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Original Research Article

Correlation of placental thickness with birth weight in singleton pregnancies

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ABSTRACT

Background: The placenta provides the physiologic link between a pregnant woman and the fetus. During pregnancy, the normal placenta increases its thickness at a rate of approximately 1 millimeter per week. The thickness is considered normal throughout the 2nd and 3rd trimester if between 2 and 4 cm. There is a need to identify the fetus failing to reach its growth potential because an early detection of intrauterine growth retardation will be beneficial to obstetric and neonatal care.

Methods: After applying inclusion and exclusion criteria, 251 antenatal women from 24-39 weeks gestation were included in the study. After informed written consent, relevant history, examination, abdominal ultrasound was performed noting fetal biometry and placental thickness. The participants were followed until delivery and birth weight noted. Statistical analysis of birth weight (< and >2500 gm) with placental thickness was done.

Results: Mean age of the study was 25.88±4.34 years. The mean placental thickness in group A was 3.33±0.92 cm and in group B was 3.38±0.68 cm. Placental thickness showed a positive correlation with fetal weight (r=0.013), however it was not statistically significant. Uncomplicated pregnancy group had mean placental thickness of 3.40±0.70 cm. The difference of mean for placental thickness was statistically significant with respect to medical disorders (p=0.042).

Conclusions: Placental thickness does increase with increasing birth weight of the fetus and hence, subnormal or more than normal placental thickness is helpful in signalling important maternal conditions that may be detrimental to the fetus.

Keywords: Birth weight, Placental thickness, Singleton pregnancy

INTRODUCTION

The placenta is a fetal organ with important metabolic, endocrine and immunologic functions besides being responsible for the nutrition, respiration and excretion for the fetus. It also acts as a barrier and protects the fetus from noxious agents.¹ 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.² Hence, any impairment in the development of placenta may have a profound impact on the developing fetus and thus, pregnancy outcome.

Despite careful antenatal surveillance involving scrupulous examination, an issue of considerable concern is that a large number of low birth weight (LBW) infants are not diagnosed until delivery and such low birth weight or small-for-gestational-age (SGA) infants are susceptible to hypoxia, fetal distress, fetal death and long-term handicaps.

Studies have also shown that diminished placental size precedes fetal growth retardation as IUGR is associated with impoverished villous development and fetoplacental angiogenesis.^{3,4} Thus, the subnormal placental thickness

for the corresponding gestational age should be evaluated further for any underlying disease condition.⁵

Hence, the present study was aimed to analyse the correlation of placental thickness with the birth weight in normal and IUGR singleton pregnancies.

METHODS

This hospital-based study was carried out in the Department of Obstetrics and Gynaecology and Department of Radiodiagnosis at Adesh Institute of Medical Sciences and Research, Bathinda, after getting approval from Institutional Ethical and Research committee. It was a prospective observational study carried over a period of one and a half years (April 2018-November 2019) with patients being followed up till delivery.

Inclusion criteria

Singleton pregnancy, gestational age 24-39 weeks.

Exclusion criteria

Multiple gestation, diabetes, established fetal anomalies, anomalous insertion of cord.

Methodology

251 pregnant women (24-39 weeks of gestation), outpatients and inpatients, were included in the study applying inclusion and exclusion criteria. After informed written consent, history and physical examination, trans-abdominal sonographic measurements were performed on GE Voluson E8 Expert Ultrasound Machine, using a 3.5 Hertz curvilinear probe obeying PCPNDT rules 1996.

