimated fetal weight and actual birth weight in normal pregnant women. One hundred Fourty five women with singleton pregnancies between 28 weeks to term gestation were studied by trans abdominal ultrasound. Fetal weight was estimated by measurement of biparietal diameter (BPD) and abdominal circumference (AC).

Gestational age was estimated by measuring the BPD and fetal femur length (FL).

Placental thickness was measured in a longitudinal section at the point of insertion of the umbilical cord. Results showed that both placental thickness and estimated fetal weight increased in fairly linear manner with gestational age. There were significant positive correlations between placental thickness and estimated fetal weight ( $p < 0.05$ ). Regression analysis yielded linear mathematical relationships between estimated fetal weight and placental thickness.

**Introduction**

A healthy baby at term is the product of three important factors: a healthy mother, normal genes, and good placental implantation and growth. It is clear that a normally functioning placenta is important for normal fetal growth and development.<sup>1,2</sup> The human placenta develops with the principal function of providing nutrients and oxygen to the fetus.<sup>3</sup> Adequate fetal growth and subsequent normal birth weight depends on the efficient delivery of nutrients from the mother to the fetus via normally functioning utero-placental organ.<sup>4</sup> It is clear that normal development of placenta during gestation is necessary for supporting a healthy fetus.<sup>5</sup> On the other hand, any impairment in its development may have a profound impact on fetal development and pregnancy outcome.<sup>3</sup> The prediction of growth restricted pregnancies from placental size is based on the fact that diminished placental size precedes fetal growth restriction.<sup>6</sup> As a general rule, the placental thickness in millimeters should be equal to the gestational age in weeks, +/- 10mm.<sup>7</sup> Placenta less than 2.5 cm thick at term

is associated with intrauterine growth retardation of the fetus, pree clampsia, prematurity, fetal malformations or trisomy, small for date fetus and neonatal high heamo globin.<sup>8</sup>Placenta more than 4 cm thick at term is associated with gestational diabetes, intrauterine infections and hydrops foetalis.<sup>9</sup> Thus the subnormal placental thickness for the corresponding gestational age should be evaluated for any disease condition.<sup>10</sup>

**Material and methods**

It was Cross sectional study, between APRIL 2021 to November 2022. This study was conducted in JLN Medical college, Ajmer, Rajasthan on women with uncomplicated pregnancy between 28 completed weeks to term gestation who were unequivocal about their LMP. A total of 145 pregnant women with normal singleton pregnancies between 28 weeks to term gestation were recruited. Their records indicated none of them had Gestational diabetes, Hypertension (systemic hypertension and pregnancy induced hyper tension), Anemia, Poly hydramnios, oligohydramnios, Foetal anomalies, Placenta praevia, placental anomalies, poor visualization of placenta, cord anomalies, Multiple pregnancies, Irregular menstrual cycles, Last menstrual period not known. Obstetric ultrasound was carried on the patients using Samsung sonoace X7 ultrasound machine with curve linear transducer. Gestational age was estimated using biparietal diameter (BPD), fetal femur length (FL) and abdominal circumference in the second and third trimesters. Fetal weight was estimated using BPD and AC. The placenta was localized in a longitudinal section and its thickness measured at the point of the umbilical cord insertion.

**Statistical Analysis**

Data were analyzed using Statistical Package for Social Sciences (SPSS, Chicago, USA) version 14.0. Values of placental thickness and estimated fetal weight at various

gestational ages were expressed as mean + standard deviation. Statistical significance was considered at  $\rho < 0.05$ . Pearson’s correlation analysis was used to establish the relationship between placental thickness and estimated fetal weight.

**Results**

Table 1: show distribution of gestational age by USG with expected fetal weight.

Table 2 show relationship between placental thickness and BPD, HC, AC, FL.

Table 3 show relationship between Mean placental thickness and corresponding mean estimated fetal weight at various gestational ages and actual birth weight.

There was significant positive correlation between placental thickness and estimated fetal weight, placental thickness and actual birth weight between 28 weeks to term gestation.;  $r = 0.837$ ,  $p \text{ value} < 0.0001$ ,  $R \text{ value} = 0.747$ ,  $p \text{ value} < 0.0001$  respectively

Figures 1 and figure 2 show linear relationship between placental thickness and estimated fetal weight and actual birth weight between 28 weeks to term gestations though with marked variations in weights corresponding to particular placental thickness. The regression equations inserted in figures 1 and 2 can be used to estimate fetal weight during obstetric ultrasound.

Table 1: Distribution of gestational age by usg with expected fetal weight

GA by USG (weeks)	No. of patients	Expected fetal weight (gm)	
		Mean	SD
28	31	621.58	264.96
29	10	595.20	495.99
30	3	1492.00	1446.40
31	3	1483.67	5.51
32	13	1764.15	97.92

33	9	1711.33	455.39
34	7	2142.86	155.48
35	19	2492.00	29.36
36	16	2631.75	42.97
37	12	2830.00	43.39
38	15	3006.60	69.60
39	5	3069.20	152.65
40	2	3455.00	5.66
Median	34	2092	-
Mean	32.25	1919	-
Std	3.77	971.55	-

Table 2: Relationship between placental thickness and BPD, HC, AC, FL.

	r value	p value
BPD v/s placental thickness (mm)	0.815	<0.0001
	r value	p value
HC v/s placental thickness (mm)	0.811	<0.0001
	r value	p value
AC v/s placental thickness (mm)	0.824	<0.0001
	r value	p value
FL v/s placental thickness (mm)	0.824	<0.0001

Table 3: Correlation of mean placental thickness with estimated fetal birth weight and actual birth weight

