



“PROSPECTIVE OBSERVATIONAL STUDY OF FETAL OUTCOME IN ABNORMAL PLACENTAL DOPPLER ULTRASOUND FINDINGS”

Obstetrics & Gynaecology

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ABSTRACT

Background: Real-time ultrasound technology, such as Placental Doppler ultrasound, has improved antepartum fetal surveillance and preventive obstetric management. It helps detect fetal at risk of death or compromise, reducing maternal and perinatal mortality. Early recognition of fetal compromise can help reduce perinatal mortality and morbidity. Abnormal color Doppler findings are being studied at the institute level. **Results:** This study analyzed the incidence of primigravida in women aged 21-25 years, with 51% experiencing perinatal distress. Out of 50 patients, 63% underwent LSCS, with most requiring PIH and IUGR. Doppler findings showed normal or abnormal outcomes, with AEDF and REDF causing perinatal mortality. Normal flow in the middle cerebral artery was good, but resistance in the middle cerebral artery led to perinatal morbidity and mortality. **Conclusion:** Doppler abnormalities increase adverse perinatal outcomes and mortality rates. Combining Doppler indices, including uterine and umbilical artery, middle cerebral artery, and uterine artery notch, can predict fetal outcomes.

KEYWORDS

Doppler ultrasound, placental thickness, pregnancy, umbilical vein, vertical transmission

INTRODUCTION

The right to be born undamaged is crucial in materno-fetal medicine, aiming to create a healthy baby and mother. The growth of the human fetus has been extensively studied, leading to increased perinatal mortality and morbidity. However, real-time ultrasound technology has made it easier to detect future catastrophes.

Placental Doppler ultrasound is a simple, non-invasive, widely available, cost-effective, and reproducible technique for studying uteroplacental and fetal circulation. Ante partum fetal surveillance is essential for preventive obstetric management aimed at reducing maternal and perinatal mortality and morbidity. Detecting fetal at risk of death or compromise in utero remains a major challenge in modern obstetrics. Specific and accurate methods can result in early appropriate intervention and reduce fetal loss.¹

Antenatal tests of fetal well-being depend indirectly on changes in fetal physiology, which was previously relatively inaccessible due to the lack of techniques to measure placental function. New technologies have now become available in clinical assessment of placental function, such as Doppler measurement of pulsatile blood velocity in umbilical arteries, which provides direct information on fetoplacental circulation and identifies placental circulatory failure.²

Diagnostic ultrasound is the mainstay in evaluating and managing obstetric patients, as fetal growth and development rely on normal uteroplacental and foetoplacental circulation to supply oxygen and nutrients from the maternal circulation. Doppler flow velocimetry, particularly of the middle cerebral and umbilical arteries, is an earlier predictor of hypoxemia and acidemia.³

Early recognition of fetal compromise by Doppler ultrasound may help reduce the incidence of perinatal mortality and morbidity. Blood flow measurement plays a significant role in monitoring and redistributing growth restricted fetus, determining the optimal time for delivery. Abnormal color Doppler ultrasound is commonly seen in patients with pregnancy-induced hypertension, oligohydramnios, intrauterine growth retardation, and postdatism.⁴

So, to improve fetal outcome and reduce perinatal mortality and morbidity study of abnormal colour Doppler finding is being conducted at institute level.

MATERIALS AND METHODS

This prospective observational study was conducted at a Tertiary Care Hospital from Jan 2022 to Jan 2023, involving 50 antenatal patients with PIH, Intrauterine growth retardation, Postdatism, and Oligohydramnios. Patients were enrolled after providing their

detailed history, including pregnancies induced hypertension, postdate, and previous pregnancy oligohydramnios. Routine and special investigations were conducted, including blood grouping, liver function tests, and obstetric USG. High-risk patients were selected for USG Doppler tests, which measured flow in the middle cerebral artery, uterine artery, and umbilical artery. The decision on the route of delivery and method of termination of pregnancy was made based on abnormal findings. Pregnancy termination was based on abnormal readings from CTG or low biophysical profile scores. Outcomes were recorded in terms of birth weight, APGAR Score, NICU admission, and neonatal mortality. The study found a correlation between abnormal Doppler findings and fetal outcomes and surgical intervention.

Inclusion Criteria:

Antenatal patient in their third trimester with

- 1) Pregnancy induced hypertension
- 2) Oligohydramnios
- 3) Intrauterine growth retardation
- 4) Postdatism

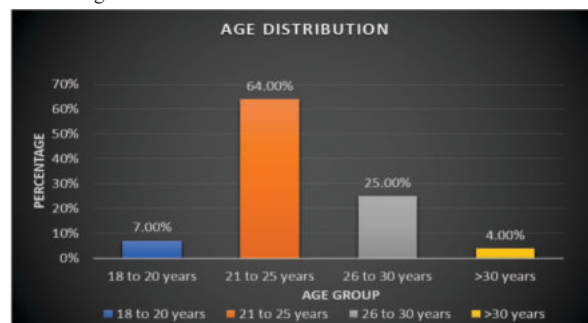
Exclusion Criteria:

All antenatal patient other than inclusion criteria.

