Gynecology

UTERINE ARTERY DOPPLER IN SECOND TRIMESTER AS A PREDICTOR OF PRE-ECLAMPSIA AND FETAL GROWTH RESTRICTION

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ABSTRACT

INTRODUCTION : Pre-eclampsia and fetal growth restriction are major causes of Perinatal morbidity and mortality. Several studies have shown that a generalized endothelial dysfunction is associated with these complications. Clinical trials have shown that pregnant women who demonstrate high resistance in utero- placental blood flow are at higher risk for pre-eclampsia and IUGR.

OBJECTIVE : Uterine artery Doppler study both in the second and first trimester can predict pregnancies at increased risk of the complications of impaired placentation. The aim of the present study was to find the significance of uterine artery Doppler study in the prediction of pre-eclampsia and IUGR in second trimester .

MATERIALS AND METHODS: This was a prospective cohort study done in the Department of Obstetrics and Gynaecology , Alluri Sitarama Raju Academy of Medical Sciences, Eluru from December, 2016 to September, 2018. A random sample of 100 women with singleton pregnancy between 20- 24 weeks were selected and subjected to uterine artery Doppler study. These women were followed up till their delivery and the details of pregnancy events, labour and delivery and neonatal outcome were noted.

RESULTS: The data was collected and results were analyzed . The uterine artery Doppler study for pre-eclampsia had sensitivity 87.5% , specificity 82.8%, positive predictive value 61.7% and negative predictive value 95.4%. The efficiency of uterine artery Doppler study for Intra Uterine Growth Restriction has got the sensitivity 81.2%, specificity 82.7%, positive predictive value 43.3% and negative predictive value 95.7%.

CONCLUSION : Normal pregnancy is characterized by a decrease of the uterine artery RI and PI values and disappearance of diastolic notch after 20 weeks of gestation. Women with normal impedance to flow in the uterine arteries constitutes a group that have a low risk (negative predictive value for pre-eclampsia is 95.4% and for IUGR is 95.7%) of developing obstetric complications related to utero placental insufficiency. Abnormal uterine artery Doppler is a better predictor of pre-eclampsia (sensitivity 87.5%) than fetal growth restriction(sensitivity 81.2%).

KEYWORDS : Uterine artery Doppler, Pre-eclampsia, Intrauterine growth restriction.

INTRODUCTION:-

Pre-eclampsia and Intrauterine growth restriction are the major causes of maternal and perinatal morbidity and mortality worldwide, particularly in developing countries. Acute prediction of preeclampsia and intra uterine growth restriction is crucial to allow judicious allocation of resources for monitoring and preventive treatment to improve maternal and perinatal outcomes. Doppler sonography has become a part of routine antenatal surveillance in obstetrics during the past decade. Blood flow measurement has significant impact in the detection of placental and fetal dysfunction since the hemodynamic changes in the uteroplacental and fetal vessels can be demonstrated well before the clinical manifestation of obstetric complications.

Fetal monitoring is based on a diagnostic procedure, among which Doppler sonography has become a top level non-invasive method. Despite the accuracy of these tests, perinatal morbidity and mortality are frequently associated with intrauterine hypoxic stress. Every forth case of cerebral palsy is caused by intrauterine events before the onset of labour. Doppler ultrasound is capable of detecting the early hemodynamic alterations,therefore, the method can be utilized in the early detection of fetal complications.

Recently published meta – analysis has proved that systematic applications of Doppler sonography has resulted in a 50 % reduction of perinatal mortality among high risk pregnancies.

AIMS AND OBJECTIVES

1.To find the significance of uterine artery Doppler study in the prediction of Pre-eclampsia and IUGR as a screening tool at 20-24 weeks of gestation.

2.To know the sensitivity, specificity , positive predictive value and negative predictive value of uterine artery Doppler study in prediction of Preeclampsia and Fetal growth restriction at 20-24 weeks of period of gestation.

PATIENTS AND METHODS:-

This was a prospective cohort study done in the Department of Obstetrics and Gynaecology at Alluri Sitarama Raju Academy of Medical Sciences, Eluru from December, 2016 to September 2018. A random sample of 100 women with single pregnancy between 20-24 weeks selected and subjected to uterine artery Doppler.

The study consisted of high and low risk patients where high risk included previous pregnancies with pregnancy induced hypertension, pre-eclampsia small for gestational age baby or poor perinatal out come.

The parameters taken into consideration to study uterine artery Doppler were:- Resistance Index (R.I) > 0.56 , Pulsatility Index (P.I) > 1.56 and Persistence of diastolic notch on one or both sides. More than 3 of the parameters being positive is taken as positive predictor.

These patients were followed up till delivery and the details of pregnancy events, labour and delivery and neonatal outcome were noted. Gestational age at the onset of labour was noted. Blood pressure recording and proteinuria were obtained. Mode of delivery, amount of liquor and birth weight were noted.

Blood pressure recordings > 140/90mm Hg and urinary albuminuria were taken for pre-eclampsia and fetal weight less than 10th percentile of that gestational age was taken for fetal growth restriction.

INCLUSION CRITERIA :-

The antenatal women who were having regular antenatal checkups at Alluri Sitarama Raju Academy of Medical Sciences, Eluru from December, 2016 to September 2018. 1.Pregnant women between 20-24 weeks of gestation. 2. High risk pregnancies including previous history of gestational hypertension, pre-eclampsia, IUGR and poor perinatal out come.

EXCLUSION CRITERIA :-
1.Patients with pre-existing hypertension, multiple pregnancies and anomalous babies were excluded from the study. 2.All registered cases who did not come for further follow up were excluded.

