



A COMPARATIVE STUDY OF PLACENTAL VOLUME IN NORMAL PREGNANCY AND PREGNANCY WITH FETAL GROWTH RESTRICTION BY ULTRASONOGRAPHY

Obstetrics & Gynaecology

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KEYWORDS

INTRODUCTION-

In every population, fetal growth shows a normal distribution at a given gestational age. Consequentially, a fraction of fetuses are large for gestational age and another fraction are small for gestation age, regardless of their own growth potential. Fetal growth depends on two components- genetic potential and substrate supply i.e. placenta function.¹

While genetic abnormalities and chronic fetal infections may cause fetal growth restriction, but most cases result from placental pathology. Fetal growth restriction (FGR) represents pathological inhibition of fetal growth and failure of the fetus to attain its growth potential.²

Fetal growth restriction can be a cause of neonatal morbidity and mortality which can be reduced with proper antenatal care and early detection of high risk factor and fetal growth restriction.

Antenatal fetal surveillance plays a major role in identifying fetuses at risk of fetal growth restriction to offer them close monitoring to prevent the perinatal morbidity and long-term consequences. There is a strong association between stillbirth and fetal growth restriction.² The sequelae of fetal growth restriction include stillbirth³, detrimental neurodevelopmental progress in childhood^{3,4}.

MATERIAL AND METHODS-

Study Universe-All women attending OPD in SMS Medical College

Study Population-All pregnant women with gestational age >34 weeks who have been admitted in Department of Obstetrics & Gynecology, SMS Medical College, Jaipur

Study Place-SMS Medical College, Jaipur.

Study Design-Prospective study.

Study Type-Hospital based prospective comparative study.

Study Duration-From August 2018 – August 2019.

SAMPLE SIZE- A group of 30 women with FGR complicating pregnancy and 30 women with normal pregnancy were selected

SELECTION CRITERIA

INCLUSION CRITERIA:

1. With singleton live pregnancy
2. Pregnant women with confirmed LMP >34 weeks
3. Women who are willing to give consent for study

EXCLUSION CRITERIA

1. Pregnant women with known maternal medical complications
2. Pregnancy with severe oligohydramnios and abnormal placentation.
3. Fetal malformation or IUFD confirmed by USG

METHODOLOGY-

After applying inclusion and exclusion criteria informed and written consent was taken pregnant women with confirmed LMP >34 weeks and willing to participate were recruited from Department of Obstetrics and Gynaecology, SMS Medical College, Jaipur.

These patients were screened with clinical method of measuring fundal height. If it was lagging behind 4 weeks for their gestational age, then they were subjected to ultrasound and fetal biometry and estimated fetal weight were measured. Estimated fetal weight of < 10th percentile for their gestational age with ultrasound were selected as cases and women with fundal height equal to gestational age and

normal ultrasound parameters were selected as control for the study after getting informed consent. Name, age, unit, Registration number, Address, socioeconomic status, occupation were noted.

Details of present pregnancy including last menstrual period, each trimester wise history, ultrasonogram were noted.

Detailed clinical examination of the patient was done & height, weight, BMI, blood pressure was noted. Routine laboratory investigations were also done.

Ultrasound examination:

The machine used for 2D dimensional ultrasound examination was GE with a 5 MHz curvilinear probe. Fetal parameters like BPD, HC, AC, FL, were measured. Estimated fetal weight was calculated by ultrasound and confirmed whether it was <10th percentile.

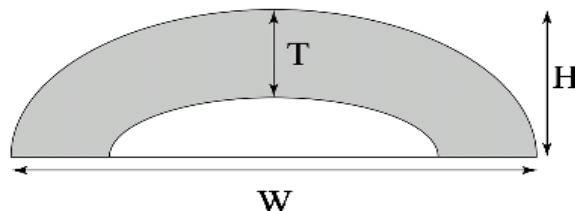
Amniotic fluid index was also done. Placental localisation was done. Measurement of placental volume was done by using the convex-concave shell formula.

$$V = \pi T/6 \times (4H(W-T) + W(W-4T) + 4T^3);$$

$$H = \text{PLACENTAL HEIGHT,}$$

$$T = \text{PLACENTAL THICKNESS,}$$

$$W = \text{PLACENTAL WIDTH.}$$



Diagrammatic representation of measurement of placental volume



RESULTS AND ANALYSIS-

Table 1 : Association between placental volume and gestational age

Gestational age by LMP	Placental volume				p-value
	FGR group		Control group		
	Mean	SD	Mean	SD	
≤35 weeks	294.23	140.96	507.23	118.45	0.001
36-37 weeks	392.00	123.21	596.35	126.98	

Our study shows that there is significant reduction in placental volume in FGR group when compared with control group in all gestational age.

