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## ORIGINAL RESEARCH

# Role of foetal doppler and non-stress test in assessing perinatal outcome in patients with pre-eclampsia

**[1]Dr. Parul Sharma, [2]Dr. Vanshika Gupta, [3]Dr. Gokul Sharma, [4]Kamakshi Mam, [5]Dr. Saagar Anand, [6]Dr. Amita Gupta, [7]Dr. Mehak Khazanchi**

[1,2,3,4,5,7]Resident, [6]Professor & HOD, Department of Obstetrics and Gynaecology, GMC, Jammu, Jammu and Kashmir, India

**Corresponding Author**
Dr. Kamakshi Mam
Resident, Department of Obstetrics and Gynaecology, GMC, Jammu, Jammu and Kashmir, India

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**Abstract**

**Objective:** To study the perinatal outcome in pregnancy with pre-eclampsia by comparative analysis of Foetal colour Doppler and non-stress test.

**Material & Methods**: 200 prenatal patients with pregnancies lasting longer than 34 weeks participated in this comparative study at the Government Medical College of Jammu. After performing normal examinations and investigations, colour Doppler and a non-stress test were administered to all patients.

**Result**: In our study, it was discovered that 64% of the pre-eclampsia group had abnormal NST and 36% had normal NST. In the control group, 82% of the NSTs were normal, while 18% were abnormal. In the Doppler investigation, 52% of patients showed abnormal findings that were suggestive of foetal hypoxia, while 48% of cases in the pre-eclampsia group had normal Doppler findings and 96% of cases in the control group had normal findings. When comparing NST and colour Doppler, it was discovered that, in cases when both techniques were aberrant, Doppler revealed alterations significantly earlier than NST, giving a lead time of up to 8 days on average.

**Conclusion:** Doppler shows chronic hypoxic alterations while NST can detect acute events in the presence or absence of chronic hypoxia, therefore we concluded that Doppler is useful in identifying foetal impairment earlier than NST, giving a lead time that is significant in managing preterm high-risk pregnancies. The poorest perinatal outcome is related with an abnormal NST that follows an abnormal Doppler. NST is still valued for its simplicity, affordability, and short training periods. Doppler, on the other hand, needs complex tools as well as operator expertise and experience.

**Keywords:** NST (non-stress test); Doppler; FHR (foetal heart rate); BPP (Biophysical profile); MBPP (modified biophysical profile)

## Introduction

Every woman who is thinking about having children hopes that her pregnancy will result in a healthy child who will reach their fullest physical and intellectual potential. A variety of biophysical techniques are used to evaluate the health of the foetus. But compared to biophysical methods, biochemical methods of foetal monitoring are less advantageous due to sample collection issues, accuracy issues, and the necessity for laboratory technology and manpower. The most typical application of non-stress testing (NST) is for antepartum

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assessment of foetal status. Nearly twice as many foetuses can be detected using this simple, non-invasive, straightforward to perform, and interpret approach as compared to intermittent auscultation of foetus heart rate [1].

The Doppler Effect, which describes how the frequency of a sound wave changes as it is reflected from a moving object and is proportionate to the velocity of the moving object, provides the basis for the use of Doppler ultrasonography for the assessment of the foetal circulation [2]. It is a non-invasive instrument that has been effective in assessing the hemodynamics of the mother and foetus. Antepartum monitoring's goal is to identify foetal hypoxia as early as possible in order to stop eventual acidemia and brain damage. A significant contributing factor to stillbirth and neonatal death is antepartum foetal asphyxia [3]. Thus, the current study's objective is to investigate foetal monitoring using a non-stress test and foetal colour Doppler in individuals with pre-eclampsia.

**Materials and methods**

200 prenatal patients with pregnancies lasting longer than 34 weeks participated in this comparative study at the Government Medical College in Jammu. After performing normal examinations and investigations, colour Doppler and a non-stress test were administered to all patients. NST was carried out with the help of a Biosys foetal monitor (BFM-800). The test lasted for 20 minutes. To prevent compression over the venacava and the supine hypotension syndrome, the patients were positioned in a semi-position.

When two or more clearly documented accelerations of the foetal heart rate from baseline to baseline lasting at least 15 seconds were observed over the course of 20 minutes, the NST was considered reactive. After the initial 20 minutes of observation, if no spontaneous movement of the foetus took place, the test was extended for another 20 minutes, during which external manipulation was used to elicit movement. Tests were deemed non-reactive if no acceleration was discovered after 40 minutes [3,4]. Four elements of the foetal heart rate were tracked during the interpretation of the NST: baseline foetal heart rate, foetal heart rate variability, accelerations present or absent, and deceleration [3-5]. On a Toshiba colour Doppler equipment with a 3.5 MHz biconvex abdominal probe, foetal imaging was done.

