

A Retrospective Study on the Use of Colour Doppler Ultrasound in High-Risk Pregnancies

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Abstract

Background: High-risk pregnancy is linked to a number of negative perinatal outcomes. Doppler ultrasound is a non-invasive approach to examine foetal and mother blood flow and direct therapeutic treatment.

Objective: The goal of this study is to better understand how Color Doppler Ultrasonography can be used to manage high-risk pregnancies.

Methods: The Department of Radiology conducted a retrospective record-based study. In the study, records of antenatal women between the ages of 20 and 30 who had singleton pregnancies lasting from 26 weeks to term and had one or more high-risk characteristics were included. The risk factors taken into account include diabetes, anaemia, oligohydramnios, and pregnancy-induced hypertension (PIH). The umbilical artery underwent a Doppler investigation. The analytical programme utilised was Epi-info 7.

Results: A total of 140 cases were examined. The age range of 20 to 25 years was the one in which high-risk pregnancies were most prevalent. With 50% of cases, PIH was the most prevalent high-risk factor in pregnancy. 40 cases out of 140 high-risk pregnancies had intrauterine growth restriction (IUGR). Umbilical artery results were abnormal in 43% of patients. In high-risk pregnancies, colour doppler can be the most useful tool for monitoring the foetus. The most significant benefit is that it directs early intervention and enhances foetal outcome.

Keywords: High Risk Pregnancy, Color Doppler, IUGR, Preterm, Perinatal Outcome, PIH.

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Introduction

One could argue that a woman's pregnancy is the most attractive time of her life. Throughout the course of the pregnancy, the pregnancy is regularly monitored using clinical examinations, laboratory investigations, and radiographic examinations. Doppler ultrasound is used in obstetrics to examine blood flow and evaluate foetal inaccessibility. A non-invasive way for obtaining a qualitative and quantitative evaluation of maternal and

foetal circulation has been made possible by the development of Doppler ultrasonographic technology [1]. Doppler velocimetry of the umbilical artery in unselected and low-risk pregnancies is not advised, according to research [2]. Doppler technology has made it feasible to examine foetal circulation non-invasively since aberrant foetal circulation is thought to have a significant role in foetal growth limitation, both as a cause and an indicator

[3]. Gestational hypertension or pregnancy-induced hypertension (PIH) are two of the main causes of high-risk pregnancies [4]. Oligohydramnios can occur on its own or in conjunction with other diseases. Anemia and diabetes also have a lot of harmful effects on foetuses and mothers [5]. Given the aforementioned information, the current study's objectives were to assess the value of a Doppler investigation in high-risk pregnancies and to compare the Doppler results to clinical findings in high-risk pregnant women.

Material and Methods

Study Design: Retrospective record-based Study

Study Settings: Department of Radiology of Tertiary care hospital.

Study Duration: 1 year

Study Population: Antenatal women who attended the OPD during the study period.

Sample Size: 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.

Results

Table 1: High-Risk Factor Incidences among Study Participants (N=140)

Conditions	Number (%)
Pregnancy Induced Hypertension (PIH)	70 (50)
Oligohydramnios	28 (20)
Diabetes Mellitus	26 (18)
Iron Deficiency Anemia	16 (12)

Women were separated into two age groups, 20–25 years (n=60) and 26–30 years (n=80), as shown in table 1. PIH was shown to have the highest incidence of high-risk conditions, occurring in 50% of women, followed by oligohydramnios in 20% of women. Diabetes mellitus prevalence was 14.2%, while anaemia was 7%. Thus, the most prevalent condition among research participants was PIH.

Exclusion Criteria: Those who didn't give consent

Ethical Consideration: The study was approved by Institutional Ethics Committee.

Consent Type: Written Informed consent

Methodology

Records of the Patients were gathered from the prenatal ward and OPD registries. Age, last menstrual date, specifics of obstetric history, and underlying risk factors were documented. The esaotae AU3 colour Doppler machine with 3.5 MHz curvilinear probe and colour and spectral Doppler was used to record all patients. The umbilical artery underwent a Doppler investigation. The umbilical arteries' resistive index, pulsatility index (PI), and systolic/diastolic ratio (S/D) were measured. A thorough USG study was conducted, measuring the femoral length, biparietal diameter, abdominal circumference, liquor, and anticipated foetal weight. According to previous Doppler results, the required patients underwent a Doppler study at the seventh or fifteenth day.

