



EVALUATION OF ROLE OF DIFFERENT FETAL DOPPLER INDICES IN PREDICTION OF ADVERSE PERINATAL OUTCOME IN FETAL GROWTH RESTRICTION

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ABSTRACT

Background: India has high perinatal mortality and fetal growth restriction (FGR), small for gestational age (SGA) babies are major cause for preterm births and low birth weight, and consequently high perinatal mortality in India. 1. Ultrasound scanning methods are nowadays used to observe fetal growth, analyze fetal biometry and fetal doppler. Colour Doppler helps to identify at risk pregnancies and fetal growth restriction along with stage based protocol for the management of Fetal Growth Restriction. 2. **Objective:** To compare the sensitivity and specificity of doppler indices of MCA, umbilical artery and uterine artery in prediction of adverse perinatal outcome. **Material And Method:** Study was conducted from October 2020 to September 2022 in the department of Radiodiagnosis of Sarojini Naidu medical college, Agra. The study included 90 clinically suspected antenatal women with period of gestational age between 29-40 weeks who were referred from Antenatal OPD of Obstetrics and Gynecology to Department of Radiodiagnosis in Sarojini Naidu Medical College, Agra. All the cases in the study were followed up from first visit upto the time of delivery and further. **Conclusion:** Women with abnormal Doppler findings had increased adverse perinatal outcomes in terms of morbidity (low birth weight, NICU admissions, perinatal death) with umbilical artery Doppler study being most sensitive and MCA being most specific in predicting adverse perinatal outcome.

KEYWORDS :

1. INTRODUCTION

IUGR suggests a pathophysiological process occurring in utero that leads to diminished growth velocity in the fetus. IUGR also represents the strongest risk factor for an unexplained intrauterine death^{3,4}.

A fetus is considered to be SGA when its size (biometric evaluation) falls below a predefined threshold for its gestational age. The most common definition of SGA is EFW (estimated fetal weight) or AC (abdominal circumference) falls below the 10th percentile.

Based on the time of onset, FGR is classified into 2 groups- early (before 32 weeks) and late (after 32 weeks) onset. Early FGR is considered to be a vascular disorder due to the abnormalities of the tertiary villous vessels particularly associated with maternal vascular malperfusion of the placenta or placental insufficiency. Late onset FGR is the more common form, present in 70-80% of FGR, and typically becoming apparent in the third trimester of pregnancy.

Uteroplacental insufficiency or dysfunction represents one of the most common and frequent causes of abnormal growth in an otherwise normal fetus.

Identification of IUGR due to placental insufficiency requires exclusion of fetuses with appropriate growth, aneuploidy, syndromes and viral infections.

Doppler ultrasound provides a unique window to the fetoplacental circulation, assessing utero-placenta blood flow and resistances in complicated pregnancies like preeclampsia or FGR⁵ as it analyses the circulatory modifications of the fetus.

Prospective observational study was done among singleton pregnant women aged 18 years or more between gestational age of 29-40 weeks who were clinically suspected IUGR cases referred from Antenatal OPD of Obstetrics and Gynecology from October 2020 to September 2022 in the Department of Radiodiagnosis, SNMC Agra.

A total of 122 pregnant were selected for the study. All the cases in the study were followed up from first visit upto the time of delivery and further if necessary.

Inclusion Criteria:

- Pregnant women aged 18 years and older
- Gestational age between 29 - 40 weeks
- Singleton live foetus without structural abnormalities
- EFW less than tenth percentile.
- Patient willing to provide informed consent.

Exclusion Criteria:

- Women aged less than 18 years
- Gestational age less than 29 weeks or more than 40 weeks
- Multiple gestation
- Structural abnormalities in fetus
- Patient not willing to provide informed consent.

RESULTS

The study was conducted in Department of Radiodiagnosis, Sarojini Naidu Medical College, for a period of 2 years from October 2020 to September 2022.

Total 122 patients underwent fetal biometry and doppler study during this period out of which 19 patients were AGA (appropriate for age) and 13 could not be followed upto delivery so a total of 90 women were taken for study and statistical analysis. The following results were found -

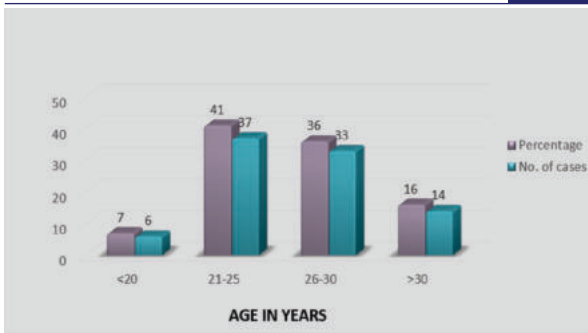


Figure 1-Most common age group was 21-25 years (41%), followed by age group 26-30 years (36%), thus 77% belonged to age group 20-30 years band 7% were <20years.

Distribution Of Cases Based On Parity

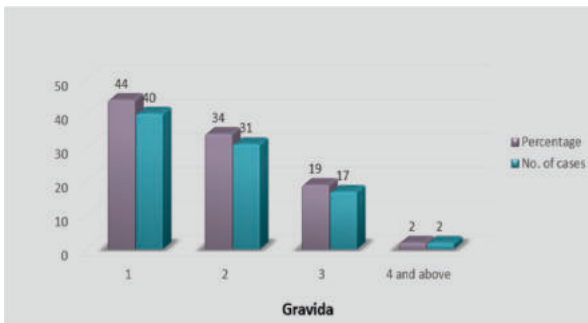


Figure 2-Majority of females were primigravida constituting for approximately 44% of cases, 34% were gravida 2 and 20% were equal to or more than gravida 3.