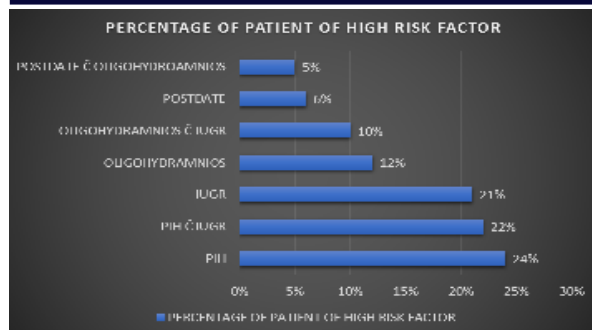
OBSERVATIONS AND RESULTS

Total 50 cases were enrolled in this study with inclusion criteria PIH, IUGR, Oligohydramnios, Postdate.

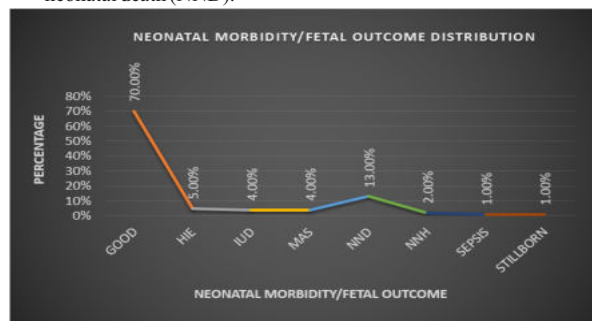
- In this study most of the women were in age group 21-25 years. The incidence of primigravida in study population is 51%. The mean gestation at the time of deliveries was 34.45 weeks



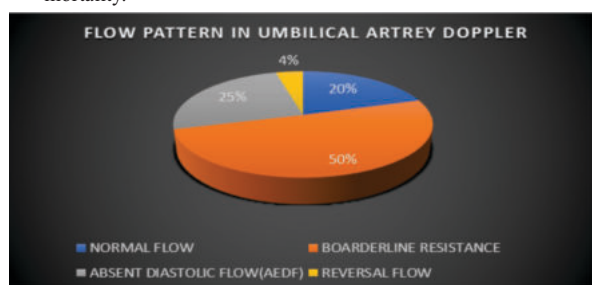
- Incidence of PIH was 24% and associated with IUGR contributed, 21% were IUGR, 12% patients were Oligohydramnios associated with IUGR consisted of 10%, postdate patients were 6% and remaining 5% consist of postdate with oligohydramnios.



- Among 50 patients 63% patients underwent LSCS, 27% patients were induced and 10% delivered by spontaneous vaginal delivery. Most of the indication of LSCS were PIH with IUGR with fetal distress.
- The incidence of mean birth weight was 2.07 kg.
- Out of 50 patients with Doppler findings 20% patients have normal Doppler findings had good fetal outcome
- Out of 40 patients with abnormal Doppler finding 50% had good fetal outcome.
- Among 15 abnormal Doppler findings 4% babies were intrauterine death, 1% was still born and remaining 25% babies had perinatal morbidity in the form of hypoxic ischemic encephalopathy (HIE-5%), sepsis (1%), neonatal hyperbilirubinemia (NNH-2%) and meconium aspiration syndrome (MAS-4%) and 13% babies had neonatal death (NND).



- Among 50 patients 20% patients has normal umbilical flow has good outcome, 50% has borderline resistance with good fetal outcome, 25% patient has AEDF and 5% patient has REDF.
- Patient with absent end diastolic flow (AEDF) has 52% perinatal mortality
- Patient with reversed end diastolic flow (REDF) has 100% mortality.



- Sensitivity of Doppler examination in predicting adverse perinatal outcome is 100%. Specificity of Doppler examination in predicting adverse perinatal outcome is 28.5%. Positive predictive value in predicting adverse perinatal outcome is 37%. Negative predictive value in predicting adverse perinatal outcome is 100%.
- Among 50 patients 20% has normal flow in middle cerebral artery and has good outcome. 50% has borderline resistance in MCA has good outcome, 30% has increased resistance which presented in this study in the form of perinatal morbidity and mortality.
- 30% patient has persistence of notch in each uterine artery has adverse fetal outcome in the form of perinatal mortality and morbidity.

