

Correlation of Fetal Outcome with Non-Stress Test in High Risk Pregnancy

Neha Singh¹, Kirti Anima Kerketta², Kumari Archana³

Abstract

Aim: To evaluate the efficacy of non-stress test in a high risk pregnancy for fetal outcome and establishing it as an easy, non-invasive technique for antepartum fetal surveillance.

Methods: 155 females booked or unbooked with more than 34 weeks of period of gestation with high risk pregnancies were included with written informed consent.

Result: Non-Stress test has sensitivity of 72%, specificity of 98%, positive predictive value came out to be 95% while negative predictive value of 85.5% in high risk pregnancies after 34 weeks of gestation.

Conclusion: NST is a valuable screening test for detecting fetal compromise in pregnancies that have a poor perinatal outcome. Though rate of operative delivery was high, fetal death rate was lower in population undergoing antepartum testing as compared to general untested population.

Keywords: NST, High risk pregnancy, fetal heart rate, fetal wellbeing.

Introduction:

Women with high risk pregnancy are at risk of delivering an asphyxiated new born which may result from abnormality in the fetal gas exchange leading to hypoxia and acidosis.¹ With timely detection of changes in fetal status and appropriate intervention

can prevent perinatal mortality and morbidity. Non Stress Test (NST) is being extensively used in the cases of high risk pregnancies because of its advantage of being simple, non-invasive, and can be repeated easily.^{2,3,4,5} Gestational age influences acceleration or reactivity of heart rate through autonomic nervous system.⁶ NST involves the use of Doppler detected foetal heart rate acceleration coincident with foetal movements perceived by the mother. The basis of NST is the absence of fetal heart acceleration with fetal movements is associated with fetal hypoxemia.⁷ The present study is to evaluate the role of non-stress test in a high risk pregnancy for fetal outcome, with

1. Consultant Gynaecologist, Navi Mumbai
2. MD, Ob & Gy, Senior Consultant and Unit Head, Dept of Ob & Gy, Bokaro General Hospital, Bokaro Steel City
3. MS, Obstetrics and Gynecology, Senior Consultant, Department of Obstetrics and Gynecology, Bokaro General Hospital
Corresponding author : Dr. Neha Singh

the objective to see if an abnormal Non-Stress test can be used to predict adverse perinatal outcome and to see if Non-Stress test can adequately detect fetal distress at an early stage and thus help in decision making.

Aim and Objective:

1. To evaluate the role of non-stress test, a screening method in management of high risk pregnancies admitted in labor room
2. To study the correlation of non-stress test with fetal outcome
3. To assess the positive and negative predictive value of non-stress test.

Matrerial and Methods

The present study was performed at Bokaro General Hospital, Bokaro Steel City, Jharkhand, India, with approval from the ethical committee. The written informed consent was taken from all the 155 participants with high risk pregnancy after 34 weeks of gestation.

Inclusion criteria-

- Gestational hypertension, IUGR, Pre eclampsia, Anemia, Less fetal movement, Gestational diabetes Postdated pregnancy, Bad obstetric history, Oligohydraminos, polyhydraminos, Antepartum hemorrhage Heart disease, ART/precious pregnancy, Thyroid in pregnancy, IHC, Elderly primi, Teenage pregnancy Rh incompatibility

Exclusion criteria-

- Pregnant women with gestational age <34 weeks or in labor, Eclampsia, Multiple gestation, Fetal congenital anomalies, Intrauterine fetal death

Methodology:

All the females booked or unbooked with more than 34 weeks of period of gestation attending OPD or IPD and fulfilling the criteria will be explained about the test. Tocodyanometer Measures uterine contractions, placed at fundus of uterus without jelly. USB probe measures baby's heartbeat applied with jelly at site where maximum fetal heart sound is heard. When the mother feels the baby kick or move, she presses a button on the event marker probe so we can see how the baby's heartbeat changed while moving. The

test will take about 20 minutes. The whole event is depicted over screen and is graphed over a specialized paper by printer for permanent record.

Parameter of Evaluation:

	Reassuring	Non-reassuring
Baseline fetal heart rate	110-160	Less than 100 More than 160
Beat to beat variability	>5 beats in 20 min	<5 beats in 40-90 min
Acceleration	>2	<2
Deceleration	No deceleration Early deceleration	Variable deceleration Late deceleration
Fetal movement	Present	Absent

Result:

A total of 155 high risk pregnant women after 34 weeks of gestation were studied. The mean age was 27.9 + 4.4 years. The mean gestational age was 39.43 ± 2.34 weeks.