Distribution Of Cases Based On Risk Factors For IUGR

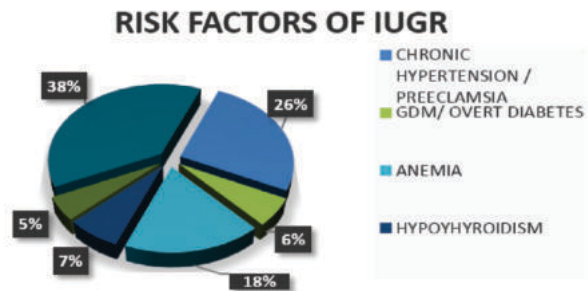


Figure 3-Out of 90 pregnant females suspected for IUGR , (62%) had maternal factors etiology while rest (38%) had other factors (idiopathic and fetal factors) etiology. Most significant Maternal risk factor observed was chronic hypertension / pre-eclampsia etiology 23 cases (26%) followed by anemia (18%). Approx. 5% females had more than one risk factor .

Distribution Of Cases Based On Socioeconomic Status

S.N	Socio-Economic Status	No. of Cases	Percentage
1.	HIGH	13	14
2.	MIDDLE	24	27
3.	LOW	53	59

Table 1-The cases were distributed according to modified Kuppuswamy classification and maximum cases (59%) were from lower socio-economic group, followed by middle class (27%) and least number of cases were from upper class (14%).Those with lower socioeconomic status (59%) had high incidence of IUGR.

Types Of Umbilical Artery Abnormality And Associated Perinatal Outcome

Table 2-

Umbilical artery PI	Perinatal Outcome				Total
	Normal	Abnormal			
		Total	Mortality	Morbidity	
Normal	63	5	1	4	68
Abnormal	5	17	7	10	22

Table 3-

Doppler flow pattern	Perinatal Outcome				Total
	Normal	Abnormal			
		Total	Mortality	Morbidity	
AEDF	0	5	2	3	5
REDF	0	2	2	0	2

- Abnormal umbilical artery flow was seen in 24.44% of cases, out of which 77.27% had abnormal perinatal outcome as compared to 7.3% had abnormal perinatal outcome in normal uterine artery flow.
- Abnormal umbilical artery flow was associated with mortality seen in 31.8% cases .
- Reversed end diastolic flow in umbilical artery found to be associated with 100% mortality.

Types Of Mca Abnormality And Associated Perinatal Outcome.

Table 4-

Middle cerebral artery PI	Perinatal outcome				Total
	Normal	Abnormal			
		Total	Mortality	Morbidity	
Normal	63	17	2	15	80
Abnormal	3	7	2	5	10

- Abnormal MCA Doppler flow pattern was seen in 11.1% cases ,out of which 70% had abnormal perinatal outcome compared to 21.25% had abnormal perinatal outcome in women with normal MCA doppler .
- Abnormal MCA flow was associated with perinatal mortality in 20% cases and perinatal morbidity seen in 71.4% cases

Types Of Uterine Artery Abnormality And Associated Perinatal Outcome.

Table 5-

Uterine artery PI	Perinatal outcome				Total
	Normal	Abnormal			
		Total	Mortality	Morbidity	
Normal	44	15	3	12	59
Abnormal	13	18	5	13	31

Table 6-

Doppler flow pattern	Perinatal outcome				Total
	Normal	Abnormal			
		Total	Mortality	Morbidity	
U/L notch	1	5	2	3	6
B/L notch	0	3	3	0	3

- Abnormal flow pattern in uterine artery was seen in 34.4% cases out of which 42% had abnormal perinatal outcome. Abnormal uterine artery flow was associated with 16.2% mortality.
- Notching of one of the uterine artery had 88.8% abnormal perinatal outcome, 62.5% was the perinatal mortality.

Cases with bilateral notching in uterine artery were associated with abnormal umbilical artery (reversal and absent end diastolic flow) and abnormal MCA doppler parameters . Thus, high mortality rate were seen in cases with bilateral notching which was 100% in present study . Among the 90 patients studied, 22 patients had abnormal Doppler of umbilical artery. Among these 22 patients, 5 patients had absent end diastolic flow and showed 40% mortality and 2 had reversal of end diastolic flow in umbilical artery and was associated with 100% mortality. These cases (showing absent /reversal of end diastolic flow in umbilical artery) also showed

notching in uterine artery and abnormal MCA parameters , thus contributing to higher mortality rates .

Sensitivity And Specificity Of All Vessels In Predicting Adverse Perinatal Outcome

Table 7-

VESSELS	SENSITIVITY	SPECIFICITY
1. UMBILICAL ARTERY	77.2%	92.6 %
2. MIDDLE CEREBRAL ARTERY	29.1%	95.4%
3. UTERINE ARTERY	54.4 %	77.19%

Abnormal Umbilical artery Doppler parameters are both highly sensitive and specific in predicting adverse perinatal outcome whereas abnormal MCA shows highest specificity but lowest sensitivity in predicting adverse perinatal outcome . Uterine artery parameters lies in between in terms of sensitivity and specificity in predicting adverse perinatal outcome.

CONCLUSION :

It was found that abnormal Doppler findings were associated with increased adverse perinatal outcomes in terms of morbidity (low birth weight, NICU admissions, perinatal death) with umbilical artery Doppler study being most sensitive and MCA being most specific, though MCA had lowest sensitivity in predicting adverse perinatal outcome thus normal MCA Doppler alone does not rule out adverse perinatal outcome in clinically suspected IUGR fetuses. Perinatal Doppler velocimetry studies can identify fetus at risk of adverse perinatal outcome so that timely intervention can be done. The lead time helps to plan delivery in preterm compromised pregnancies and allows better post-natal management and outcomes.

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