

## PLACENTAL THICKNESS AS PREDICTOR OF FETAL WEIGHT IN SECOND AND THIRD TRIMESTER IN SINGLETON PREGNANCIES

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### ABSTRACT

**Objectives:** The aim of the study was to find out correlation between placental thickness and fetal weight in singleton pregnancies.

**Methods:** One hundred and twenty patients with singleton pregnancies between 14 and 42 weeks of gestation were included in this study on the basis of a predefined inclusion and exclusion criteria. Gestational age and fetal weight were determined by biometry. Placental thickness was measured at the level of cord insertion. Correlation between placental thickness and fetal weight was assessed using Pearsons coefficient.  $p < 0.05$  was taken as statistically significant.

**Results:** The mean age of the studied cases was found to be  $26.12 \pm 6.38$  years. The mean gestational age of studied cases was found to be  $28.62 \pm 9.12$  years. In majority of the cases (46.67%), placenta was anterior in location followed by posterior (31.67%). In 14 (11.67%) cases, placenta was found to be fundal. In 3 cases (2.50%), placenta was found to be covering internal Os (Placenta Previa). The mean placental thickness varied from 13.32 mm (at 12 weeks) to 36.34 mm (42 weeks). The thickness gradually increased from 13.32 mm to reach a nadir of 37.22 at 38 weeks after which there was slight decline in placental thickness. The analysis of correlation between placental thickness and fetal weight showed that there was a strong correlation between mean placental thickness and fetal weight from 14 weeks till 37 weeks of gestation.

**Conclusion:** There is a positive correlation between placental thickness and fetal weight in second and third trimester of singleton pregnancies.

**Keywords:** Placental thickness, Gestational age, Fetal weight, Biometry, Ultrasound.

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### INTRODUCTION

Placenta plays a crucial role in fetal development. It is responsible for providing the fetus with the necessary nutrients, oxygen, and protection to support its growth and development. One of the most important functions of the placenta is to transport nutrients, gases, and waste products between the mother and the fetus. In addition to nutrient exchange, the placenta also produces hormones that regulate the mother's metabolism and is essential for continuation of pregnancy [1].

Placental imaging is an essential part of assessment of maternal as well as fetal well-being during pregnancy. Thus, any abnormalities in the placenta can have significant consequences for the health of the mother and the developing fetus. Placental abnormalities such as placenta previa and morbidly adherent placenta may cause life-threatening bleeding thereby seriously jeopardizing maternal health. Similarly, placental abnormalities such as placenta increta and placenta membranacea are reported to be associated with increased risk of fetal complications such as second-trimester miscarriages and even fetal demise. It is therefore important to assess the placenta by way of imaging [2].

The most common imaging technique used for placental assessment is ultrasound and Doppler examination. In selected cases, magnetic resonance imaging can be done which provides detailed information about the structure, blood flow, and function of the placenta [3]. Early detection and accurate diagnosis of placental abnormalities can help treating obstetrician to intervene promptly and manage complications effectively, ultimately leading to better maternal and fetal outcomes. Ultrasound examination can give precise idea about the location as well as any placental abnormality. On ultrasound placenta appears as uniformly echogenic structure along uterine wall. In normal placenta, a hypoechoic band is seen separating placenta from myometrium [4].

Recently many studies have found that placental thickness can help in assessment of gestational age as well as fetal weight. Estimation of fetal weight is an important determinant of perinatal outcome since low-birth-weight babies are more likely to develop complications such as neonatal hypoglycemia, hyperbilirubinemia, and sepsis. Low birth weight babies are more likely to require neonatal intensive care unit (NICU) admission and need for parenteral nutrition [5]. Low birth weight as well as extremely low birth weight babies may develop complications such as birth asphyxia and may require need for neonatal resuscitation in immediate postnatal period and hence such deliveries should preferably be done at a higher center well equipped with facilities for neonatal resuscitation and NICU facilities if need for NICU admission arises. It is therefore for this reason that accurate estimation of fetal weight particularly in third trimester is an important part of imaging of pregnant women [6].

