

Research Article

Assessment of the Role of Uterine Artery Doppler in Prediction of Preeclampsia: A Cross-Sectional Study from Rural Maharashtra

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ABSTRACT

Background: In recent years, ultrasonography is commonly used in measurement of fetal biometry and diagnosis of congenital anomalies and IUGR. Problem which still exists is identification of those pregnancies which are at risk of increased maternal and fetal morbidity as in pregnancy induced hypertension. Various biochemical tests used in screening of high-risk population for pre-eclampsia have lower positive predictive values, high cost and less patient compliance. ² Doppler is a non-invasive method for evaluation of feto placental circulation without any disturbance to human pregnancy. **Objective:** To assess the role of uterine artery doppler in prediction of preeclampsia. **Methodology:** This is a prospective study done over a period of 2 years in St. philomena hospital-Bangalore from October 2010 to October 2012. Women with singleton pregnancy from 20-36 weeks of gestation attending St. philomena hospital and diagnosed as pre-eclampsia were subjected to uterine and umbilical artery Doppler along with morphology and biometry scan. **Results:** Majority of the patients were from 25-29 years age group i.e. 43% followed by 29% from above 30 years, 25% from 20-24 years and 3% from below 20 years age group. The mean maternal age was 27.2 years. 75.8% of cases had abnormal uterine artery S/D ratio. 83.9% of cases with abnormal RI. Uterine artery notch (54.8%) to be more than those without notch (45.16%). **Conclusion:** 83.9% of cases with abnormal RI. Number of cases with uterine artery notch (54.8%) to be more those without notch (45.16%). Cases with bilateral notch (55.88%) were more than those with unilateral notch (44.12%).

Keywords: Uterine Artery Doppler, Preeclampsia.

INTRODUCTION

Preeclampsia and fetal growth restriction (FGR) have been identified as antecedent causes in 6% and 10% of perinatal deaths, respectively.¹ In the latest Centre for Maternal and Child Enquiries (CEMACE) report on maternal deaths ("saving mothers' Lives" 2006-2008), preeclampsia/eclampsia was the second commonest cause of direct maternal deaths in the United Kingdom (0.83 per 100,000 maternities).¹ Hypertension in pregnancy is also responsible for fetal (more than 19 weeks of gestation) and infant mortality as well as 46% of infants born small for gestation.² Similarly, it was estimated that 3-10% of infants are growth restricted. Fetal growth restriction is associated with substantive perinatal morbidity and mortality. This is true for both preterm and term infants.^{3,4} Early screening for preeclampsia may allow vigilant antenatal surveillance and appropriate

timing of fetal delivery in order to avoid serious sequel. Various hemodynamic and biochemical measurements have been found to have limited accuracy as a screening test for this condition.^{5,6} Preeclampsia is characterized by an imbalance between prostacyclin and thromboxane A2 production as well as failure of the second wave of trophoblastic invasion of the endometrio-myometrial vasculature.² The result is abnormal uteroplacental blood flow and this lead to an idea of using Doppler assessment of uterine artery velocimetry waveforms as the method of screening for this antenatal complication.⁷

In recent years, ultrasonography is commonly used in measurement of fetal biometry and diagnosis of congenital anomalies and IUGR. Problem which still exists is identification of those pregnancies which are at risk of increased maternal and fetal morbidity as in pregnancy induced hypertension. Various biochemical

tests used in screening of high-risk population for pre-eclampsia have lower positive predictive values, high cost and less patient compliance.² Doppler is a non-invasive method for evaluation of feto placental circulation without any disturbance to human pregnancy.⁸ A high resistance index, pulsatility index and persistent uterine artery notching in uterine artery Doppler wave form has been shown to be the best screening test.⁹

Objective: To assess the role of uterine artery doppler in prediction of preeclampsia.

METHODOLOGY

This is a prospective study done over a period of 2 years in St. philomena hospital-Bangalore from October 2010 to October 2012. Women with singleton pregnancy from 20-36 weeks of gestation attending St. philomena hospital and diagnosed as pre-eclampsia were subjected to uterine and umbilical artery Doppler along with morphology and biometry scan. A colour Doppler scanner with a 3-5 MHz curvilinear probe was used for studying uterine, umbilical arteries after fulfilling the inclusion and exclusion criteria.

Inclusion criteria-

- Pregnancy should be within 20-36 weeks of gestation & diagnosed as pre-eclampsia.

Exclusion criteria-

- Patient with congenital anomaly of fetus, multiple gestation, chronic hypertension, renal disease, cardiac disease.

- Patients with unreliable LMP details and not confirmed by Scan < 20 weeks gestation. When above criteria are met study group was subjected to Doppler study.