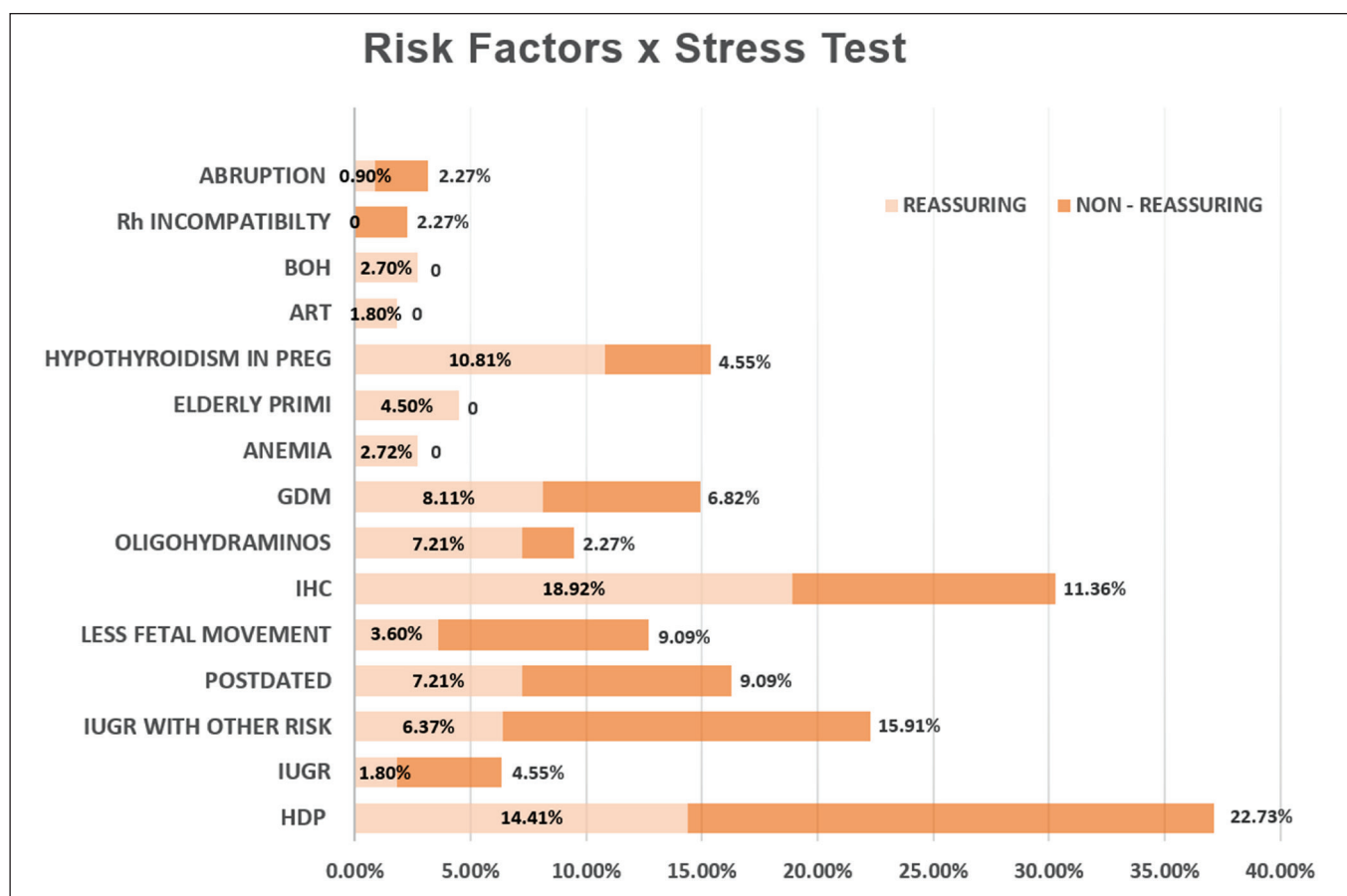
Maximum subjects among study group were primigravida 90 (58.06%). 133 (85.8%) were booked while 22 (14.2%) attended emergency.

Among all the subjects, 109 subjects with single high risk factor, 20% had non-reassuring NST while out of 46 subjects with multiple high risk factors, 47.8 % had non-reassuring NST suggesting abnormal NST increases with an increase in the number of high-risk factors.

Table 1: Correlation Of Number Of High Risk Factors With Result Of Non-Stress Test

	Reassuring NST	Non Reassuring NST	Total
Single High Risk Factor	87 (80%)	22 (20%)	109 (100%)
Multiple High Risk Factors	24 (52.17%)	22 (47.8%)	46 (100%)

Out of 155 subjects, 111(72%) had reassuring NST and 44 (28%) had non-reassuring Non-Stress test. Most common risk factor associated with non-reassuring NST was hypertensive disorders of pregnancy (22.7%) followed by IUGR with and without associated risk (20.5%) and IHC (11.36%), postdated pregnancy and subjects presenting with less fetal movement were 9% each. GDM (6.82%), hypothyroidism (4.5%), abruption placentae (2.2%) and Rh incompatibility (2.2%) respectively.



