



## Role of umbilical artery doppler in predicting IUGR and fetal outcome in pregnant ladies with PIH

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### Abstract

**Aim and Objectives:** The purpose of this study was to evaluate the role of umbilical artery doppler among pregnant women with Pregnancy Induced Hypertension (PIH) with clinical suspicion of IUGR and to predict the foetal outcome.

**Materials and Method:** A total of 72 women with high-risk pregnancy were subjected to uterine and umbilical artery Doppler study. In this prospective study, women having high-risk pregnancies between 26 and 30 weeks of gestation were observed for one year. We investigated at the flow velocity forms in the uterine and umbilical arteries. S/D ratio and RI (resistance index) in the uterine and umbilical arteries were investigated. S/D ratio and a RI that deviates from the mean by more than 95% were categorised as abnormal.

**Results:** S/D ratio and notch on uterine artery Doppler imaging independently demonstrated 60% sensitivity and 33.3% and 37.5% positive predictive values, respectively, for pre eclampsia. Notch on uterine artery Doppler imaging was the best indicator with the highest sensitivity (25%) and positive predictive value (25%) for PIH as compared to other indices. Doppler S/D ratio had the best positive predictive value (40%) and RI had the best sensitivity (42.86%) for predicting IUGR.

**Conclusion:** Uterine and umbilical arteries combined the greatest indication for predicting preeclampsia and IUGR is the doppler. Better than the individual Doppler indices in the uterine artery is the diastolic notch as a single measure. The strongest indicator of preeclampsia and a poor foetal outcome is absent end diastolic flow.

**Keywords:** Doppler imaging, IUGR, Pregnancy Induced Hypertension

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### Introduction

Hypertensive disorders affect approximately 5-10% of all pregnancies worldwide. It is the most typical medical condition in pregnancy. As a significant risk factor of maternal and perinatal mortality and morbidity globally, it accounts for almost 10-20% of pregnancy-related mortality in low and middle-income countries. Hypertension during pregnancy results in uteroplacental insufficiency. It is considered a major contributing factor in adverse post-delivery outcomes such as newborn intensive care unit (NICU) admission, low birth weight, birth asphyxia, preterm birth, perinatal death, intrauterine growth restriction and stillbirth. As per the classification recommended by the National High Blood Pressure Education Program Working Group on High Blood Pressure in Pregnancy, hypertensive disorders in pregnancy are classified as chronic hypertension, preeclampsia-eclampsia, preeclampsia superimposed on chronic hypertension, and gestational hypertension <sup>[4]</sup>.

Doppler monitoring of uterine and umbilical artery velocity waveforms has been proposed as a technique of screening for these prenatal problems since the outcome is abnormal uteroplacental blood flow. The systolic/diastolic (S/D) ratio, resistive index,

- Or the presence of an early diastolic notch all serve as indicators of an abnormal test result [9, 10].

**Aims and objectives**

- The purpose of this study was to evaluate the role of umbilical artery doppler among pregnant women with Pregnancy Induced Hypertension (PIH) with clinical suspicion of IUGR and to predict the foetal outcome.

**Materials and methods**

- A total of 72 women were subjected to uterine and umbilical artery Doppler study. In this prospective study, women having high-risk pregnancies between 26 and 30 weeks of gestation were included. We investigated at the flow velocity forms in the uterine and umbilical arteries. S/D ratio and RI (resistance index) in the uterine and umbilical arteries were investigated. S/D ratio and a RI that deviates from the mean by more than 95% were categorised as abnormal. Early diastolic notch's existence or absence in the uterine artery was observed.
- After birth, the hospital records were examined to assess the pregnancies' results. The institute's institutional review board (IRB) gave its approval to this study.

**Results**

- A total of 72 pregnant ladies with PIH and clinical suspicion of IUGR between 26 and 30 weeks of pregnancy were included in the study. The patients age ranged from 22-32 years with mean age of 26.09±2.09 years. Most of them were primigravida (61.0%). Bad Obstetric history was present among 25.0% patients. Most of the ladies had the amniotic fluid index (AFI) of 8-24 cms.

