International Journal of Reproduction, Contraception, Obstetrics and Gynecology
Patel JI et al. Int J Reprod Contracept Obstet Gynecol. 2024 Jun;13(6):1559-1562
www.ijrcog.org
pISSN 2320-1770 | eISSN 2320-1789

DOI: https://dx.doi.org/10.18203/2320-1770.ijrcog20241444

Original Research Article

Role of uterine artery doppler in prediction of pre-eclampsia

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Received: 05 April 2024
Revised: 03 May 2024
Accepted: 04 May 2024

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ABSTRACT

Background: Approximately 5-10 % of pregnancies are complicated by pre- eclampsia and it is a prime cause for maternal and perinatal mortality and morbidity worldwide, particularly in developing countries. In pre-eclampsia insufficient invasion of maternal spiral arteries by the trophoblast early in gestation due to abnormal implantation or maternal vascular disease results in impaired placental perfusion. Aspirin is a potent anti-inflammatory drug, has been shown to inhibit the biosynthesis and release of prostaglandins, even in low dosage. Ingestion of low dose aspirin may result in a decrease in the incidence of pre-eclampsia and fetal growth restriction and the precise mechanism by which it prevents preeclampsia in some women is also uncertain.
Methods: The present prospective observational study was carried out in females between 18-20 weeks of gestation with raised uterine artery PI attending antenatal clinic in obstetrics and gynaecology department in SVP Hospital Ahmedabad from May 2023 to December 2023 using Microsoft excel and SPSS version 23.
Results: In this study all the females were with raised uterine artery PI in 18-20 weeks ultrasound among them 51.85% were normotensive in later pregnancy. 48.14% developed pre-eclampsia in later pregnancy. In our study the middle cerebral artery indices in doppler ultrasound showed increased diastolic flow (including brain sparing effect) among 37% of the patients. The umbilical artery doppler showed that 62.9% of subjects were having normal umbilical artery indices, 18.5% of the patients were having decreased diastolic flow, 11.1% of the patients were having reversal of diastolic flow and 7.4% of the patients were having absent end diastolic flow
Conclusions: Doppler study for fetal surveillance in pre-eclampsia is a very useful and non-invasive method and abnormal uterine artery velocimetry lead to the worse pregnancy outcomes in the present study. The knowledge of uterine and umbilical artery doppler is very helpful to improve pregnancy management and to identify and assess hypertensive disorder of the pregnancy at early gestational age compared to other antepartum test modalities.

Keywords: Abnormal doppler indices, Pre-eclampsia, Low dose aspirin, Abnormal uteroplacental doppler flow

INTRODUCTION

Approximately 5-10% of pregnancies are complicated by pre- eclampsia and it is a prime cause for maternal and perinatal mortality and morbidity worldwide, particularly in developing countries.[1] There is initiation of invasion of decidual part of spiral arteries by trophoblastic cells during the 8th week of gestation and progress of complete invasion continues till 13th week of gestation. After which there is initiation of invasion of myometrial part of spiral arteries by trophoblast cells and the progress of complete invasion continues till 18-19th week of gestation, although delay may extend completion of this process till 22-24th week of gestation.[2,3] In normal pregnancy, progressive trophoblastic invasion transforms the high resistance low volume uteroplacental spiral arteries into low resistance high volume non-responsive vessel. In pre-eclampsia insufficient invasion of maternal spiral arteries by the

trophoblast early in gestation due to abnormal implantation or maternal vascular disease results in impaired placental perfusion.[1] Abnormal placentation occurs long before the clinical appearance of PIH. This has generated a great interest in the possibility of using uterine artery doppler as screening test, particularly for pre-eclampsia.[4] Sensitivity of uterine artery doppler prediction of pre-eclampsia may also be improved by addition of certain risk factors of maternal history as well as single or multiple biochemical markers to screening algorithm in first and second trimester.[1] Aspirin is a potent anti-inflammatory drug, has been shown to inhibit biosynthesis and release of prostaglandins, even in low dosage. Ingestion of low dose aspirin may result in a decrease in the incidence of pre-eclampsia and fetal growth restriction and the precise mechanism by which it prevents preeclampsia in some women is also uncertain.[5-8]

Aims and objectives

The objective of my study is to study the role of uterine artery doppler in prediction of pre-eclampsia and its correlation with perinatal outcome and to study the role of low dose aspirin in prevention of pre-eclampsia

METHODS

The present prospective observational study was carried out in 81 females between 18-20 weeks of gestation with raised uterine artery PI attending antenatal clinic in obstetrics and gynaecology department in SVP Hospital Ahmedabad from May 2023 to December 2023. Uterine artery pulsatility index >1.56 was considered as abnormal and follow up was done in ANC clinic till the delivery. Various feto-maternal outcomes were studied. Role of low dose aspirin in prevention of pre-eclampsia was studied.

