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Original Research Article

Comparative study of fetal doppler versus non stress test as predictor of perinataloutcome in high risk pregnancy between 36 to 42 weeks

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ABSTRACT

Background: Pregnancy is a unique physiologically event in a women's life. The main aim of the study was to compare the efficacy of the Doppler velocimetry versus non stress test in relation to perinatal outcome in high risk pregnancies between 36 to 42 weeks.
Materials and Methods: This comparative prospective study was carried out on 200 antenatal patients between 36-42 weeks of pregnancy in Department of Obstetrics & Gynaecology Smt Kashibai Navle Medical College and Hospital a tertiary care center from December 2016 to July 2018.
Results: All cases were divided into four groups based on NST and Doppler velocimetry of umbilical artery. Abnormal Doppler studies were found in 12% women. 14% had abnormal NST. Apgar score < 7 at 5 minutes were in 19 fetuses, out of these 15 had abnormal Doppler velocimetry. Average birth weight was low in Group D (1.2kg), where both the tests were abnormal. NICU admissions were 5% in Group A and 100% in Group B and D, where Doppler was abnormal. Mean gestational age was also low in group D. Highest perinatal mortality and neonatal morbidity was seen in women with abnormal umbilical artery Doppler. 6 neonatal deaths occur in Group D and 1 in Group B. In the present study, umbilical artery sensitivity for predicting perinatal morbidity and mortality is 46.1, specificity is 94, PPV is 93 and NPV is 54.
Conclusions: Highest percentage of perinatal complications and perinatal deaths were seen in groups with abnormal Doppler velocimetry. Group D had the worst perinatal outcome.

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1. Introduction

Pregnancy is a unique and physiological event of woman's life. Any pregnancy can turn into a high risk one any time during its course. A high-risk pregnancy is one where the mother or the fetus has increased risk of adverse outcomes compared to uncomplicated pregnancies. It increases the chances of maternal and neonatal mortality and morbidity.

In India about 20-30% of pregnant women constitute high-risk criteria, accounting for 75% of perinatal deaths and 80% of maternal deaths.[1]

Antepartum fetal monitoring is of colossal importance for detection of fetal compromise in high risk pregnancies. Fetal asphyxia is one of the major reason of still birth and neonatal death.[2]

The aim of the antepartum monitoring is to diagnose fetal hypoxia promptly in order to prevent subsequent acidemia and brain damage.

The fetal wellbeing is acessed by various methods like fetal movement assessment, non-stress test, contraction stress test, fetal biophysical profile, modified biophysical profile, vibro-acoustic stimulation and UAD velocimetry.[3] Biochemical methods of fetal monitoring are less favorable than biophysical methods because of the problem of sample collection, accuracy and need for laboratory technology and

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personnel.

NST is the commonly used basis test done for assessment of fetal well-being. It discerns 50% more fetuses with an abnormal fetal heart rate pattern than intermittent auscultation.

The good utero-placental circulation development is essential for achievement of a normal outcome of fetus and mother.[1] Fetal-maternal Doppler assessment has been shown to be the gold standard to access placental development and function.

Doppler ultrasound reflects downstream impedance. It is based on physical principal of Doppler Effect.[2–5] It accurately evaluates uteroplacental function. There is significant reduction in perinatal mortality when UAD is included in the treatment of high risk pregnancy.[6]

The majority of fetuses with acidemia can be identified with the arterial and venous doppler testing (sensitivity 70-90% and specificity 70-80%).[6–8]

The aim of the was to study two different aspects of fetal monitoring the NST and Doppler Velocimetry for monitoring high risk pregnancies with probable placental cause of pathology and to assess the perinatal outcomes.

This study was done to find out the comparative usefulness of Doppler and NST in the management of high risk pregnancies and subsequent correlation with perinatal outcome.

2. Materials and Methods

The Department of Obstetrics and Gynecology, Smt Kashibai Nave Medical College and Hospital, a tertiary care facility, conducted this comparative study on 200 pregnant women between 36 and 42 weeks of pregnancy in December 2016 - January 2018. Pregnant women with high-risk singleton pregnancies except multiple gestations, cardiovascular illness, essential hypertension, and congenital defects in the foetus were included in the study.

After ANC check up and blood reports, colour Doppler and NST was done in all women. Using the Biosysfetal monitor (BFM-800), NST was performed. NST was interpreted according to American college of Obstetricians guidelines.