Indices	Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
S/d ratio	12.50%	91.30%	11.11%	92.31%
Ri	12.50%	93.48%	14.28%	92.47%
notch	25%	93.48%	25%	93.48%
Combined	25%	86.96%	16.67%	93.02%

- Notch on uterine artery Doppler imaging was the best indicator with the highest sensitivity (25%) and positive predictive value (25%) for PIH as compared to other indices

Indices	Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
S/d ratio	37.50%	93.48%	33.33%	94.50%
Ri	25%	94.56%	28.57%	93.55%
notch	50%	95.65%	50%	95.65%
Combined	62.50%	90.22%	35.71%	96.51%

- On umbilical artery, Doppler S/D ratio had the best positive predictive value (40%) and RI had the best sensitivity (42.86%) for predicting IUGR (Table 4).
- There were 100% patients with abnormal uterine and umbilical Doppler with pre-eclampsia and IUGR. When both parameters are normal, only 1.28% patients developed preeclampsia, 3.85% developed PIH, and 2.56% developed IUGR.

AFI	Frequency	%
< 5 cms	6	8.3%
5-8 cms	31	43.1%
> 8 cms	35	48.6%

  

Indices	Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
S/d ratio	60%	93.70%	33.30%	97.80%

Indices	Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
Ri	40%	94.70%	28.56%	96.77%
notch	60%	94.74%	37.50%	97.82%
Combined	80%	89.47%	28.57%	98.83%

- S/D ratio and notch on uterine artery Doppler imaging independently demonstrated 60% sensitivity and 33.3% and 37.5% positive predictive values, respectively, for preeclampsia. The best indicator with the highest sensitivity and positive predictive value was Notch as a single parameter. Nevertheless, the combination of both values was the strongest predictor of preeclampsia, with a sensitivity and specificity of 80% and 89.4%, respectively.

**Discussion**

- During pregnancy, Doppler ultrasonography provides a safe and noninvasive approach for assessing foetal and mother circulation patterns.
- Doppler velocimetry assessed the foetal hemodynamics caused by variations in placental resistance. Doppler indices can assist in identifying fetuses with elevated placental resistance and lower cerebral resistance.
- Preeclampsia was prevalent in our sample at 5%, which is comparable to the rates reported by Bewley *et al.*<sup>[13]</sup> and Irion *et al.*,<sup>[14]</sup> which were 4.6% and 4%, respectively. SGA less than 10 percentile prevalence (IUGR) was 8%, which was comparable to the 6.6% reported by North *et al*<sup>[8]</sup>.
- For the uterine artery S/D ratio, RI, and notch, there was a sensitivity of 60%, 40%, and 60%, respectively. For all indices, the specificity ranged from 93% to 94%. This is comparable to the outcome reached by Kurdi *et al.*<sup>[15]</sup> In a research by *Bhattacharya et al.*,<sup>[16]</sup> it was discovered that the sensitivity and specificity of abnormal uterine artery Doppler for the prediction of preeclampsia in high-risk pregnancies were 73.33% and 86.48%, respectively. For the S/D ratio, RI, and notch, the positive predictive values were 33.3%, 28.6%, and 37.5%, respectively. As a result, notch is thought to be a more accurate predictor of preeclampsia. This is in line with Bower *et al.*<sup>[17]</sup> and Antsaklis *et al.*<sup>[18]</sup>
- In a research done by Mirza *et al.*,<sup>[19]</sup> 57 incidences of abnormal Doppler were found. Preeclampsia was identified in 14% of these patients. S/D ratio, RI, and

missing end diastolic flow all had high positive predictive values of 40%, 25%, and 100%, respectively. This suggests that uterine artery Doppler is less accurate than umbilical artery Doppler.

Of patients who had abnormal umbilical artery Doppler had IUGR babies, with sensitivity for S/D ratio and RI of 25% and 42.86%, respectively. It shares the same viewpoint as that of Antsaklis *et al.* [17] and Beattie *et al.* [21] As per the study by Romero *et al.*, [22] 52% of them had abnormal umbilical Doppler results. They discovered that abnormal umbilical Doppler is linked to severe infant morbidity, a lower Apgar score, and lower birth weight.

### Conclusion

- Uterine and umbilical arteries combined the greatest indication for predicting preeclampsia and IUGR is the doppler. Better than the individual Doppler indices in the uterine artery is the diastolic notch as a single measure. The strongest indicator of preeclampsia and a poor foetal outcome is absent end diastolic flow. Women who have normal Doppler flow in their uterine and umbilical arteries are at a lower risk of experiencing obstetric problems. Hospitals may use uterine and umbilical arteries to identify a group of individuals at risk of preeclampsia and poor foetal outcome. Therefore, to lower maternal and neonatal morbidity and death, Doppler studies may be performed for the prediction of preeclampsia and IUGR.

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