Usually, fetal biometric parameters such as head circumference, biparietal diameter, abdominal girth, and femur length are used for assessment of fetal weight. However, in certain conditions such as skeletal dysplasia, Gastroschisis, diaphragmatic hernia and multiple gestations, fetal biometry cannot be entirely relied upon [7]. In addition to these factors such as polyhydramnios is reported to be associated with a tendency of overestimation of fetal weight. Because of these reasons, there is a need to have a parameter for assessment of fetal weight which should be independent of fetal biometry. Many studies have found a positive correlation between placental thickness and fetal weight [8].

We conducted this observational study to find out the correlation between placental thickness and fetal weight in second and third trimester of pregnancy.

**Aims and objectives**

The aim of the study was to find out correlation between placental thickness and fetal weight in singleton pregnancies.

**METHODS**

This was an observational study in which 120 patients in second and third trimester of pregnancy were included on the basis of a predefined inclusion and exclusion criteria. The study was done in the department of obstetrics and gynaecology and department of Radiology of Sikkim Manipal Institute of Medical Sciences, Gangtok, Sikkim. The institutional ethical committee approval was not required since it was a purely observational study. An informed and written consent was obtained from all the patients. The study duration was 1 year from August 2021 to August 2022. After enrolment a detailed history was taken from the participants. The details obtained included menstrual history, last menstrual period, and presence of any systemic illness which are likely to affect fetal outcome was asked for and noted. Gestational age by last menstrual period was noted. Antenatal ultrasound was done by a qualified senior radiologist. The patient was scanned in supine position. Convex probe of Mindray DC80X Insight machine was used for scanning.

Sample size was estimated according to reference studies in which placental thickness was used for estimation of fetal weight. The minimum sample size so determined was 90 patients as calculated by Open Epi-version 3.01 online software, A 10% difference was determined having 80% power and 5% significance ( $\alpha=0.05$ ,  $\beta=0.80$ ). We therefor enrolled 120 patients in this study.

An assessment of fetus with respect to presentation and lie was done. Amniotic fluid index was determined using four quadrant method. The presence of any gross fetal anomaly was noted. Fetal weight estimation was done with the help of fetal biometry (head circumference, biparietal diameter, abdominal circumference, and femur length). Placental imaging was done with a view to determine the site as well as presence of any placental abnormality. Placental pathologies such as abnormalities of placental shape, if any, or site such as low-lying placenta or placenta previa was noted. Placental thickness was noted at the level of insertion of umbilical cord. The mean values along with standard deviation were noted for placental thickness at various gestational ages in second and third trimester of pregnancy. The analysis of placental thickness in correlation with fetal weight (as determined by biometry) was done.

For statistical purposes, SPSS 21.0 software was used and  $p<0.05$  was taken as statistically significant. Pearson coefficient was used to find out correlation between placental thickness and fetal weight.

**Inclusion criteria**

The following criteria were included in the study:

1. Pregnant women from 14 to 42 weeks of gestation
2. Gave informed written consent to be part of the study
3. Singleton pregnancies.

**Exclusion criteria**

The following criteria were excluded from the study:

1. Refusal to give consent
2. Multiple gestations
3. Maternal illnesses likely to affect fetal weight such as maternal hypertension, bronchial asthma, gestational diabetes, and eclampsia
4. Fetuses with significant congenital anomalies, intrauterine growth restriction, hydrops fetalis, and intrauterine fetal demise
5. Fetuses with syndromes likely to affect fetal growth and development.

**RESULTS**

In this study, 120 patients in second and third trimester of pregnancy were included on the basis of a predefined inclusion and exclusion criteria. The most common age group to which patients belonged was between 31 and 35 years (37.50%) followed by 26–30 years (35 %)

and between 18 and 25 years (20%). Nine (7.50%) patients were above 35 years of age. The mean age of the studied cases was found to be  $26.12\pm 6.38$  years (Table 1).

The gestational age was determined by fetal biometry head circumference, biparietal diameter, abdominal circumference, and femur length). Forty-three (35.83%) patients were having gestational age between 25 and 30 weeks. Thirty-eight (31.67%) and 27 (22.50%) patients were between 31 and 37 weeks and 14 and 24 weeks. Twelve (10%) patients were above 38 weeks of gestation. The mean gestational age of studied cases was found to be  $28.62\pm 9.12$  years (Table 2).