The gestational age was confirmed by menstrual history and ultrasound examination and was followed by color Doppler examination. Consent was taken from the patient or the guardian

Procedure: The patient was explained about the non-invasive/ atraumatic nature of the procedure. Synthetic ultra-gel was applied liberally over the abdomen to get a good acoustic coupling. The ultrasound machine with a convex transducer of 3.5 MHz frequency was used. Doppler wave form was obtained after localising the vessels by B-mode real time scanner. Pulsed Doppler was used to get the Doppler signals after localising the vessels. The maximum Doppler shift frequencies were obtained and various ratios were calculated from each vessel. Doppler examination was done when fetus was in apnoeic state to avoid the influence of fetal respiration on Doppler signals.

RESULTS

In the present study out of one hundred pre-eclampsia cases, 62 showed positive Doppler indices in any of the three vessels studied. The remaining 38 cases showed normal Doppler indices in all the three vessels studied. The following were the results of the study.

Table 1. Age wise distribution of the cases

Age group (years)	No. of cases	Percentage
<20	3	3.00
20-24	25	25.00
25-29	43	43.00
≥30	29	29.00
Total	100	100.00

Majority of the patients were from 25-29 years age group i.e. 43% followed by 29% from above 30 years, 25% from 20-24 years and 3% from below 20 years age group. The mean maternal age was 27.2 years.

Table 2. Abnormal doppler findings

Doppler	Number	Percentage
Normal	38	38.00
Abnormal	62	62.00
Total	100	100.00

After studying three arteries, patients were classified into normal and abnormal based on their color Doppler indices. Normal were those with no abnormality in any of the arteries. Cases who had any of the following criteria were considered abnormal:

a) S/D ratio >2.6 or RI >0.58 of uterine artery.

b) Presence of persistent early diastolic notch in uterine artery.

c) S/D ratio of >3 or RI > 0.7 of umbilical artery.

d) Presence of absent end diastolic velocity (AEDV) of reversed end diastolic velocity (REDV).

e) e) RI <0.7 of middle cerebral after

Table 3. Uterine artery S/D ratio

S/D ratio	No. of cases	Percentage
Abnormal	47	75.8
Normal	15	24.2

In the present study 75.8% of cases had abnormal uterine artery S/D ratio.

Table 4. Uterine artery resistance index

Resistance index	No. of cases	Percentage
Abnormal	52	83.9
Normal	10	16.1
Total	100	100.00

The table shows 83.9% of cases with abnormal RI in this study.

Table 5. Uterine artery Diastolic notch

Diastolic notch	No. of cases	Percentage
No. of cases with notch	34	54.8%
No. of cases without notch	28	45.16%
Total	62	100%

The table shows the number of cases with uterine artery notch (54.8%) to be more than those without notch (45.16%).

Table 6. Incidence of uterine artery diastolic notch

Incidence	No. of cases	Percentage
Unilateral diastolic notch	15	44.12
Bi-lateral diastolic notch	19	55.88
Total	34	100.00

In the present study, it is found that the cases with bilateral notch (55.88%) were more than

those with unilateral notch (44.12%)

DISCUSSION

Singh SK et al¹⁰ reported the age of the patients that ranged from 18 to 36 years with a mean age of 22.8 years (S.D 3.6 years). Of them 69% were primigravida and 31 were multigravida. Gestational age of the patients

ranged between 28-40 weeks. Maximum number of patients (60%) belonged to 37-40 weeks group. **Aharwal S. et al¹¹** reported that cases under PIH were distributed under the age group of > 20 , 20-24, 25-29, 30-34yrs under PIH majority of the cases came under the age

group of 20-24 accounting for about 39.0% Mean age of subjects being 25.7 yrs. 34.1% cases were found in 25-29 age gp. Thus 73.1% of cases were found in 20-29 yrs age group. **Neravi A et al¹²** reported that 52% of women were in the age group 21-30 years, 46% were teenagers and 54% of them were primi gravidas. These findings are comparable to our study findings.

Neravi A et al¹² reported that uterine artery Doppler notching at 12-16 weeks was seen in 34.3% of preeclamptic women which is statistically significant ($p < 0.042$). Similarly, **Shashi G et al¹³** reported 20% of incidence which is consistent with our findings. **Gupte S et al¹⁴** reported 10% of incidence which is less as compared to our findings.

CONCLUSION

- In the present study 75.8% of cases had abnormal uterine artery S/D ratio.
- 83.9% of cases with abnormal RI.
- Number of cases with uterine artery notch (54.8%) to be more those without notch (45.16%).
- In the present study, it is found that the cases with bilateral notch (55.88%) were more than those with unilateral notch (44.12%).

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Conflicts of interest: There are no conflicts of interest.

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