The following vessels were scanned: foetal umbilical artery, middle cerebral artery, and thoracic aorta. The following indices were calculated:

RI = S-D/S for the resistance index.

When a Doppler examination was deemed abnormal. I. -RI of the foetal thoracic artery and umbilical artery > 2SD for gestational age [4]. II. Middle cerebral artery RI in the fifth percentile for gestational age. III.-The umblical artery's end diastolic flow, whether it is present or absent, or whether it is reversed. IV. -The middle cerebral artery has a brain-sparing effect.

**Results**

40% of pre-eclampsia instances in primigravida and 60% of pre-eclampsia cases in multigravida (Table 1). According to the study, the majority of pre-eclampsia instances (40%) occurred in people between the ages of 20 and 25. In the pre-eclampsia group, the average gestational period was 37.34 weeks, with 48% of pregnancies falling between 34 and 37 weeks and 44% between 38 and 40 weeks.

In our investigation, it was discovered that while 36% of the pre-eclampsia group's NST was normal, 64% was aberrant. In the control group, 82% of the NSTs were normal, while 18% were abnormal. In the Doppler investigation, 48% of cases in the pre-eclampsia group had normal Doppler results, while 96% of cases in the control group had normal results. 52% of the cases exhibited aberrant findings that were suggestive of foetal hypoxia.

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All foetuses were categorised in four sub-groups according to their NST and Doppler findings

1) Group A – NST-Reassuring + Colour Doppler -normal 2) Group B– NST-Non Reassuring + Colour Doppler -normal 3) Group C– NST-Reassuring + Colour Doppler –foetal hypoxia 4) Group D– NST- Non Reassuring + Colour Doppler –foetal hypoxia

When compared to the control group, it was found that the pre-eclampsia group's Apgar scores at 1 and 5 minutes were lower. The pre-eclampsia group's mean Apgar score at 1 minute was 5.34, while the control groups was 7.56. The pre-eclampsia group's mean Apgar at 5 minutes was 7.14 while it was 8.9 for the control group. (P value for Group A vs. D = 0.945) (Table 2).

The most percentage of NICU admissions in group D (75%), as opposed to merely 15.5% in group A, 23.07% in group B, and 60% in group C, occurred when both NST and Doppler were abnormal. In the pre-eclampsia group, both group C and group D admissions to the NICU were 100%. In total, 5 people died in the pre-eclampsia group, compared to 1 in the control group. P values for Group A Vs D were 0.0012 and 0.2216, respectively (Table 3).

**Table 1: Maternal Characteristics**

| Maternal Characteristics | Control (n=100) | Pre-eclampsia (n=100) |
|---|---|---|
| Primiparity | 44 (44%) | 60 (60%) |
| Multiparity | 56 (56%) | 40 (40%) |
| Maternal Age (years) | 26.8 | 28.5 |
| Gestational Age (weeks) | 37.8 | 37.4 |

**Table 2: Mean Apgar Score in Relation to Non-stress Test and Color Doppler**

| Sub group | Pre-eclampsia | | Control | |
|---|---|---|---|---|
| | At 1 min | At 5 min | At 1 min | At 5 min |
| Group-A: NST- reassuring Colour Doppler- normal (26) | 6.6 | 8.1 | 7.9 | 9 |
| Group-B: NST-non-reassuring Colour Doppler-normal (24) | 5.2 | 6.7 | 6.6 | 8.3 |
| Group-C: NST-reassuring Colour Doppler foetal hypoxia (10) | 5.8 | 7.8 | 4 | 6 |
| Group-D: NST-Non- reassuring Colour Doppler Foetal Hypoxia (40) | 4 | 5.2 | 2 | 0 |

**Table 3: Mean Apgar Score (5 min.), NICU Admission and Perinatal Mortality in Relation to NST and Color Doppler**

| Sub group | Pre-eclampsia | | | Control | | |
|---|---|---|---|---|---|---|
| | At 1 min | NICU Admissions | Perinatal deaths | At 1 min | NICU admissions | Perinatal deaths |
| Group-A: NST-reassuring Colour Doppler- normal (26) | 8.1 | 2 -15.5% | | 9 | 2 -5% | |
| Group-B: NST-non-reassuring Colour Doppler-normal (24) | 6.7 | 3 -23.07% | | 8.3 | 2 -25% | |