The placental location was determined in all cases. In majority of the cases (46.67%), placenta was anterior in location followed by posterior (31.67%). In 14 (11.67%) cases, placenta was found to be fundal. Placenta was right lateral in 7 (5.83%) and left lateral in 5 (4.17%) patients (Table 3).

Placenta was labeled to be low lying if lower end of placenta was within 3.5 cm from internal Os. In 91 (75.83%) patients' placenta was safely away from Os whereas in 26 (21.67%) patients' placenta was low lying. In 3 cases (2.50%), placenta was found to be covering internal Os (Placenta Previa) (Fig. 1).

**Table 1: Maternal age in the studied cases**

Maternal Age	Number of cases	Percentage
18–25 years	24	20.00
26–30 years	42	35.00
31–35 years	45	37.50
>35 years	9	7.50

Mean age= $31.12\pm 8.42$  years

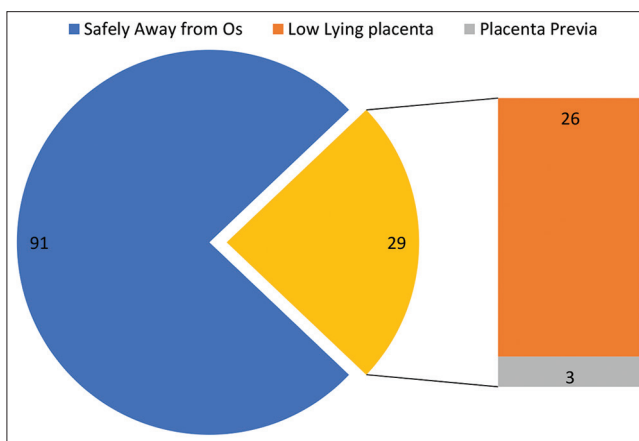
**Table 2: Gestational age of the studied cases**

Gestational age	Number of cases	Percentage
14–24 weeks	27	22.50
25–30 weeks	43	35.83
31–37 weeks	38	31.67
38–42 weeks	12	10.00

Mean gestational age= $28.62\pm 9.12$  years

**Table 3: Placental location in the studied cases**

Placental location	Number of cases	Percentage
Anterior	56	46.67%
Posterior	38	31.67%
Fundal	14	11.67%
Right Lateral	7	5.83%
Left Lateral	5	4.17%
Total	120	100%



**Fig. 1: Location of placenta in relation to internal Os.**

Table 4: Correlation between placental thickness and fetal weight in studied cases

Gestational age by fetal biometry (in weeks)	Mean placental thickness (In mm)	Mean fetal weight in grams	Pearson co-efficient (r-value)	p-value
14	15.62	119	0.9768.	<0.00001.
15	16.32	143	strong positive	Highly significant
16	17.96	179	correlation between	
17	19.07	217	placental thickness and	
18	19.82	295	fetal weight)	
19	20.48	253		
20	21.76	359		
21	21.9	471		
22	21.94	519		
23	22.48	691		
24	23.6	799		
25	24.82	655		
26	25.48	879		
27	27.14	1241		
28	28.34	1305		
29	29.2	1365		
30	29.82	1473		
31	31.12	1591		
32	31.82	1817		
33	32.92	2187		
34	33.92	2247		
35	35.22	2528		
36	35.28	2617		
37	37.18	2949		
38	37.22	2971	-0.7738	0.12753
39	36.58	3015	Strong Negative	Not Significant
40	36.46	3053	Correlation between	
41	36.38	3117	placental thickness and	
42	36.34	3220	fetal weight	

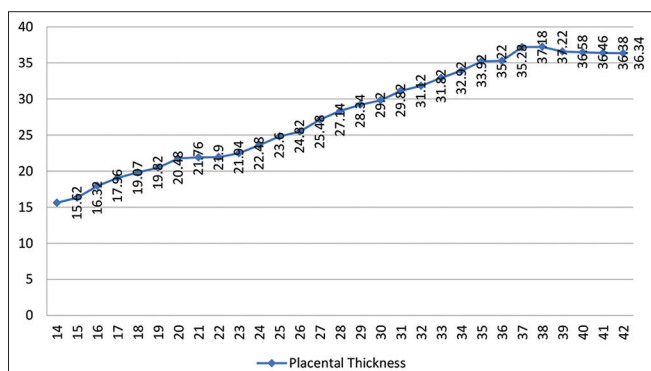


Fig. 2: Placental thickness in second and third trimester in studied cases

Placental thickness was determined at the level of cord insertion. The mean placental thickness varied from 15.62 mm (at 14 weeks) to 36.34 mm (42 weeks). The thickness gradually increased from 15.62 mm to reach a nadir of 37.22 at 38 weeks after which there was slight decline in placental thickness. The mean placental thickness at 42 weeks was found to be 36.34 mm.