Graph 1: CORRELATION OF HIGH RISK FACTORS WITH RESULT OF NST

Among 133 subjects with booked status, 98(74%) had reassuring NST result while 35 (26%) had non-reassuring NST findings. Out of 22 subjects with unbooked status, 13 (59%) had reassuring Non-Stress test result while 9 (41%) had non-reassuring NST findings. On comparing Non-Stress test findings according to booking status, statistical significant association ($p < 0.05$) was observed between NST results and booking status indicating higher reassuring results in booked subjects.

About 98% women underwent LSCS and only 2% were delivered vaginally among non-reassuring group. However, 25% of reassuring group were delivered vaginally and 75% underwent LSCS. Statistical significant difference ($p < 0.05$) was observed in relation to different modes of delivery in non-reassuring NST group. Rate of LSCS was 98% and vaginal delivery was (2%)

Table 2: CORRELATION OF MODE OF DELIVERY WITH RESULT OF NON- STRESS TEST

Mode of Delivery	Reassuring (n=111)		Non Reassuring (n=44)	
	Frequency	%	Frequency	%
Vaginal Delivery	28	25%	1	2%
LSCS	83	75%	43	98%
Total	111	100%	44	100%

Chi square test = 14.65, $p = 0.015^*$
(statistical significant difference)

Most common indication of LSCS among non-reassuring group was fetal distress accounting for 44.1% followed by failed IOL (32.5%) and severe preeclampsia (13.9%) while in reassuring group, most common indication for lscs was failed IOL was 36.1% where induction was done for associated high risk and fetal distress occurred in 10.8%,. Severe preeclampsia accounted for 12%.

2.32% subjects with meconium stained liquor had non-reassuring NST where as 2.4% showed reassuring NST.

Table 3: CORRELATION OF COLOR DOPPLER RESULT WITH NON-STRESS TEST

Doppler	Reassuring NST	Non Reassuring NST
Normal Doppler	97 (87%)	34 (77%)
Abnormal Doppler	14 (13%)	10 (23%)
Total	111 (100%)	44 (100%)

Table 4: MEAN AMNIOTIC FLUID INDEX AMONG STUDY GROUP

	Reassuring Mean (SD)	Non Reassuring Mean (SD)	Unpaired 't' test	p value, Significance
AFI	11.36 (2.36)	10.37 (2.41)	t = 2.264	p = 0.025*

Mean amniotic fluid index was 11.36 cm in reassuring group while it was 10.37 cm in non-reassuring group. Significant association was found between non-stress result and amniotic fluid index. ($p < 0.025$)

Neonatal outcome was correlated with result of NST in terms of APGAR at 5 min, NICU admissions, birthweight and meconium staining. All neonates of reassuring group had Apgar score >7 at 5 min while in subjects with non-reassuring NST, 6 (14%) neonates had Apgar score <7 and 38(86%) had APGAR >7 at 5 min.

On correlating birth weight of neonates for gestational age with non-stress test results, there was highly statistical significant association ($p < 0.001$) obtained with SGA having high proportion (45%) of NR NST while LGA had only 2.5% of NR NST. In the study of 111 subjects who belonged to reassuring NST group, 67% were appropriate for gestational age, 16% were small for gestational age (SGA) and 17% were large for gestational age (LGA) whereas among 44 subjects with non-reassuring NST, small size for gestational

age (SGA) were 41%, Appropriate for gestational age (AGA) 48%, LGA -11%. 19% neonates in reassuring Non-Stress test group required NICU admission while 45% neonates in non-reassuring NST were admitted in NICU. Meconium stained liquor was observed in 6% reassuring Non-Stress test and 39% in non-reassuring NST group. Still births were not reported in either group. Meconium stained liquor was seen in 17 neonates. 6 neonates had Apgar <7 at 5 min and fetal distress was found in 19 subjects in non-reassuring NST group. There were 7 neonates with meconium staining in reassuring group who had fetal distress. No still birth in both the groups.