The reduction in placental volume is more significant in ≤ 35 gestational age group.

Table 2 : Distribution according to Placental Volume by USG

Placental Volume by USG(cc)	FGR group	Control group	p-value
Mean	358.67	579.67	0.001
SD	80.57	29.23	

In our study, placental volume in FGR group was 358.67 ± 80.57 cc and in control group was 579.67 ± 29.23 cc. The difference in both groups was found statistically Significant.

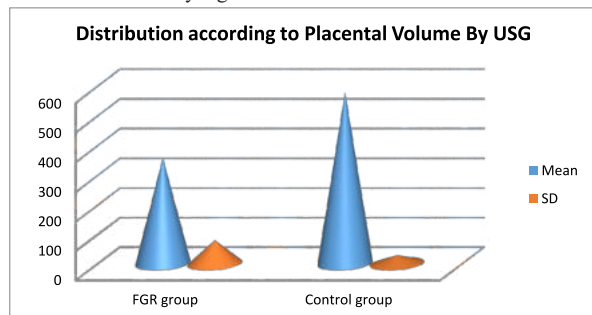
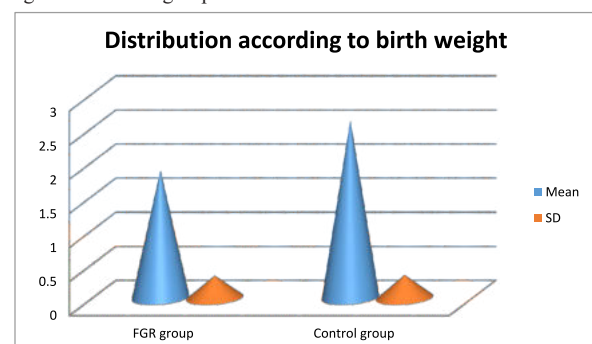


Table 3 : Distribution according to Birth weight (Mean birth weight)

Birth weight in kg	FGR group	Control group	p-value
Mean	1.87	2.60	0.001
SD	0.33	0.34	

In present study mean birth weight in FGR group was 1.87 ± 0.33 kg and in control group was 2.60 ± 0.34 kg. The difference was statistically significant in both groups.



DISCUSSION-

Our study was done to compare the placental volume in FGR complicating and normal pregnancy using 2D ultrasound and to correlate it with the perinatal outcome. The results were compared with that of normal pregnancy. The average placental volume in normal pregnancy was 579.67 cm^3 . The average placental volume in FGR pregnancy was 358.67 cm^3 . On statistical analysis, this showed significant difference $P < 0.001$ (highly significant; Levines T-Test). Anandavalli.B, Lavanya Kumari.K and Mirunalini et al (2017)¹ conducted a study to compare the placental volume in FGR complicating and normal pregnancy using 2D ultrasound and correlate it with perinatal outcome. They found there was no significant difference in placental volume measured antenatally and after delivery and average placental volume of all gestational age groups in FGR group was 332 cm^3 and in control group was 603 cm^3 , it was observed that the volume was significantly less with a P value of < 0.001 . Adverse outcomes were seen in 80% of babies in IUGR group (MSAF, IUD and low APGAR scores).

In 2002 Hafner, Phillip, Schuchter and Baure inferred that placental volume estimation in predicting FGR had 82.5% sensitivity & 52.5% specificity and prognostic influence could be shown for placental volume ($p < 0.0001$)⁵.

The mean birth weight of babies in FGR group was between 1.87kg. In a study done by Marana LR they showed that 20% of all stillborns showed evidence of FGR.⁶

Further in 2000, Ira, Jeffery, Gary and Agnetta studied the association

between fetal growth restriction and adverse neonatal outcomes in a population of 19,759 singleton very low-birth-weight neonates. There was a statistically significant association of intrauterine growth restriction with neonatal death, necrotizing enterocolitis and respiratory distress syndrome and hypoxic ischemic encephalopathy.⁷ Our study showed that the placental volume had good correlation with the fetal outcome. Hence placental volume measurement by ultrasound can be taken as one of the methods of predicting adverse neonatal outcome in FGR.

CONCLUSION-

The diagnosis of Uteroplacental insufficiency, the major cause of FGR, identifies the group of fetuses who are at increased risk for perinatal complications. Ultrasonography plays a major role in early diagnosis of FGR. Doppler ultrasonogram helps in identifying fetuses already at risk of hypoxia and acidemia so that early interventions could be done to reduce perinatal complications. But it needs costly equipment and trained person, which limits its usefulness in developing country like India. Placental volume has positive correlation with birthweight of the baby and perinatal complication. Estimation of placental volume by simple 2 dimensional ultrasound could be a better alternative method of antenatal fetal surveillance in FGR where Doppler ultrasound is not available.

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