Variab les	Total no. of cases	Rang e	Me an	Sd	p val ue	r valu e
Placen tal thickn ess (mm)	145	17-38	31.11	4.75	-	-
Expect ed fetal	145	67-3459	1919	971.55	<0.0001	0.837

weight						
Actual birth weight	145	1020	272	747.74	<0.0001	0.747
		-	6.6			
		4200	2			

Figure 1:

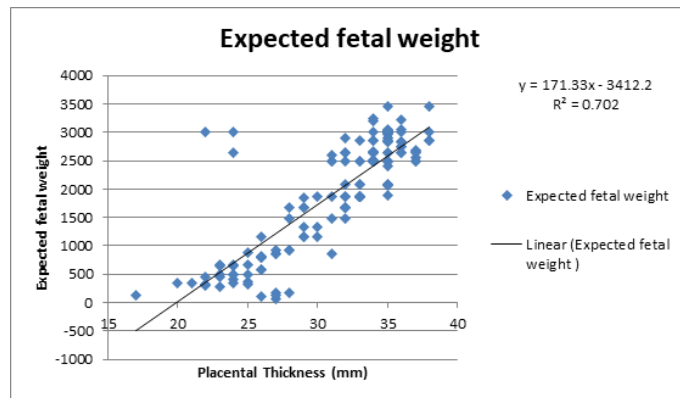
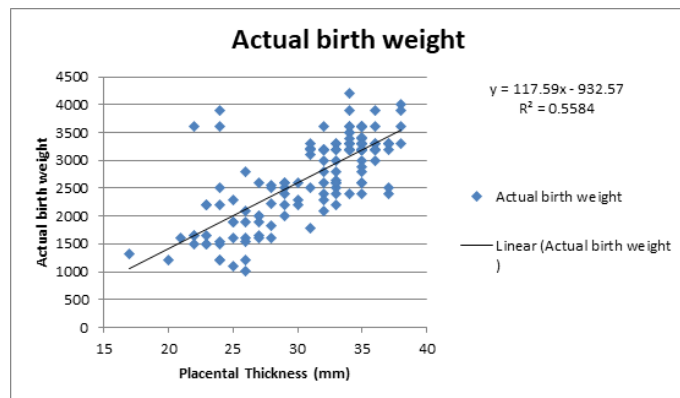


Figure 2



**Discussion**

The present study assessed the relationship of placental thickness (in mm) with sonographic gestational age (in weeks) and also the fetal weight with advancing gestational age and placental thickness and actual birth weight. In our study total 145 singleton pregnant women were studied Among which majority of cases (38.62%) 20-25 years age group and followed by 26-30 age group 25.52% and more than 30 years and less than 20 year were 23.45% and 12.41% respectively. In our study mean placental thickness was 31.12+/- 4.75 mm and median was 33 mm. The study showed that the placental thickness (in mm) increases Steadily with increasing

gestational age (in weeks) in a linear fashion and almost matching the gestational age from 28-35 weeks of gestation. The rate of increase of placental thickness gradually diminished from 36-40 weeks and was less by 1-4 mm compared to gestational age from 28-35 weeks. The mean EFBW (calculated from BPD, FL, AC) according to Hadlock formula by the ultrasound machine) was  $1919 \pm 971.55$  gm. The actual birth weight that was measured immediately after birth using a pediatric weight scale, mean birth weight was  $2726.62 \pm 747.74$  gm. There is also a highly significant positive correlation between mean placental thickness and actual birth weight ( $r = 0.747$ ,  $p$  value  $< 0.001$ ). Our results matches also with the study conducted by Karami Rasoul et al<sup>11</sup> who found a significant correlation between the placental thickness in the second and third trimester of pregnancy with fetal weight at these times ( $r = 0.539$ ,  $p = 0.005$ ;  $r = 0.541$ ,  $p = 0.005$ ). They found that per 100 gm of fetus gain in the second trimester the placental thickness increased by 1 millimeter, per 250 gm of fetus weight gain in the third trimester the placental thickness increased by 0.4 mm. Our results also matches with results of the study conducted by Pawan et al.<sup>12</sup> who observed that the maximum mean placental thickness at 26th week is  $29.76 \pm 2.163$  and at 38th week is  $38.12 \pm 2.09$  mm. The mean fetal weight at 26th week was  $879.5 \pm 59.15$  and at 38th week was  $3169.66 \pm 187.5$ , indicating an increase in placental thickness with fetal weight in fairly linear manner ( $r = 0.79$ ,  $p = 0.001$ ;  $r = 0.50$ ,  $p = 0.004$ ).

So concluded that placental thickness is a good prognostic factor in assessing neonatal outcome like birth weight and should be measured in addition to biometric parameters in antenatal women undergoing ultrasound.

### Conclusion

The relationship between the placental thickness and gestational age is linear and direct. Placental thickness

and fetal weights are closely correlated from 28 weeks to 36 weeks and it follows nearly a linear pattern except during last few weeks (after 36 weeks) of gestation. Initial growth being much more rapid than that of the fetus. Placental thickness (in mm) measurement can be an important additional parameter for estimating gestational age along with other parameters especially second and third trimesters of gestation. Placental thickness (in mm) increases with increasing gestational age (in weeks) and almost matching for weeks of gestation. The relationship of Placental thickness with gestational age falls marginally and the rate of growth of Placental thickness decreased after 36 weeks of gestation and was lower by 1-3 mm. The placental growth directly influences the fetal weight. Placental thickness can be used as a promising parameter in predicting expected fetal birth weight (EFBW) with other fetal parameters during antenatal follow up by ultrasound.

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