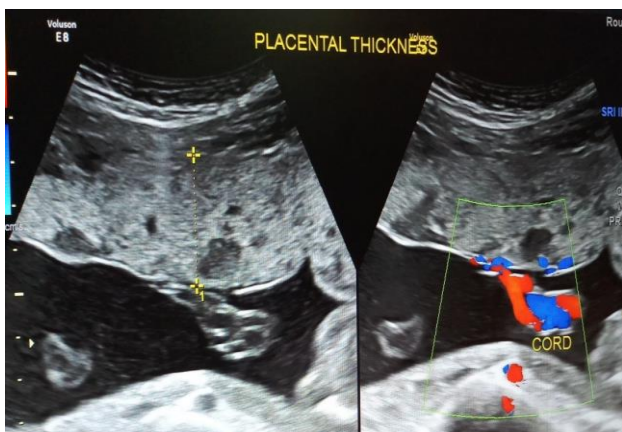


Figure 1: Placental thickness measurement at the level of cord insertion.

The placental thickness was measured at the level of umbilical cord insertion by placing one calliper at the level of cord insertion and other in a perpendicular direction at

the level of basal plate of placenta as shown in Figure 1. The retroplacental venous lakes were excluded for the purpose of measurement. Any measurements during uterine contraction were repeated to avoid false localization and measurement.

Subjects were followed until delivery of the baby. Subsequently, placental thickness was correlated with birth weight by categorizing into group A and B of baby weights <2500 gm and ≥2500 gm respectively. Statistical analysis was done using SPSS19.0 version.

RESULTS

There were 251 antenatal women included in the study with an age distribution ranging from 18 years to 44 years with 84.06% patients belonging to 20-30 years age group. It was observed that the mean placental thickness in primigravida (n=84) was 3.51 cm while in multigravida (n=167) was 3.30 cm, the difference of which was found to be significant (p value 0.04).

Placental thickness, observed in the study, had a minimum value of 1.40 cm and a maximum of 6.30 cm, with a mean value of 3.37cm. Similarly, birth weight ranged from 1290 gm to 5000 gm, with a mean value of 2811gm as tabulated below.

Table 1: Mean age and placental thickness in study.

Parameter	Min.	Max.	Average	SD
Age (years)	18	44	25.88	4.34
Placental thickness (cm)	1.40	6.30	3.37	0.73
Birth weight (gm)	1290	5000	2811	421.20

Depending on the localization of placenta in the uterine cavity on ultrasound, it was found that 56.6% of placenta were anterior, 28.3% were posteriorly located while 12.7% were found attached to the fundus. Only 2.4% subjects in our study had lateral attachment of placenta. The mean placental thickness for anteriorly located placenta was 3.29 cm while that of fundal, posterior and lateral placenta was 3.40 cm, 3.52 cm and 3.51 cm respectively.

Of the 251 antenatal women included in the study, a total of 75 women had co morbidities namely- anemia (40), hypothyroidism (18), amniotic fluid disorders (6), Rh negative pregnancy (6), pre-eclampsia (2) and medical disorders (3) (like maternal ASD, asthma, thrombocytopenia) representing 29.9% whereas the remaining 70.1% being uncomplicated pregnancies. The mean placental thickness along with their standard deviations among various co morbidities is shown in Table 3. Statistical analysis revealed that difference of mean was significant in the medical disorders group with p value of 0.04.

Table 2: Mean placental thickness in group A and group B.

Gestational age group	Group A birth weight <2500 gm		Group B birth weight ≥2500 gm	
	N=49	Mean placental thickness	N=202	Mean placental thickness
24-25	0	-	10	2.75±0.36
>25-26	1	2.35±0.00	9	2.75±0.23
>26-27	3	2.90±0.83	7	3.09±0.56
>27-28	4	3.40±1.45	11	2.94±0.51
>28-29	3	2.65±1.56	12	3.20±0.43
>29-30	4	3.54±0.76	8	3.25±0.81
>30-31	7	3.29±0.70	5	3.38±0.78
>31-32	2	3.31±0.13	13	3.33±0.42
>32-33	11	3.79±1.03	23	3.46±0.48
>33-34	9	3.08±0.88	26	3.30±0.51
>34-35	3	3.55±0.39	31	3.67±0.63
>35-36	1	3.22±0.00	29	3.77±0.73
>36-37	0	-	9	3.24±0.99
>37-38	1	3.55±0.00	8	3.62±0.91
>38-39	0	-	1	5.88±0.00

