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Original Research Article

## Role of color doppler ultrasonography in high risk pregnancies: a retrospective study

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### ABSTRACT

**Background:** Numerous adverse perinatal outcomes are associated with high-risk. The usage of doppler ultrasound bids a non-invasive way to study the fetal and maternal circulation and guide the clinical management. Objective of this study was to investigate the role of color doppler ultrasonography in effective management of high-risk pregnancies.

**Methods:** A retrospective record-based study was carried out Department of obstetrics and gynecology. Record of antenatal women who belonged to the age group of 20-30 years with singleton pregnancy of gestational age of 26 weeks to term and presence of one of the high-risk factors were included in the study. The risk factors which were considered are pregnancy-induced hypertension (PIH), diabetes, anemia, oligohydramnios. Doppler study of umbilical artery was done. Epi-info 7 was used for analysis.

**Results:** A total of 140 cases were studied in which high-risk pregnancy was most common in the age group of 20-25 years. The most common high-risk factor in pregnancy was PIH which accounted for 50% of cases. Out of 140 cases high-risk pregnancies, 40% of cases resulted in intrauterine growth restriction (IUGR). 43% of cases, umbilical artery findings were abnormal.

**Conclusions:** Color doppler can be used as most effective for fetal surveillance in high-risk pregnancy cases. Most importantly it helps in guiding early intervention and improving fetal outcome.

**Keywords:** Color doppler, High-risk pregnancy, Intrauterine growth restriction, Perinatal outcome, Preterm, Pregnancy- induced hypertension

### INTRODUCTION

Pregnancy can be considered as the most beautiful period of a woman's life. The pregnancy is continuously observed by clinical examination, laboratory investigations, and radiographic examinations at exact intervals through its course. In obstetrics, the use of doppler ultrasound is to study blood flow to assess fetal inaccessibility. The growth of doppler ultrasonographic technology has provided an opportunity to obtain a qualitative and quantitative valuation of maternal and

fetal circulation using a non-invasive method.<sup>1</sup> It has been studied that doppler velocimetry of umbilical artery in unselected and low-risk pregnancies cannot be recommended.<sup>2</sup> Non-invasive investigation of fetal circulation has become possible with the use of doppler as abnormal fetal circulation is considered a major factor in fetal growth restriction, both as a cause and an indicator.<sup>3</sup> Major causes of high-risk pregnancies are Pregnancy-induced hypertension (PIH) or gestational hypertension being one of the most common.<sup>4</sup> Oligohydramnios can be idiopathic or may be associated

with other conditions. Diabetes and anemia also have many adverse fetal and maternal outcomes.<sup>5</sup> Considering the above facts the present study was aimed to evaluate the importance of doppler study in high-risk pregnancy and to correlate the findings of doppler with clinical findings in high-risk pregnant women.

## METHODS

Retrospective record-based study conducted at Department of obstetrics and gynaecology of tertiary care hospital. One-year study with 140 antenatal women who attended the OPD during the study period. A total 140 antenatal women with high risk factor which includes PIH, diabetes, anemia, oligohydramnios.

### Inclusion criteria

- Those belonged to the age group of 20-30 years
- Women with singleton pregnancy of gestational age of 26 weeks to term and
- Women presence of one of the high-risk factors
- Clinical suspicion of IUGR.

### Exclusion criteria

- Those who didn't give consent.

The study was approved by Institutional Ethics Committee. Written informed consent was taken for the study.

Records of the patients were taken from the OPD registers and from antenatal ward. Details of obstetric history, age, last menstrual date, and underlying risk factors were noted. All patients who were recorded were on esaotae AU3 color doppler machine with 3.5 MHz curvilinear probe and with color and spectral doppler. Doppler study of umbilical artery was done. Parameters in the form of a resistive index, pulsatility index (PI), and systolic/diastolic ratio (S/D) of umbilical arteries were taken. Detailed USG study in the form of maturity by biparietal diameter, femoral length, abdominal circumference, liquor, and expected fetal weight was measured. Doppler study was done in required patients at 7<sup>th</sup> or 15<sup>th</sup> day according to the previous doppler findings. Details of delivery and fetal outcomes were also noted.

### Statistical analysis

Recorded observations were stored in excel sheets and further analysed in Epi-info 7 software. They were expressed in proportions and percentages. Pearsons correlation was used for determining the correlation between fetal outcomes and high-risk condition.

## RESULTS

As per Table 1 women were divided into two age groups 20-25 years (n=60) and 26-30 years (n=80). The highest

incidences of high-risk condition were found to be PIH in 50% of women followed by oligohydramnios in 20%. incidences of diabetes mellitus were 14.2% and anemia were 7%. So, among the study participant the PIH was most common.