Statistical Analysis

The software Epi-info 7 was used to further analyse the recorded observations after storing them in Excel sheets. They were described using percentages and proportions. The association between foetal outcomes and high-risk conditions was ascertained using Pearson's correlation.

Table 2: IUGR cases in high-risk circumstances 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

According to Table 2, 40% of cases (N=56) led to IUGR as a result of several high-risk factors. The majority of IUGR cases (42%) are found in women with PIH as a high-risk factor. Oligohydramnios, which caused 13 cases of IUGR and 10 cases of diabetes, came next. As a result, it can be seen that PIH, oligohydramnios, and diabetes are more frequently linked to IUGR.

Table 3: Doppler results and foetal outcome in high-risk situations: a correlation

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

r- correlation coefficient

According to table 3, all of the PIH cases with IUGR displayed aberrant Doppler findings. Early induction or LSCS performed on an emergency basis, together with the admission of IUGR foetuses to the NICU in both PIH and diabetic instances, boosted survivability. As there was little to no alcohol, LSCS was performed in every case of oligohydramnios. This demonstrated the strong link. There were only two instances of iron deficiency anaemia with low apgar scores, and both had unusual Doppler results. After spontaneous delivery, the two foetuses from spontaneous labour had low apgar scores.

Table 4: Abnormal Umbilical Artery Doppler Findings and Fetal Results

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

According to table 4, 43% of cases had aberrant umbilical arteries. These instances received early care, and the foetal survival rate was 65%. IUDs were present in about 67% of foetuses with missing or reversed diastolic flow. 38% of patients with middle cerebral artery strokes at their highest systolic velocity survived. 60% or so have low apgar scores.

Discussion

The function of the Doppler in high-risk pregnancies was assessed in the current

study. Doppler results' predictive power in several high-risk pregnancies was investigated, and their significance in foetal outcome management was established. There were 56 IUGR foetuses in the high-risk pregnancy cases we examined. The most frequent risk factor was discovered to be PIH. This is consistent with a recent review's conclusion that one of the main causes of maternal death worldwide is hypertensive illness of pregnancy [5]. In our study, 56 cases with IUGR were examined, and 88% of those cases exhibited

abnormal Doppler results. This is similar to the findings of the Northern Regional Health Authority Coordinating Group study, which found that IUGR is linked to 36% of IUD in properly formed singleton fetuses [6]. As a result, we can even state that it is crucial to perform Doppler studies on all IUGR instances in order to determine the final foetal prognosis. All IUGR instances should immediately be followed up with Doppler velocimetry, according to Kramer and Weiner's findings [7]. According to a research by Bhatt *et al.*, 60 percent of the 100 PIH cases developed IUGR. The current study, which found that 48% of PIH cases had IUGR, further supports this [8].

Similar to this, a research by Casey *et al.* indicates that, out of 147 [9]. Steer had discovered that the birth of small babies is related to severe anaemia in a study of maternal haemoglobin and birth weight [10]. Low birth weight, greater induction rates, surgical delivery, and foetal death were all linked to severe maternal anaemia [11,12]. Additionally, Doppler does not provide any meaningful characteristics in anaemic instances that could aid in the improvement of foetal outcome [12]. According to Reed *et al.*, IUGR is linked to irregularities in foetal circulation. The umbilical artery and venous investigation is the most effective way to assess these anomalies. Particularly in fetuses at risk for growth restriction, doppler ultrasonography of the umbilical artery has been helpful [3].

Additionally, perinatal death resulted from the lack or reversal of umbilical artery flow, which had a negative impact on foetal outcomes. According to Wenstrom *et al.*, therapy should be tailored for each individual case because the absence of end diastolic flow in the umbilical artery after 20 weeks of gestation may be related to many maternal and foetal problems [13]. In the current investigation, there were 15 cases where the uterine artery showed a prolonged diastolic notch and an elevated pulsatility index. These 15 instances

included 14 with poor perinatal outcomes. According to Ochi *et al.*, raised PI and the existence of a diastolic notch in the flow velocity of the uterine artery are signs of higher uterine arterial resistance and poorer uterine circulation [14].

Conclusions

Doppler analysis is a very trustworthy standard for evaluating the foetus in PIH with IUGR instances, and it can aid clinicians in making decisions about early intervention. Doppler of the umbilical artery is an excellent measure for monitoring the foetus. So it is possible to distinguish between a compensated and decompensated placental insufficiency using Doppler ultrasound. Additional research is required to evaluate the Doppler ultrasound's prognostic utility in high-risk pregnancies and to develop management procedures for IUGR cases using Doppler data.

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