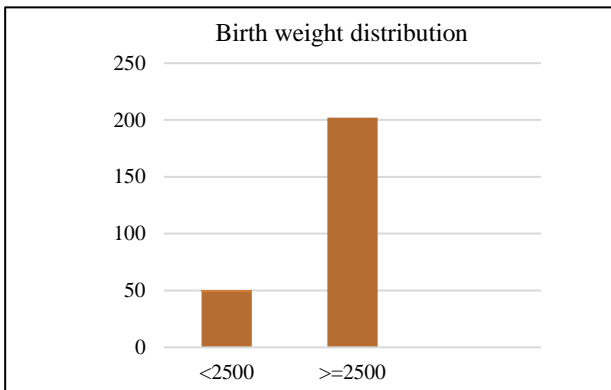


Figure 2: Birth weight distribution in the study.

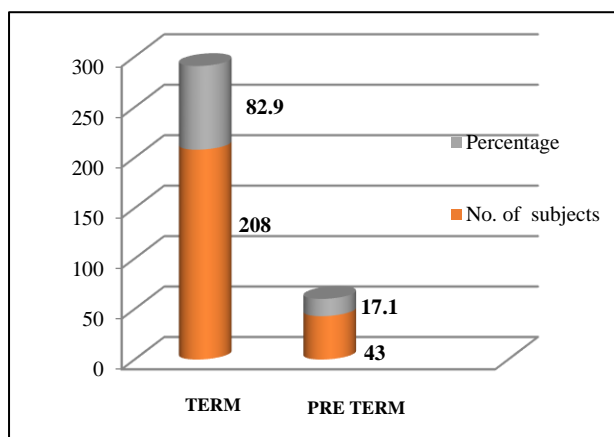


Figure 3: Gestational age at birth.

All 251 patients were followed up till delivery and the birth weight of each child was noted. Out of these, 43 (17.1%) had pre-term delivery and the remaining 208 subjects had delivery at term (Figure 3). There were 49 low birth weight

i.e. birth weight <2500 gm (group A) babies and the rest (202) weighed ≥2500 gm (group B) as shown in Figure 2.

Table 3: Placental thickness among co morbidities.

Comorbidities (n)	Mean placental thickness±SD (in cm)
Anemia (40)	3.29±0.62
Hypothyroidism (18)	3.03±0.62
Amniotic fluid disorders (6)	3.98±1.26
Rh negative pregnancy (6)	2.83±0.98
Pre-eclampsia (2)	3.19±0.76
Medical disorders (3)	4.70±0.47
Uncomplicated (176)	3.40±0.70

The placental thickness in group A (i.e. birth weight <2500 gm) and in group B (i.e. those that weighed ≥2500 gm) were studied. The mean of placental thickness at different gestational age in both the groups is shown in Table 2. On applying correlation coefficient, the study showed a positive correlation of placental thickness with birth weight with $r=0.013$, however, it was not found to be statistically significant ($p=0.838$).

DISCUSSION

It has been seen that from the 22nd week to the 35th week of gestation, the placental thickness in millimeters coincides almost exactly with the gestational age in weeks.⁶

Small and thin placenta

Placenta less than 2 cm thick, have been shown to be present in cases of fetal malformations, chronic uterine infections with CMV, HSV, gestational hypertension, pre conceptional diabetes and in women with low pre-

pregnancy weight and less weight gain during the pregnancy who have a low blood volume expansion in pregnancy.^{7,8} Small placentae are associated with increased frequency of preeclampsia, small for dates fetus, fetal growth restriction and still births.^{9,10}

Large and thick placenta

According to the literature, a placenta more than 4 cm thick over its entire extent has an association with maternal diabetes mellitus, fetal hydrops and intrauterine fetal infections. Common causes of unusually large placenta are villous edema, severe maternal anemia, congenital syphilis, large intervillous thrombi and large subchorionic haematoma. Thick placenta is associated with increased rates of placental abruption, NICU admissions and anomalies.^{11,12}