Fetal colour Doppler was done on a Doppler machine having a biconvex abdominal probe of 3.5 MHz frequency, Toshiba machine. Fetal umbilical artery was scanned. Resistance index and Systolic to diastolic ratio of umbilical artery, called the pulsatility index were calculated. Doppler study were considered abnormal when S/D ratio of umbilical artery is >3. PI is >0.99 and RI is >0.7

According to their NST and Doppler findings all foetuses were categorised in four sub-groups.

Group 1: NST Reassuring + Colour Doppler-normal

Group 2: NST Reassuring + Colour Doppler- fetal hypoxia

Group 3: NST Non Reassuring + Colour Doppler-normal

Group 4: NST Non Reassuring + Colour Doppler-fetal hypoxia

On the basis of maternal outcome, the analysis was done. It includes gestational age at time of delivery and mode of delivery and perinatal outcome - Agar score <7 at 5 min, Birth weight, Perinatal morbidity and mortality and NICU admission.

3. Results

Age distribution varied from 18 to 35 years in the study. Of these 52% were from age group of 21 to 25 yrs. Of these 24.5% of women were from the age group of 26-30 yrs, 16% were in the age group of less than 20 yrs and 7.5% of were in the age group of more than 30 yrs respectively. 52% were primigravida and 48% were multigravida. Most of the pregnancies were terminated at gestational age of 37.4 weeks.

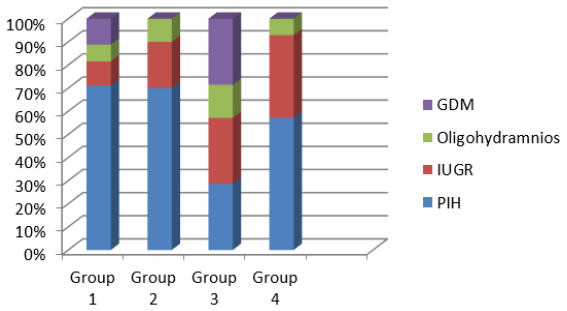


Figure 1: Maternal high risk factors

63.5% of the women were PIH, 13.5% were IUGR, 7.5% were oligohydramnios, 10.5% were GDM, and 5% were Rh-negative pregnancy.(Figure 1)

NST was reactive in 86% and was non-reactive in 14%. Umbilical artery Doppler was insignificant in 88% while 12% had significant changes. Out of 24 women, 7 (29%) displayed reversal of diastolic flow and 17 (71%) displayed absent end diastolic flow.

98 (49%) women underwent caesarean section out of which 23% were emergency and remaining 77% were elective. 23 women had caesarean section for fetal distress, 34 for severe PIH, 19 for failed induction, 14 for IUGR, 7 for severe oligohydramnios.

In the current research, 15 of the 19 babies had Apgar score less than 7 at 5 minutes showed aberrant Doppler velocities. In this study, Group 4 had a low average birth weight where NST was non-reassuring and umbilical artery doppler displayed significant changes. When Doppler was abnormal, NICU admissions were 5% in Group 1 and 100% in Group 2 and 4. Further low mean gestational age in group 4.(Table 1)

Table 1: High risk pregnancy - perinatal outcome.

Neonatal parameters	Group 1 (n=162)NST - R Doppler - N	Group 2(n=10)NST - RDoppler - Abn	Group 3 (n=14)NST - NRDoppler – N	Group 4(n=14)NST - NRDoppler - Abn
Apgar < 7 at 5 minutes	4	8	0	7
Average birth weight	2.6 kg	2 kg	2.3 kg	1.2 kg
NICU admission	8	10	0	14
Gestational age (weeks)	38	37	37	36
Neonatal deaths	0	1	0	7

Table 2: Sensitivity and specificity of umbilical artery Doppler.

	TP	TN	FP	FN	Sensitivity	Specificity	PPV	NPV
Umbilical Artery	24	40	2	32	43%	95.2%	92.3%	56%

3.1. Infant mortality in high risk Pregnancy

In the current investigation, women with abnormal Umbilical artery Doppler were shown to have the greatest rates of perinatal mortality and morbidity. When NST and Doppler parameters were abnormal i.e. Group 4 experienced 6 newborn fatalities while Group 2 experienced 1.