Inclusion criteria

Primigravida age between 20 to 35 years with or without associated risk factors for development of hypertensive disorders of pregnancy like familial risk for pre-eclampsia, obesity, h/o renal disease, severe migraine, diabetes. Multigravida with h/o pre-eclampsia in previous pregnancy, intrauterine growth restriction, placental abruption, IUD or still birth in previous pregnancy with raised uterine artery PI in present pregnancy were included in this study. All the patients were selected randomly and Low dose tablet aspirin was started in patients.

Exclusion criteria

Patient with chronic hypertension, congenital anomaly in fetus and lost to follow up were excluded.

Statistical analysis

Data entry and data analysis was done by using Microsoft excel and SPSS version 23.

RESULTS

This present study was conducted among 81 pregnant women with raised uterine artery PI in second trimester. In our study 37% patients were nulliparous, 29.6% were having parity of 1, 22.2% were having parity of 2 and 11.1% were having parity of 3 or more (Figure 1).

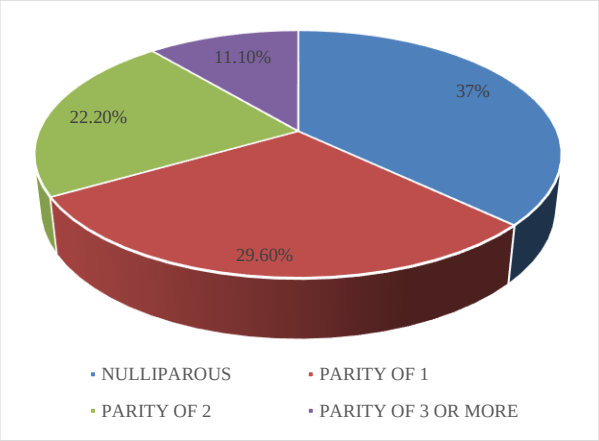

Figure 1: Parity.

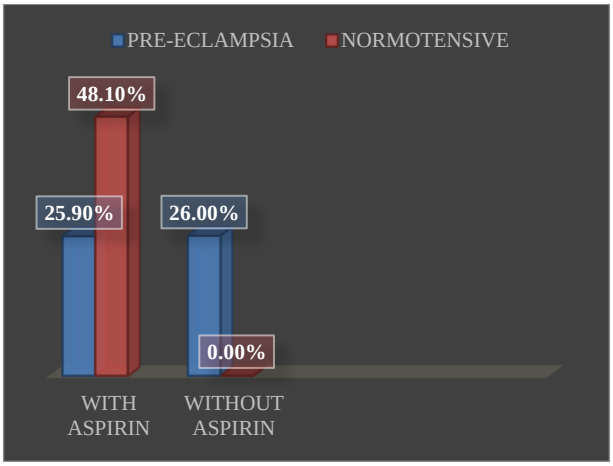

Figure 2: Effect of aspirin in development of hypertensive disorder of pregnancy.

In this study all the females were with raised uterine artery PI in 18-20 weeks ultrasound among them 51.85% were normotensive in later pregnancy. 48.14% developed pre-eclampsia in later pregnancy. In our study 74% of the women were treated with low dose tablet aspirin out of which 25.9% of the patients had developed pre-eclampsia later and 48.1% were normotensive in later pregnancy. 26% were not given tablet aspirin and in later pregnancy all of them developed pre-eclampsia.

Table 1: Mode of delivery.

Route of delivery	N	%
Vaginal delivery	24	29.6
Caesarean section	57	70.3

Patients who were not taking low dose tablet aspirin were either emergency cases, lost to follow up or did not have regular antenatal visits (Figure 2). The middle cerebral artery indices in doppler ultrasound showed increased diastolic flow (including brain sparing effect) among 37% of the patients. The umbilical artery doppler showed that 62.9% of subjects were having normal umbilical artery indices, 18.5% of the patients were having decreased diastolic flow, 7.4% of the patients were having absent end diastolic flow and 11.1% of the patients were having reversal of diastolic flow (Figure 3).

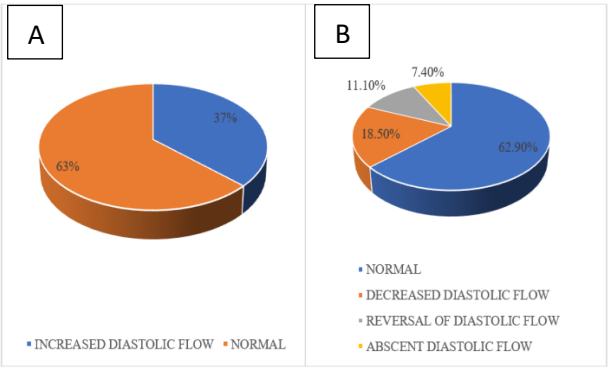

Figure 3: A) Middle cerebral artery indices and B) umbilical artery indices.