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| | | | | | | |
|---|---|---|---|---|---|---|
| Group-C: NST-reassuring Colour Doppler foetal hypoxia (10) | 7.8 | 3 -60% | 1 | 6 | 1 -100% | 0 |
| Group-D: NST-Non-reassuring Colour Doppler Foetal Hypoxia (40) | 5.2 | 15 -75% | 4 | 0 | 1 -100% | 1 |

**Table 4: Sensitivity, specificity, positive predictive value and negative predictive value of NST and Colour Doppler in Prediction of poor perinatal outcome.**

| | Non-Stress test (%) | Colour Doppler (%) |
|---|---|---|
| Sensitivity | 76 | 72.4 |
| Specificity | 60 | 80 |
| Positive Predictive Value | 55.8 | 84 |
| Negative Predictive Value | 62.5 | 68 |

## Discussion

A reliable sign of foetal health and the absence of acidosis is FHR responsiveness, whether it is spontaneous or obtained with VAS (vibroacoustic stimulation). For pregnant women between 24 and 32 weeks, the definition of reactivity is amended, and NST is considered as reactive if the peak of acceleration reaches at least 10 beats per minute for 10 seconds [5]. The parameters that need to be assessed for the NST are [3-5]. - i. Baseline FHR ii. FHR Variability iii. Accelerations present or absent iv. Decelerations are present or absent.

NST has a false-negative rate of 3.2/1000 [1]. The MBPP (Modified Bio-Physical Profile-NST with VAS and Amniotic Fluid Volume) test is a great way to assess the health of the foetus [6]. Ott [7] found that the combination of NST and MCA/UA PI was an excellent predictor of perinatal outcome after comparing the single Doppler metric MCA/UA S/D ratio with NST to forecast neonatal deterioration in a larger population of 447 patients. When comparing NST with colour Doppler, it was discovered that, in cases where both techniques were aberrant, Doppler revealed alterations significantly earlier than NST, with a lead time of up to 8 days on average [6,8]. This lead time is crucial because preterm foetuses can receive steroid prophylaxis during this time or be monitored to help them reach a little more pulmonary maturity. Babies can also be delivered at this time.

According to statistical analysis, the rate of caesarean sections was substantially greater ($p=0.011$) when group D was compared to group A than it was when group D was compared to group B ($p=0.357$) (Table 3). When the chances of a neonate surviving were low, group D patients had their caesarean procedure delayed. In the Padmagirison et al. [8] study, group D, which had both abnormal tests, had a caesarean delivery rate of 56.2%.

## Conclusion

Doppler shows chronic hypoxic alterations but NST can identify acute events in the presence or absence of chronic hypoxia, which gives a lead time that is crucial in managing preterm high risk pregnancies, according to our findings [5, 6, 8]. The worst perinatal outcome is associated with an aberrant NST that follows an abnormal Doppler [9,10]. NST is still valued for its simplicity, affordability, and short training periods. However, Doppler demands specialised tools, operational expertise, and experience.

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**References**


1. Arias F, Daftary SN, Bhide AG. Practical Guide to High- Risk pregnancy &delivery: A South Asian Perspective. (3rd edn); 2011. p. 16-29.
2. Bhatt AB, Tank PD, Barmade KB, Damania KR. Abnormal Doppler flow velocimetry in growth retarded foetuses as a predictor of nectrotizing enterocolitis. J Postgraduate Medicine 2003; 48(3): 145-148.
3. American college of Obstetricians & Gynaecologists ACOG Practice Bulletin. Antepartum foetal surveillance. Int J Gynecol Obstet 1999; 68(2): 175-186.
4. Preboth M. ACOG Guidelines on antepartum Foetal Surveillance. Am Fam Physician 2000; 62(5): 1184-1188.
5. ACOG. Practice Bulletin No 145. Antepartum Foetal Surveillance Obstet Gynaecol 2014;124(1): 182-192.
6. Baschat AA. Integrated foetal testing in growth retardation: continuous multi- vessel Doppler & Biophysical Profile. USG Obstet Gynaecol 2003; 21: 1-8.
7. Ott WJ. Comparison of NST with centralization of blood flow for the prediction of neonatal compromise. USG Obstet Gynaecol. 1999; 14(1): 38-41.
8. Padmagirison R, Rai L. Fetal Doppler versus NST as predictor of adverse perinatal outcome in severe pre-eclampsia and fetal growth restriction. J Obstet Gynecol India 2006; 56(2): 134-138.
9. Arora D, Desai SK, Seth PN. Significance of umbilical artery velocimetry in perinatal outcome of growth retarded foetuses. J Obstet Gynecol India 2005; 55(2): 138-143.
10. Agarwal RK, Goel K, Mehta AJ. Perinatal mortality-A hospital based review. J Obstet Gynaecol India 2000; 50: 49.