Prematurity, respiratory distress syndrome and sepsis were the three main causes of infant fatalities.

The current study found that the umbilical artery was 43% sensitive, 95.2% specific, 92.3% positive predictive and 56% negative predictive for perinatal morbidity and mortality. (Table 2)

4. Discussion

High-risk expectant mothers require a highly accurate, specific, non-invasive diagnostic test that can be used extensively.

Out of 200 women in our study, 52% were between the ages of 21 and 25. The early marriage age and early career start for obstetricians in our nation may be the cause of this. This finding closely resembles with Malikarjunappa et al[9] and Nagar T et al.[10]

56% of the women were first-time mothers. This is comparable to the study of Verma U.[11] Most of the pregnancies were terminated at gestational age of 37.4 weeks which correspondence with Verma U (37.4)[11] study. But in the study of Deshmukh A et al the mean age of termination was 34.4.[12]

The major risk factor was Pregancy induced hypertension was (64%) and then IUGR (14%) which is comparable to Srivastava et Al.[13]

12% of the women in the current study exhibited a doppler aberration, which is consistent with the investigations conducted by Choudhury et al (7%).[14]

The rate of caesarean section in present study was 49% which is lower than the studies of Young Byun JI et al.[15] 23% of women had emergency caesarean section because of foetal distress and severe PIH. This correlates with results of Choudhury et al (23%).[14]

Onset of labour was spontaneous in 44% in NST group and 39% in Colour Doppler group.54% of the patients in the NST group were induced of which 16% delivered vaginally. In the Color Doppler group 57% of the cases were induced of which 36% delivered vaginally. If identified early, and terminated at right time these foetuses experienced less distress, which yielded a lower caesarean delivery rate.

In this study, perinatal mortality was 4% while study of Choudhury et al showed 3%.[14] According to our research, the poorest perinatal outcome was related with an abnormal Doppler followed by non reactive NST. Initially increased impedance to flow in the umbilical artery may progress to absent and then reversed end diastolic flow. This negative progression correlates with hypoxia, acidosis, and fetal death. 8% of the women had absent end-diastolic flow, which is consistent with studies by Prasad G V[16] and Manikyrao.[17] 4% displayed reversed end diastolic flow. There was no perinatal mortality in 1^{st} n 3^{rd} group. 4^{th} group showed 5 more perinatal deaths than Group 2. This result was in line with the findings of Gomathi V et al study.[18]

Umbilical artery Doppler in the current study group showed specificity of 95.2% and PPV of 92.3% in predicting unfavourable perinatal outcome. This is consistent with research by Khanduri et al[19] (specificity: 94.4%, PPV: 96.3%) and Malik et al[20] (specificity: 80%, PPV: 96.6%).

The mean birth weight was 2.4 kg, which is consistent with the results of Sharma U et al.[21] Early pregnancy termination due to foetal interest, doppler anomalies were linked to low birth weight in neonates. In our investigation, a severe PIH omen with REDF in the umbilical artery doppler had the lowest birth weight, which was 1.13 kg.

Because of ongoing foetal monitoring and prompt intervention, the majority of the newborns had good Apgar scores. The current study found that 12% of neonates were admitted to the NICU, which is comparable to the study by Choudhury et al. Preterm birth, low birth weight, and respiratory distress were the reasons for NICU hospitalisation.

5. Conclusion

NST was introduced with the aim of reducing perinatal mortality and morbidity. It is most widely used test. Normal NST signifies normal fetal condition. It is important for foetal monitoring in underdeveloped nations like India since it is simple to do and is cost-effective though it is inadequate to preclude an acute asphyxial event.

Doppler represents uteroplacental function. Introduction of Doppler velocimetry as a primary screening test must balance any advantages against its necessary training and associated costs. Umbilical artery Doppler abnormalities represent the negative progression from fetal adaptation to failure. Doppler assessment, compared with an NST, identified a higher proportion of patients with early placental compromise which gives lead time to intervene and reduce risks of fetal death with the hazards of preterm birth.

6. Limitation of the Study

In the study only Umbilical artery Doppler assessment was done. Other parameters like uterine artery Doppler, middle cerebral artery Doppler and cerebroplacental index were not taken into consideration. There is an absolute need for larger studies designed to correlate all the above Doppler parameters together and also at earlier gestational age.

7. Source of Funding

None.

8. Conflict of Interest

None.

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