**Table 1: Incidences of high-risk factors among the study participants (N=140).**

Conditions	Number (%)
Pregnancy induced hypertension (PIH)	70 (50)
Oligohydramnios	28 (20)
Diabetes mellitus	26 (18)
Iron deficiency anemia	16 (12)

**Table 2: Incidences of IUGR in high-risk conditions among the study participants.**

Conditions	IUGR	Non-IUGR
Pregnancy induced hypertension (PIH)	30	40
Oligohydramnios	13	15
Diabetes mellitus	10	16
Iron deficiency anemia	6	10

As per Table 2 due to various high-risk conditions 40% of cases resulted in IUGR (N=56). Most of the incidences of IUGR seen in women who's having PIH as the high-risk factor (42%). Followed by Oligohydramnios resulting in 13 IUGR cases and 10 with Diabetes. This shows that PIH, Oligohydramnios and Diabetes are more commonly associated with IUGR.

**Table 3: Correlation between doppler findings and fetal outcome in high-risk conditions.**

Conditions	Fetal outcome		r
	Fetal survival	Low apgar score	
Pregnancy induced hypertension (PIH)	12	18	0.11
Oligohydramnios	5	8	0.01
Diabetes mellitus	2	4	0.02
Iron deficiency anemia	1	2	-0.23

As per Table 3 All the cases of PIH with IUGR showed abnormal doppler findings. Survivability increased as early induction or LSCS was done on emergency basis, and IUGR fetuses were admitted in NICU in both PIH and diabetes cases. LSCS was done in all the cases of oligohydramnios as there was very less or almost absent liquor. Which showed the positive correlation. Only two cases of iron deficiency anemia had low apgar score, and both showed abnormal Doppler findings. Spontaneous labour 2 fetuses had low apgar score after spontaneous delivery.

As per Table 4 around 43% cases had abnormal umbilical artery, in these cases early intervention was done, and

fetal survivability was 65%. Around 67% of fetuses with absent or reversal of diastolic flow were IUD. In cases of Middle cerebral artery with peak systolic velocity 38% survived. Around 60% has low apgar score.

**Table 4: Doppler findings of abnormal umbilical artery and fetal outcomes.**

Doppler findings	Fetal outcome	
	Fetal survival	Low apgar score
AUA with end diastolic velocity	23	11
Absent end diastolic flow	32	12
Reversal of end diastolic flow	0	21
MCA with peak systolic velocity	20	58

## DISCUSSION

In the present study the role of doppler in high-risk pregnancies was evaluated. The predictive value of doppler findings in various cases of high-risk pregnancies was studied, and its importance in management of fetal outcome was determined. In our study of high-risk pregnancy cases, there were 56 cases of IUGR fetuses. PIH was found to be most common risk factor. This is like the findings of a recent review which concludes that hypertensive disease of pregnancy is one of the leading causes of maternal mortality worldwide.<sup>5</sup> In our study, out of 56 IUGR cases, 88% of cases had abnormal doppler findings. This is like the findings of the study of Northern regional health authority coordinating group, which says that 36% of IUD of normally formed singleton fetuses are associated with IUGR.<sup>6</sup> Thus, we can even say that it is very important to carry out doppler study of all IUGR cases to find out the final fetal outcome. Kramer and Weiner had concluded that all IUGR cases should be followed up with doppler velocimetry as soon as possible.<sup>7</sup> A study carried out by Bhatt et al, shows that, out of 100 cases of PIH, 60% of cases had IUGR. This is also supported by the present study as 48% of PIH cases had IUGR.<sup>8</sup> Similarly, a study conducted by Casey et al, suggests that, out of 147 cases of oligohydramnios, 26% had IUGR.<sup>9</sup> Steer had found in a study of maternal hemoglobin and birth weight that severe anemia is associated with the birth of small babies.<sup>10</sup> Severe maternal anemia was associated with low birth weight, higher induction rates, operative delivery, and fetal death.<sup>11,12</sup> Furthermore, in cases of anemia, Doppler does not give any significant parameters which can help in the improvement of fetal outcome.<sup>12</sup> Reed et al, concluded that IUGR is associated with abnormalities in fetal circulation. These abnormalities are best evaluated with umbilical artery and venous study. Doppler ultrasound, particularly, of umbilical artery has been useful in fetus at risk for growth restriction.<sup>3</sup> Furthermore, absence or reversal of flow in umbilical artery had bad fetal outcome and in the form of perinatal

death. Wenstrom et al, concluded that absent end diastolic flow in umbilical artery after 20 weeks of gestation may be associated with varying maternal and fetal abnormalities, and management should be individualized for that.<sup>13</sup> In the present study, 15 cases had a persistent diastolic notch in uterine artery with increased pulsatility index. Out of these 15, 14 cases had adverse perinatal outcome. Ochi et al, found that elevated PI and the presence of diastolic notch in the uterine artery flow velocity are indicators of increased uterine arterial resistance and impaired uterine circulation.<sup>14</sup>

## CONCLUSION

Doppler analysis is a very reliable criterion to assess the fetus in the cases of PIH with IUGR and can help clinician take verdicts regarding early intervention. Umbilical artery doppler is a very good parameter for fetal surveillance. Thus, doppler ultrasound makes it possible to differentiate between a compensated and decompensated placental insufficiency. Further studies are needed to assess further predictive value of doppler ultrasound and create clinical protocols in IUGR cases with the help of doppler findings in high-risk pregnancies.

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