RESULTS :-
The collected data has been compiled in following formats.

Table-1 : Age-wise distribution of cases with Abnormal vs Normal Uterine artery Doppler

Age in Years	Abnormal uterine artery doppler		Normal uterine artery doppler	
	Number	Percentage	Number	Percentage
18-20	5	14.7%	16	24.2%
21-23	12	35.5%	23	34.8%
24-26	7	20.5%	12	18.2%
27-29	6	20.5%	12	18.2%
30 above	4	17.6%	3	4.6%
Total	34	100%	66	100.0

The cases with abnormal uterine artery Doppler are 34. Out of which , the highest distribution of cases was with age group between 21-23 years with 35.5% ,followed by 24-26 years with 20.5% and least above 30 years with 11.7 %.

Table 2- Distribution of cases with abnormal uterine artery Doppler.

Uterine artery Doppler	Number of cases	Percentage
Abnormal uterine artery	34	34%
Normal uterine artery	66	66%
Total :	100	100%
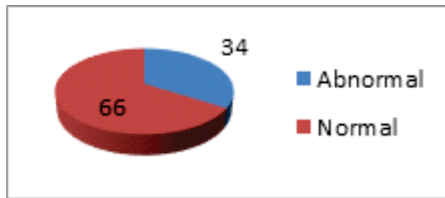
Table -3 Parity-wise distribution in abnormal Doppler cases.

Parity	Number of cases	Percentage
Primiparous	21	61.7%
G2	8	23.7%
G3	3	8.8%
G4	1	2.9%
>=G5	1	2.9%
Total	34	100%

Maximum number of cases with abnormal uterine artery Doppler were primiparous with 61.7% followed by second gravid with 23.7% of cases.

Table -4 Comparison of Uterine artery Doppler in Preeclampsia and Fetal growth restriction.

Uterine artery Doppler	Pre-eclampsia		Fetal growth restriction	
	Present	Absent	Present	Absent
Abnormal	21	13	13	17
Normal	3	63	3	67

Table -5 - Sensitivity, Specificity , Positive predictive value and Negative predictive value of Uterine artery Doppler in Pre-eclampsia and Fetal growth restriction.

Outcome	Sensitivity	Specificity	PPV	NPV
PE	87.5%	82.8%	61.7%	95.4%
IUGR	81.2%	82.7%	43.3%	95.7%

Table – 6 Perinatal outcome in cases with Abnormal and Normal uterine artery Doppler.

Perinatal outcome	Abnormal uterine artery		Normal uterine artery	
	Number	Percentage	Number	Percentage
IUGR	13	38.2%	4	6.1%
Dead	4	14.8%	1	3.1%
Stillbirth	1	2.9%	0	0
Babies without any risk	15	44.1%	60	90.8%
Total	34	100%	66	100%

The data in the above table was statistically significant as p value was <0.05. Therefore, cases with abnormal uterine artery Doppler have significant association with increased fetal risk than compared to normal uterine artery Doppler. Hence , 55.9% of cases with abnormal uterine artery Doppler study were at increased fetal risk in this study.

DISCUSSION :-
Over the past two decades, several investigators have explored the validity of uterine artery Doppler flow velocity wave forms as predictors of pre-eclampsia, fetal growth restriction and adverse perinatal outcomes.In present study, it was found: Uterine artery Doppler study for the prediction of pre-eclampsia had the sensitivity 87.5%, specificity 82.8%, positive predictive value 61.7% and negative predictive value 95.4%. Uterine artery Doppler study for the prediction of intrauterine growth restriction had the sensitivity 81.2%, specificity 82.7% positive predictive value 43.3% and negative predictive value 95.7%. These results were comparable to one reference study undertaken by the Padmalatha V. V and Asha Thomas et al in which uterine artery Doppler study for pre-eclampsia has got sensitivity 60%, specificity 98%, positive predictive value 38% and negative predictive value 99%. For intrauterine growth restriction, it has got the sensitivity 32%, specificity 87% positive predictive value 27%, and negative predictive value 90%. According to their study the women, with normal Doppler of uterine artery have got a low risk of developing obstetric complications related to utero-placental insufficiency like pre eclampsia and IUGR with the negative predictive value of 99% for pre-eclampsia and 90% for IUGR. In their study they have concluded that abnormal Doppler is better predictor of pre-eclampsia than the fetal growth restriction with the sensitivity of 60% for pre-eclampsia and 32% for IUGR.

CONCLUSION :-
Utero-placental circulation can be assessed non invasively by Doppler study of uterine arteries as abnormal Doppler study is associated with outcomes such as pre-eclampsia, intrauterine growth restriction and perinatal mortality. Increased pulsatility index (PI), persistence of uterine artery notch and increased resistance index (RI) can be a good predictor of pre-eclampsia and intrauterine growth restriction. Hence, Doppler analysis of uterine arteries should be included along with routine biometry in second trimester ultrasound. A combination of parameters is the best predictor for prediction of pre-eclampsia and Intrauterine fetal growth restriction. Appropriate and early diagnosis of IUGR gives the best opportunity for improving fetal salvage. Abnormal uterine artery Doppler at 20-24 weeks of gestation is a better predictor of pre-eclampsia (sensitivity 87.5%) than intrauterine fetal growth restriction (sensitivity 81.2%).Doppler velocimetry of the uterine artery blood flow as a screening method at 20-24 weeks allows to get a prognosis about further course of pregnancy in the groups of low and high risk for pre-eclampsia and IUGR development.

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