In our study out of 81 patients 29.6% were delivered by vaginal delivery and 70.3% were delivered by caesarean section (Table 1). The pregnant women were followed postpartum till early neonatal phase and it was observed that there were 92.59% live birth and 7.4% were IUD.

Table 2: Fetal outcome in patients with pre-eclampsia and normotensive females.

Fetal outcome	Pre-eclampsia, N (%)	Normotensive, N (%)
Normal (>2500 g)	4 (4.9)	44 (54.32)
ELBW (<1000 g)	3 (3.7)	0 (0)
VLBW (1000-1500 g)	8 (9.8)	1 (1.2)
LBW (1501-2500 g)	12 (14.81)	3 (3.7)
Intrauterine death	6 (7.4)	0 (0)

Among the live births in normotensive patient 54.32% of newborn were having normal birth weight and among pre-eclampsia patients only 4.9% were having normal birth weight, where in normotensive 3.7% and among pre-eclampsia patients 14.81% were of low birth weight, in normotensive patients 1.2% and in pre-eclampsia patient 9.8% were of very low birth weight, in normotensive women none and in pre-eclampsia patients 3.7% were of extremely low birth weight (Table 2).

DISCUSSION

Pre-eclampsia is the most common cause of the feto-maternal mortality affecting 10% of the pregnant women and is associated with 22% perinatal deaths. Doppler studies in high-risk pregnancies are more helpful in the management of the perinatal and neonatal outcomes.[9] In this study total of 81 pregnant females with raised uterine artery PI were included with the age group of 20-35 years. In our study 37% patients were nulliparous, 29.6% were having parity of 1, 22.2% were having parity of 2 and 11.1% were having parity of 3 or more. In the study by Khalid et al 60.3% and Lakhkar et al 77.7% more than half of the pregnant women were primigravida.[10,11] Whereas in study by Rafia et al 40.8% of the pregnant women were primigravida.[12] In this study all the females were with raised uterine artery PI in 18-20 weeks ultrasound among them 51.85% were normotensive in later pregnancy. 48.14% developed pre-eclampsia in later pregnancy. In our study 74% of the women were treated with low dose tablet aspirin out of which 25.9% of the patients had developed pre-eclampsia later and 48.1% were normotensive in later pregnancy. 26% were not given tablet aspirin and in later pregnancy all of them developed pre-eclampsia.

In our study out of 81 patients 29.6% were delivered by vaginal delivery and 70.3% were delivered by caesarean section. In our study the middle cerebral artery indices in doppler ultrasound showed increased diastolic flow (including brain sparing effect) among 37% of the patients. The umbilical artery doppler showed that 62.9% of subjects were having normal umbilical artery indices, 18.5% of the patients were having decreased diastolic flow, 11.1% of the patients were having reversal of diastolic flow and 7.4% of the patients were having absent end diastolic flow. The similar findings were observed in the studies by Lakhkar et al, Frusca et al, Rafia et al and Epsinoza et al.[13-16]

Study by Bhatt et al showed that the fetus with the reversal of diastolic flow and absent diastolic flow in umbilical artery doppler was associated with fetal growth restriction (FGR). In this study it was observed that there were 92.59% live birth and 7.4% were IUD. Among the live births in normotensive patient 54.32% and among pre-eclampsia patients only 4.9% newborn were having normal birth weight, where in normotensive 3.7% and among pre-eclampsia patients14.81% were of low birth weight, in normotensive patients 1.2% and in pre-eclampsia patient 9.8% were of very low birth weight, in normotensive women none and in pre-eclampsia patients 3.7% were of extremely low birth weight.

In a study by Chan et al 15.5% of the fetus born to mother with pre-eclampsia were having abnormal uterine indices were having perinatal mortality or major morbidity.[16] study by Bhatt et al showed that the prevalence of fetal growth restriction or low birth weight among fetus born to mother with hypertensive disorder of the pregnancy having abnormal uterine indices was 60%.[9] The present study included pregnant women attending only SVP hospital Ahmedabad and represent only one geographical region. The present study was done at tertiary care centre where all the facilities for ultrasonography and obstetrician

were available which might not be available at remote areas.

CONCLUSION

Doppler study for fetal surveillance in hypertensive disorder of the pregnancy is a very useful and non-invasive method and abnormal uterine artery velocimetry lead to the worse pregnancy outcomes in the present study. The knowledge of uterine and umbilical artery doppler is very helpful to improve pregnancy management and to identify and assess hypertensive disorder of the pregnancy at early gestational age compared to other antepartum test modalities. Low dose aspirin is to be given if uterine artery doppler is raised and in present study it is seems to be effective in prevention of hypertensive disorder of the pregnancy in later stage. Daily low dose prophylaxis is indicated and started between 12 to 28 weeks of gestation to prevent pre-eclampsia and fetal growth retardation.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Patel JI, Deliwala KJ, Shah SR, Parikh PM. Role of uterine artery doppler in prediction of pre-eclampsia. Int J Reprod Contracept Obstet Gynecol 2024;13:1559-62.