



## DOPPLER ULTRASOUND, AS VITAL AID TO PREDICT FETAL OUTCOME IN HIGH RISK PREGNANCIES

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### ABSTRACT

**INTRODUCTION:** Pulsed Doppler ultrasound allows a clearer understanding of hemodynamic changes and has thus become one of the most effective clinical methods in

high risk pregnancies for fetomaternal surveillance. Fetuses with abnormal flow velocity waveform exhibit a high rate of perinatal asphyxia and death compared to those with normal flow properties. Doppler velocimetry determines not only the frequency of antenatal testing and the optimum delivery time, but also the mode of delivery.

**OBJECTIVE:** To evaluate fetal outcome in High Risk Pregnancies with Doppler changes.

**MATERIAL AND METHODS:** Fetal outcome of 100 high risk pregnancies with doppler changes showing abnormality were analysed over a period of 4 months from May 2020 to August 2020. Ultrasound was done followed by Doppler evaluation. Uterine, umbilical and middle cerebral artery flow velocity waveforms (FVW) were analyzed and the resistance index (RI), pulsatility index (PI) and the systolic/diastolic (S/D) ratios were measured. Fetal outcome was determined by APGAR score after 5 minute.

**RESULTS:** Out of 100 cases, 43 patients underwent vaginal delivery, out of which 25 full term and 18 were preterm deliveries. 57 patients underwent caesarean section out of which 33 were full term and 24 were preterm. Out of 88 live births, 22 babies had APGAR <6 at 5 minutes and 34 babies required NICU admission because of fetal distress, low birth weight, low APGAR, respiratory distress syndrome and IUGR.

**CONCLUSION:** Doppler can be used as promising adjunct in management of high risk pregnancies. It helps in guiding early intervention and improving fetal outcome.

**KEYWORDS :** Colour Doppler, High Risk Pregnancies, Perinatal outcome

### INTRODUCTION

Pregnancy is considered to be high risk when potential complications can affect mother, baby or both. High risk pregnancy refers to either identification of high risk factors like anemia, cardiac disease, systemic hypertension, thyroid, diabetes mellitus, renal disorder, Rh alloimmunization, connective tissue disorders during antenatal period in the previous or current pregnancy like Anemia, Gestational hypertension, Pre-eclampsia, Eclampsia and Gestational diabetes mellitus that leads to poor maternal or fetal outcome[1].

The key objective of antenatal fetal surveillance is to detect fetal compromise, assess fetal wellbeing, and enhance perinatal outcomes in normal and high risk pregnancies in order to take prompt and appropriate action to minimize maternal and perinatal mortality and morbidity rates. Doppler ultrasound allows a clearer understanding of hemodynamic changes and has thus become one of the most effective clinical methods in high risk pregnancies for fetomaternal surveillance. Fetuses with abnormal flow velocity waveform exhibit a high rate of perinatal asphyxia and death compared to those with normal flow properties. Doppler velocimetry determines not only the frequency of antenatal testing and the optimum delivery time, but also the mode of delivery, whether to carry out conservative management or interventions to reduce maternal and neonatal mortality [2]. With the introduction of doppler ultrasound examination it became possible to assess the uteroplacental blood flow, fetoplacental blood flow and fetal blood circulation. Maternal disorders or placental conditions that are known to obliterate small muscular arteries in the placental tertiary stem villi result in a progressive decrease in end diastolic flow in the umbilical artery Doppler Waveform which later becomes absent and then reversed flow during diastole eventually.[3] Reversed end-diastolic flow in the umbilical arterial circulation is an indication of advanced stage of placental compromise and has been associated with obliteration of

about 70% of arteries in placental tertiary villi.[4,5] Absent flow or reversed end-diastolic flow in the umbilical artery are found commonly associated with severe intrauterine growth restriction (IUGR) and oligohydramnios[6,7].

### MATERIAL AND METHODS

The prospective study was conducted in 100 high risk pregnant women with color doppler changes in department of obstetrics and gynecology, civil hospital, Ahmedabad from May 2020 to August 2020. Initial assessment consisted of a detailed history of the patient as per the proforma. The study population was selected on the basis of following inclusion and exclusion criteria.