The correlation between mean placental thickness and fetal weight in grams was analyzed using Pearson co-efficient. The placental thickness value of 35.22 mm was found to be corresponding to 2528 g (normal birth weight) which was seen at 35 weeks of gestation. The mean placental thickness at 34 weeks was found to be 33.92 mm which was corresponding to fetal weight of 2247 g (low birth weight). The analysis of correlation between placental thickness and fetal weight showed that there was a strong correlation between mean placental thickness and fetal weight from 14 weeks till 37 weeks of gestation. After the pregnancy reached full term (37 weeks), the placental thickness and

fetal weight were found to have negative correlation since the fetal weight went on increasing after 37 weeks and placental thickness slightly reduced giving rise to negative correlation ( $r=-0.7738$ ). However, this negative correlation was not found to be statistically significant ( $p=0.127$ ).

DISCUSSION

Although fetal biometry is commonly used for estimation of fetal weight, there are certain conditions such as skeletal dysplasia, craniosynostosis, cases with abdominal wall defects, and diaphragmatic hernia in which fetal biometry cannot be wholly relied on. In addition to these fetal conditions, severe oligohydramnios and polyhydramnios are also known to affect the estimation of fetal weight done by fetal biometry [9]. In all these cases, estimation of fetal weight independent of fetal biometry becomes important. An erroneous estimation of fetal weight may have catastrophic consequences if delivery occurs at a place which is not well equipped to manage low birth weight babies in immediate postnatal period. Placental thickness is reported to have a positive correlation with fetal weight and many studies have found that it can be used to assess fetal weight [10].

In our study, the mean placenta thickness was found to be 15.62 mm at 14 weeks which corresponded to mean fetal weight of 119 g. The mean placental thickness went on gradually increasing till 38 weeks of gestation whereas fetal weight was found to increase till 42 weeks of gestation. There was a strong correlation between mean placental thickness and fetal weight from 14 weeks till 37 weeks of gestation. After the pregnancy reached full-term (37 weeks), the placental thickness and fetal weight were found to have negative ( $r=-0.7738$ ). Suseela *et al.* conducted a study to correlate the relationship between placental thickness with estimated fetal weight [11]. The study comprised of 250 pregnant patients in whom correlation between placental thickness and fetal weight was studied. The study found that normal and abnormal placental thickness were correlated with birth

weight ( $p < 0.05$ ). On the basis of these findings, the authors concluded that placental thickness can be used for assessment of fetal weight as well as fetal well-being. Similar positive correlation between placental thickness and gestational age was reported by the authors such as Agwuna *et al.* [12] and Balla *et al.* [13].

Ahmed *et al.* conducted a similar study to find out whether placental thickness can be used for estimation of gestational age and fetal weight in healthy singleton pregnancies [14]. In this study, 210 patients in second and third trimester of pregnancy who has undergone antenatal ultrasound examination were included in the study. First gestational age estimation was done using fetal biometry (head circumference, biparietal diameter, abdominal circumference, and femur length). Placental thickness was measured at the level of cord insertion. Correlation between placental thickness and gestational age as well as fetal weight as determined by biometry was analyzed. The study found that there was strong positive correlation between placental thickness and gestational age between 12 and 38 weeks. Similarly positive correlation also existed between placental thickness and gestational age between 14 and 37 weeks. ON the basis of these findings, the authors concluded that placental thickness can be used for estimation of gestational age as well as fetal weight in cases where fetal biometry cannot be entirely relied on. Similar findings were also reported by the authors such as Ahn *et al.* [15].

#### CONCLUSION

Placental thickness is found to have a strong positive correlation with fetal weight till 37 weeks of gestation. It can be used to assess fetal weight independent of fetal biometry in situations where fetal biometry cannot be entirely relied on.

#### CONFLICTS OF INTEREST

None.

#### SOURCE OF FUNDING

None.

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