In our study, it was found that 42 subjects had placental thickness more than 4 cm. Out of these, 7 subjects delivered babies with birth weight less than 2500 gm and required NICU admissions. One patient with birth weight of the baby 1400 gm was an IVF conception with hypothyroidism and had PPROM. Another patient whose baby weighed 1400 gm had polyhydramnios with PPROM with cord presentation. Similarly, Elchalal et al stated that sonographically thick placenta (>4 cm or >90th percentile) is associated with increased perinatal mortality and morbidity like fetal anomalies, small for gestational age (SGA), large for gestational age (LGA) infants at term.¹¹ Since our study did not include anomalies, so the same cannot be commented upon, but 16.67% babies did require NICU admission despite the fact that they had no malformations.

On the other hand, of the total 49 subjects who delivered babies weighing less than 2500 gm, 7 subjects (14% of LBW babies) had placental thickness more than 4 cm which is similar to the study by Elchalal et al.¹¹ There were no LGA babies in the same group in our study.

The present study also analysed the mean placental thickness in two groups divided on the basis of birth weight into group A (birth weight <2500 gm) and group B (birth weight ≥2500 gm). The mean placental thickness in group A was 3.33±0.92 cm while that in group B was 3.38±0.68 cm, the difference of which was not found to be statistically significant.

In a similar study done by Mathai et al, the study population- 498 antenatal women, were divided into two groups based on outcome fetal weight. Group A included fetal weight <2500 gm and group B included fetal weight >2500 gm as in our study. Placental thickness was calculated from gestational weeks 24 to 39. The 'r' value indicating correlation between placental thickness and gestational age for group A was 0.325 and group B was 0.135 (p value 0.01). The placental thickness mean values for Group A was, thus, found to be higher when compared to Group B.¹³

In a study by Wolf et al placental volume and fetal weight were estimated by ultrasound at regular intervals from 16-20 weeks in 18 patients. In 7 normal cases, placental and fetal growth followed a sigmoid or nearly linear pattern. In 11 cases with an abnormal outcome of pregnancy (fetal death, fetal distress necessitating caesarean section or neonatal weight below 10th percentile), placental growth retardation always preceded fetal complications or fetal growth retardation by at least three weeks.³

Similarly, Habib concluded in his study that placental diameter and thickness measurements are valuable parameters for predicting low birth weight infants.¹⁴ He also framed a warning limit of placental thickness of 2 cm at 36 weeks gestation as a predictor of LBW infants and subsequent IUGR.⁵ However, in our study only one patient had a placental thickness of <2 cm, i.e. 1.4 cm, but the patient delivered a baby of birth weight 2800 gm (not low birth weight). Also, it is imperative to note that the same patient was an Rh negative pregnancy with epilepsy, so a lesser placental thickness may be in part due to the comorbidities, which though has been observed in the study but establishing its significance needs further evaluation.

Limitations of the study are the fetuses with congenital anomalies were excluded from the study and hence, the study cannot comment on the same. Also, the comorbid conditions need to be studied in detail as a properly matched study in order to establish a cause-effect relationship between various comorbid conditions and the placental thickness.

CONCLUSION

The maternal milieu serves to affect the placental thickness and in turn the fetus and thus, may land up a fetus in an intensive care unit and increase to the family expenses, adding burden to the health care. Therefore, a subnormal or more than normal placental thickness for the gestational age should signal investigating the case further for maternal conditions like diabetes mellitus, pre-eclampsia, fetal growth restriction, hypothyroidism, hydrops fetalis and intrauterine infections such as CMV and HSV.

Thus, laying down emphasis on the fact that as vital a structure as placenta for the in-utero life needs to be examined carefully and a simple tool of measuring placental thickness is really helpful in signalling important maternal conditions detrimental to the fetus.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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