### INCLUSION CRITERIA

- Singleton pregnancy more than 28 weeks of gestation
- Presence of high-risk factors like Gestational Hypertension, Preeclampsia, chronic hypertension, diabetes mellitus overt and GDM, postdated pregnancy, IUGR, Rh negative pregnancy and pregnancy with other medical disorder

### EXCLUSION CRITERIA

- Pregnancy with documented congenital anomaly/ chromosomal anomaly
- Multiple pregnancy

### METHOD OF STUDY

Informed written consent from the antenatal women were obtained after explaining the procedure, its advantages and the absence of any radiation hazards to the fetus or herself in detail. Thorough general and obstetric history was elicited and recorded. General examination, systemic examination and obstetric examination were done. Ultrasound was done followed by Doppler evaluation. Uterine, umbilical and middle cerebral artery flow velocity waveforms (FVW) were analyzed and the resistance index (RI), pulsatility index (PI) and the systolic/diastolic (S/D) ratios were measured. On the

basis of flow velocity waveforms (FVW), the uteroplacental fetal blood flow was classified as normal, increased resistance to flow, absent end diastolic flow (AEDF) and reversed end diastolic flow (REDF). In case of reversed and absent end diastolic flow decision to terminate pregnancy irrespective of gestational age was taken. Serial Doppler study was done depending on the need.

Decision to deliver was taken in situations such as

- Gestational age -37 weeks for hypertensive mothers
- Absent end diastolic flow

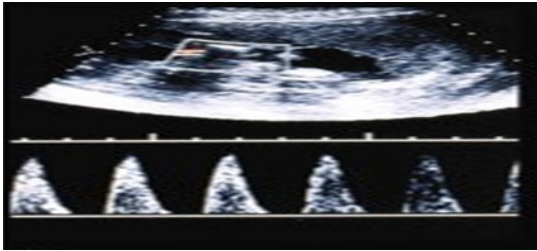


Figure 1: AEDF in umbilical artery

- Reversed end diastolic flow

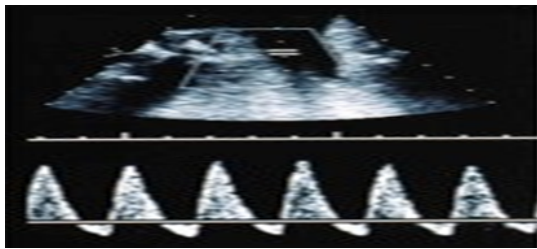


Figure 2: REDF in umbilical artery

- Abruption
- Worsening of maternal conditions like HELLP, Imminent eclampsia, uncontrolled hypertension and deteriorating renal function.
- Evidence of Fetal distress either by Biophysical profile or abnormal cardiotocography (CTG)
- Oligohydramnios  
Mode of delivery, gestational age at delivery whether delivery was induced or spontaneous, mode of delivery- labor natural/ elective or emergency LSCS was noted Following were taken as adverse Perinatal outcome
- Preterm delivery
- IUGR
- APGAR at 5 minutes less than 6/10
- Admission to NICU requiring oxygen support/ inotrop support
- Perinatal death and still birth

**RESULT**

In the present study, majority women were in age group of 22-35 years. 55 patients were primigravida and 45 patients were multigravida.

**TABLE 1- Distribution of cases in relation to obstetrics risk factors**

OBSTETRICS RISK FACTORS	NO. OF PATIENTS (n= 100)
Oligohydramnios	15
Pre-eclampsia	35
IUGR	28
Post-date pregnancy	6
Cardiac disease	4
Anemia	3
Gestational Diabetes Mellitus (GDM)	5
Overt Diabetes Mellitus	3
Rh Isoimmunization	1

Table 1 shows majority of patients in study are of

preeclampsia followed by IUGR, oligohydramnios and postdate pregnancy.

