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Research Article

Early prediction of pregnancy induced hypertension by colour Doppler and role of antioxidants

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ABSTRACT

Background: Hypertension is one of the commonest medical complications during pregnancy and a leading cause of maternal and perinatal mortality. The objective of this study was to evaluate the efficacy of color Doppler in predicting pregnancy induced hypertension at early gestation by assessing blood flow velocity profile and to assess the role of antioxidants in reducing the oxidative stress of the disease by their effect on pregnancy outcome.

Methods: The study was carried as a blind prospective study in 310 antenatal patients attending the outpatient department and indoor cases of upper India sugar exchange maternity hospital, GSVM Medical College, Kanpur, Uttar Pradesh, India for a period of 18 months.

Results: Early trimester colour Doppler ultrasonography has an excellent role to play as a predictor of pregnancy induced hypertension. However the role of antioxidant supplementation in early pregnancy for amelioration of the process could not be justified.

Conclusions: From the above study it is concluded that early trimester colour Doppler ultrasonography has an excellent role to play as a predictor of pregnancy induced hypertension.

Keywords: Pregnancy induced hypertension, Colour Doppler ultrasonography, Antioxidants

INTRODUCTION

Hypertension is one of the commonest medical complications during pregnancy and a leading cause of maternal and perinatal mortality. Hypertensive disorders complicate 5 to 10% of all pregnancies and form one member of the deadly triad of maternal mortality contributing to 16% of maternal mortality in developed countries. The working group of the national high blood pressure education programme (2000) classification of hypertensive disorder complicating pregnancy describes 4 types of hypertensive disease.

- Gestational hypertension
- Pre-eclampsia and eclampsia syndrome

- Pre-eclampsia syndrome super imposed on chronic hypertension
- Chronic hypertension.

Underlying cause of pathophysiologic mechanisms that are thought to be responsible for disease process appears to occur much earlier in pregnancy between 8-18 weeks. For this reason it seems logical to search for earlier indicators of this disease, so that timely diagnosis and intervention may prevent complications and improve pregnancy outcome.¹ Doppler velocimetry has been most extensively studied technology to assess fetal well-being and predict adverse pregnancy outcome. It is a non-invasive technique which can easily be used as for evaluations of maternal and fetal hemodynamics.² Flow in numerous maternal and fetal vessels have been studied

to better understand antenatal pathophysiology. Quantitative doppler indices include velocity and flow measurements. Qualitative indices include S/D ratio, resistance index, pulsatility index.

METHODS

The study was carried as a blind prospective study in 310 antenatal patients attending the outpatient department and indoor cases of upper India sugar exchange maternity hospital, GSVM Medical College, Kanpur, Uttar Pradesh, India for a period of 18 months.

Inclusion criteria

- Antenatal patients in first and second trimester
- Primi as well as multipara
- With singleton pregnancies (present).

Gestational age of the patient was calculated from the first day of the last menstrual period and if it was not known then by available ultrasonographic parameters preferably in first trimester by crown rump length and in second trimester by bi-parietal diameter and femoral length etc.

RESULTS

Total 310 patients were enrolled in our study. Out of these 42 patients develop pregnancy induced hypertension (13.55%) and 268 patients (86.45%) remained normotensive.

Table 1: Total number of cases of PIH and normotensive.

Total no of cases=310	No	%
Number of cases who developed PIH	42	13.55%
Number of cases who remained normotensive	268	86.45%

Table 2: Distribution of cases according to abnormal S/D ratio in umbilical artery.

S/D ratio in umbilical artery	PIH (n=42)	Normotensive (n=268)
>5.88	28 (66.67%)	19 (7.09%)
<5.88	14 (33.37%)	249 (92.91%)
	Sensitivity = 66.67%	Specificity = 92.91%
	PPV = 59.57%	NPV = 94.67%

Table 2 shows relation of abnormal S/D ratio in umbilical artery and development of PIH. Patients who had elevated S/D ratio in umbilical artery develop preeclampsia subsequently on follow up (p value <0.0001). Relation of persistent uterine artery notch with

development of PIH shown in Table 3. In our study sensitivity of uterine artery notch is 80.95% and specificity is 93.28%. PPV is 65.38% and NPV is 96.8%. Table 4 shows relation of uterine artery pulsatility index with development of PIH. At a cut off of >1.48 sensitivity is 83.33% and specificity is 95.15% in our study. PPV of Ut A PI is 92% and NPV is 97.33%. Role of antioxidants in PIH shown in Table 5. Incidence of PIH in the antioxidant group is 64.29% and in control group is 62.96% implying there is no benefit of antioxidant supplementation for prevention of PIH (p value =0.9188).

Table 3: Distribution of cases according to persistent uterine artery notch.

Uterine A notch	PIH (n=42)	Normotensive (n=268)
Bilateral	9	-
Unilateral	25	18
Absent	8	250
	Sensitivity = 80.95%	Specificity = 93.28%
	PPV = 65.38%	NPV = 96.8%

Table 4: Distribution of cases according to abnormal uterine artery pulsatility index.

Pulsatility index	PIH (n=42)	Normotensive (n=268)
PI>1.48	35 (83.33%)	13 (4.85%)
PI<1.48	07 (16.67%)	255 (95.15%)
	Sensitivity = 83.33%	Specificity = 95.15%
	PPV = 72.92%	NPV = 97.33%

Table 5: Distribution of PIH patients among patients supplemented with antioxidants (vit-C-1000 mg and vit-E-400IU) and patients who were not supplemented.

Number of patient with Doppler abnormalities (n=55)	No. of patients		
	No.	PIH	Normotensive
Antioxidant supplementation given (study group)	28	18 (64.29%)	10 (35.71%)
Antioxidant supplementation not given (control group)	27	17 (62.96%)	10 (37.04%)

DISCUSSION

Pregnancy induced hypertension complicates around 5-10% of all pregnancies and is an important cause of maternal and perinatal mortality and morbidity. Although multiple theories have been proposed for its pathogenesis, abnormal trophoblastic invasion and placental free radical oxidative stress appear to play a major role as causative agents. Several evidences such as definite treatment of pre eclampsia by delivery of placenta and occurrence of

pre eclampsia in absence of viable fetus confirm the hypothesis. In spite of reduction in morbidity and mortality of pre eclampsia by improvement in maternal and obstetric care, no significant changes occurred in prediction of pre eclampsia and hence it's timely prevention.

In our study, we found that patients who had elevated S/D ratio in umbilical artery developed pre-eclampsia subsequently on follow up. Our study in accordance with studies done by Fleisher et al and Bhatt et al.^{3,4} Uterine artery notch seems to be a good predictor of pregnancy induced hypertension.⁵ In our study p value is <0.0001 implying a statistically highly significant association between uterine artery notch and PIH. Uterine artery pulsatility index is a very good discriminator to differentiate between pre-eclampsia and normotensive cases. This finding is supported by studies by Gomez et al and Jurkovic and Juaniaux et al, Cnossens JS et al also found in their study that Pulsatility index, alone or combined with notching, is the most predictive doppler index.⁶⁻⁸ Future researches should concentrate on combining uterine artery doppler ultrasonography with other tests.

CONCLUSION

From the above study it is concluded that early trimester colour doppler ultrasonography has an excellent role to play as a predictor of pregnancy induced hypertension. However the role of antioxidant supplementation in early pregnancy for amelioration of the process could not be justified. It is suggested that further trials with large sample sizes be carried out to further evaluate the role of various screening strategies in prediction of PIH and also the role of antioxidant supplementation.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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