DISCUSSION

The details of comparison, similarities and differences of various studies in the terms of Fetal outcome in abnormal placental Doppler

findings in patients in their third trimester have been noted and described in detail. In present study, it is observed that maximum number of patients were between age group 21 to 25 years (64%). The mean age of the mother in present study is 24.62 $\pm$ 3.384 years. In similar studies by **Smitha et al⁵** and **Ozeren et al⁶**, they reported mean age as 23.4 and 27.6 years respectively.

In present study 51% patients were primigravida. **Yash et al⁷**, **Lakshmi et al⁸** and **BN Lakhkar et al⁹** in their studies reported 54%, 69% and 77.7% primigravida patients respectively. This can be attributed probably for increased pregnancy rate in these age group. Pregnancy induced hypertension is more common in primigravida due to first time exposure to chorionic villi.

The present study reveals that maximum patients were found between 33 weeks to 36 weeks. Mean gestational age was 34.45 $\pm$ 2.354 weeks. In similar studies done by **Odibo et al¹⁰** and **Ulkumen et al¹¹** mean gestational age was found to be 35.6 and 34.82 weeks respectively. **Yash et al⁷** reported 34% of the patients were above 36 weeks, 24% were above 32 weeks and 42% above 30 weeks.

In present study 63% underwent LSCS, 27% vaginal induced and 10% spontaneous delivery. **Sharma et al. (2010)¹²** had a 78% caesarean delivery rate in PIH patients with abnormal Doppler.

Dhand Hemlata et al (2011)¹³, 84% of their cases with abnormal underwent C-sections Doppler flows the study 75% of babies with abnormal Doppler flows were subjected to caesarean section where as 50% cases with normal Doppler flows underwent caesarean section. 4% of the cases needed termination of the pregnancy on account of severe oligohydramnios in fetuses with reversal of flow in umbilical artery whereas none of the cases with normal Doppler flow required termination of pregnancy.

In the study conducted by **Nallini YL et al (2015)¹⁴** The mode of deliveries were 30% vaginal deliveries and 70% LSCS. 20 had elective LSCS in view of IUGR and 50% had emergency LSCS for PIH with fetal distress, BOH with IUGR patients. 19% patients delivered vaginally. 4% cases with reversal diastolic flow in umbilical artery (gestational age <30 weeks were terminated on account of severe fetal distress and weight < 1.2 kg.

In present study most of the patient has Pregnancy induced hypertension (24%). Pregnancy induced hypertension associated with IUGR (22%), IUGR alone (21%), Oligohydramnios (12%), Oligohydramnios with IUGR (10%), Postdate (11%)

In study conducted by **Nallini YL et al (2015)¹⁴** Pregnancy induced hypertension and IUGR constituted majority of the cases (58%), in 24 of cases they were bad obstetric history with IUGR. No apparent cause was found in 8% of cases.

In the present study the umbilical artery PI had a sensitivity of 76.6%. According to **D.Gramellini et al¹⁵**, the sensitivity of PI in the Umbilical artery in predicting perinatal outcome was 64%. Umbilical artery was the main vessel used for monitoring high risk pregnancies. This is because umbilical artery represents fetoplacental system and primarily reflects placental resistance. Another study by **K W Fong et al¹⁶** showed the sensitivity of PI in the umbilical artery as 44.7%.

In present study Uterine artery has sensitivity 63.33%, specificity is 80%, PPV is 57.6% and NPV 83.6% which is comparable to study conducted by **Colemann et al¹⁷**

In present study Umbilical artery sensitivity is 76.6%, specificity is 88.57%, PPV is 74.2%, NPV 89.9% which is more comparable with study conducted **Gramellini et al¹⁵**.

In present study MCA PI has sensitivity 38.6%, specificity 82.4%, PPV 76.6%, NPV 45.5% which is more comparable to study conducted **BN Lakhkar et al⁹**

CONCLUSION

There was significant increase in occurrence of adverse perinatal outcome with increasing severity of Doppler abnormalities. Patient with marked Doppler abnormalities had adverse perinatal outcome, to those with mild Doppler abnormalities. There was significant increase in perinatal mortality with increasing flow in umbilical artery, middle

cerebral artery and persistent of uterine artery notch.

These observation shows that Doppler can accurately prognostic factor for perinatal morbidity and can help in optimising the time of intervention in hypoxic fetus. Combination of Doppler indices of uterine and umbilical artery, middle cerebral artery is the best prediction of fetal outcome in patient like PIH, Oligohydroamnios, IUGR, Postdate. Diastolic notch in uterine artery as single parameter is better than the individual Doppler indices in uterine artery. Absent end diastolic flow in umbilical artery is better predictor of perinatal morbidity and mortality. Reversed end diastolic flow has highest sensitivity of perinatal mortality. MCA/Umb PI more sensitivity index than umbilical PI and MCAPI alone.

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