**TABLE 2- Finding of Abnormal Doppler in Cases**

Uterine Artery (Increased S/D ratio with Diastolic Notch)	Umbilical Artery			Middle Cerebral Artery i.e. brain sparing effect (decrease S/D ratio and PI)	No. of Patients (n= 100)	percentage
	Decrease Diastolic Flow (Increased PI and S/D ratio)	Absent End Diastolic Flow (AEDF)	Reversal of End Diastolic Flow (REDF)			
-	Yes	-	-	-	32	32%
Yes	Yes	-	-	Yes	13	13%
Yes	-	Yes	-	Yes	21	21%
Yes	-	-	Yes	Yes	14	14%
Yes	-	-	-	-	20	20%

Majority of doppler changes associated with preeclampsia, Oligohydramnios, IUGR and postdate pregnancies. Among these patients, grave prognosis was seen in patients with reversal of flow in umbilical artery. 14 cases with REDF in umbilical artery and brain sparing effect required Urgent intervention in form of emergency cesarean section out of 12 were preterm cesarean section, 8 babies APGAR <5 and required resuscitation, intubated and taken to NICU.

**TABLE 3- Distribution of Cases according to Mode of Delivery**

Mode of Delivery	Full term	Preterm	No. of patients in percentage(n= 100)
Vaginal Delivery	25	18	43%
Caesarean Section	33	24	57%

In present study, patient induced and by considering low threshold for caesarean section for fetal distress 43 patients underwent vaginal delivery, out of which 25 full term and 18 were preterm deliveries. 57 patients underwent caesarean section out of which 33 were full term and 24 were preterm.

**TABLE 4- Neonatal Outcome**

Characteristics	No. of Babies
Live birth	88
Still birth	12
Birth weight (> 2 kg)	68
Birth weight (< 2 kg)	32
APGAR SCORE (>6) at 5 min	66
APGAR SCORE (<6) at 5 min	22
NICU Admission	34

Out of 100, 88 were live birth and 12 were still birth babies. 68 babies having birth weight of more than 2 kg while 32 have less than 2 kg.

APGAR score >6 at 5 min was observed in 66 babies while 22 babies show APGAR score <6 at 5 min. 32 babies required NICU admission.

## DISCUSSION

The colour flow Doppler imaging has already found its place in studying the pathological vascular flow patterns in intrauterine growth restriction and high-risk pregnancy. Its indices provides important information on the hemodynamics of the vascular area under study[8]. Doppler study of the fetal umbilical and middle cerebral arteries helps us to predict the perinatal outcome and modify the management accordingly. In a present study out of 100, most commonly found complication with doppler changes was pre-eclampsia followed by IUGR and oligohydramnios. Highly increased resistance flow in umbilical artery seen as AEDF and REDF is a good marker of hypoxic and acidotic fetus which requires termination of pregnancy. Fetuses with absent and reverse end diastolic flow were at a significantly increased risk for delivery at low gestation, IUGR, low birth weight and perinatal deaths. The fetus responds to asphyxia by increasing flow to cerebral hemisphere, i.e. decrease in resistance in MCA is a sign of a compromised fetus and increase flow is a compensatory sign, so called brain sparing effect. A continue insult to the fetus causes decrease in flow as a terminal event so reversal of brain sparing effect in fetus is indicative of grave fetal distress. Abnormal Umbilical artery doppler waveforms associated with IUGR and pre-eclampsia pregnancies. In our study, 14 cases of REDF in umbilical artery with brain sparing effect required emergency cesarean section. In our study, out of 100 cases, 57 cases required cesarean section. Out of 88 live births, 22 babies have APGAR <6 at 5 minutes and 34 babies required NICU admission because of fetal distress, low birth weight, low APGAR, respiratory distress syndrome and IUGR.

## CONCLUSION

Doppler can be used as promising adjunct in management of high risk pregnancies. The positive predictive value for assessment of fetal Doppler flow velocimetry has revolutionized the diagnosis of abnormal blood flow the foeto-placental bed, and early identification of these abnormal patterns are useful in the determining the optimal time for delivery to reduce the perinatal mortality. Perinatal mortality increased with abnormality of fetal doppler. It is generally accepted that the findings of AEDF and REDF in umbilical artery is reliable sign of imminent fetal asphyxia and require intervention even in case where Cardiotocography is still normal. Serial doppler study should be done to detect improving or deteriorating trend and timely obstetric intervention in fetal interest. **RECOMMENDATION:** Doppler should be used as routine investigation as a part of antepartum surveillance in high risk pregnancies.

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