Table 5: PERFORMANCE OF NON-STRESS TEST WITH END RESULT

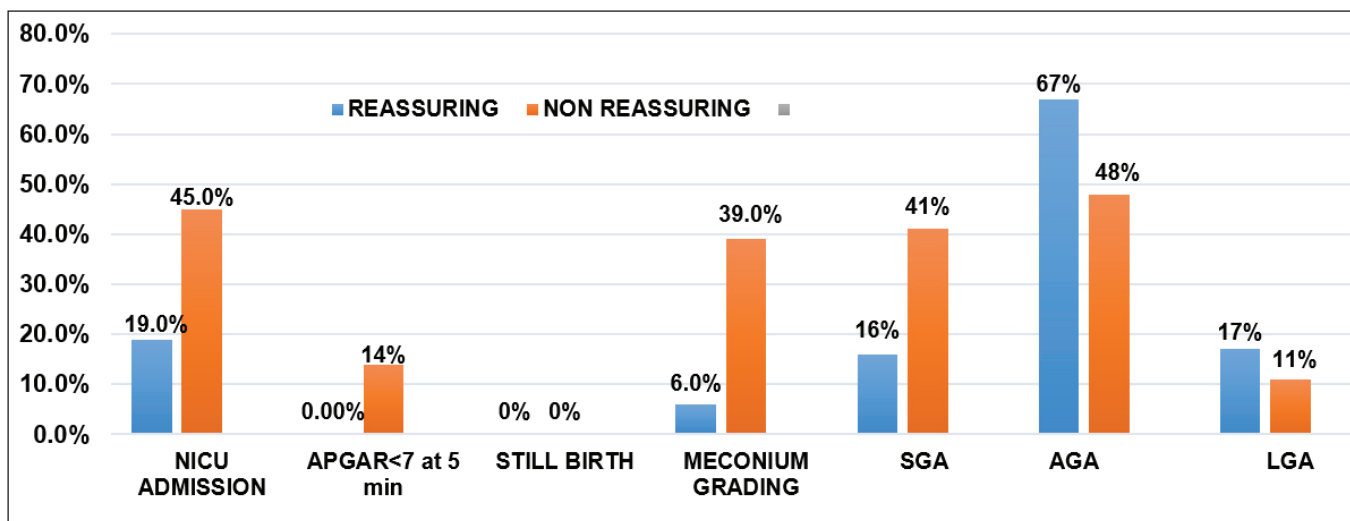
	Sensitivity	Specificity	PPV	NPV
Result of NST	72%	98%	95%	85.5%

Performance of Non-Stress test was correlated with fetal outcome. The study showed Non-Stress test has sensitivity of 72%, specificity of 98%.

The positive predictive value came out to be 95% while negative predictive value of 85.5% Hence, non-stress test can be used as a screening test to identify fetal distress so that early intervention and mode of delivery can be planned.

Discussion:

Antenatal fetal monitoring is a field of emerging importance as still birth still accounts for majority of perinatal mortality. Hence identifying fetuses requiring intervention to prevent death or damage and allowing healthy fetuses go to term there is need of

**Graph 2: CORRELATION OF NEONATAL OUTCOME WITH END RESULT OF NON- STRESS TEST**

fetal surveillance method that is noninvasive, accurate and yield immediate results

This study suggests that presence of multiple high risk factor was associated with non-reassuring NST was also seen in study done by Patange RP et al, where 50% abnormal Non-Stress test was seen in subjects with 3 high risk factors and 10% in group with only 1 high risk factor.

Most prevalent high risk factor with highest percentage of non-reassuring NST was seen in gestational hypertension and pre-eclampsia (hypertensive disorders of pregnancy 23%) followed by IUGR and IUGR associated with other risk factor (20.5%). Subjects presenting with less fetal movement (5%) and postdated pregnancy were 8%. Most common high risk factor in the study by Patange RP et al was overdue pregnancy (60.6%), which was only 8% in present study. This may be attributed to high number of booked cases who were regularly followed up and was planned for delivery by 40 weeks of gestation. Study of Bhutiyani A et al showed PETas second most common high risk factor (18%) and gestational hypertension accounted (n=2) 4.3% while in our study it is 23%, included in hypertensive disorders of pregnancy.

In this study, statistical significant association ($p < 0.05$) was observed between stress test results and booking status indicating higher reassuring results in booked subjects. Common mode of delivery among 44 subjects with non-reassuring NST was LSCS, 43(98%). Only 1(2%) was delivered vaginally and most common indication of LSCS among Non-reassuring NST was fetal distress (44.1%) followed by failed induction of labor (32.5%). Similar to study of Singh S et al, 90% subjects with non-reactive NST underwent LSCS and most common indication was fetal distress, while 10% delivered vaginally. In study of Himabindu P et al, 46% underwent LSCS and most common indication was failed IOL (12%) followed by fetal distress (11%). In reassuring group of present study, 25% were delivered vaginally while 75% underwent LSCS. In study of Singh S et al, 76.7% of antenatal women delivered vaginally and 23.3% of antenatal women delivered with caesarean section in reactive NST group. Most common indication of LSCS in this group was failed IOL (36.1%), IOL done for associated high risk factors. As NST is not a substitute

to clinical judgment, all subjects in this study were further evaluated with ultrasonography for amniotic fluid level and umbilical artery color Doppler.

Among 40 subjects with non-reassuring NST, 10 (25%) had abnormal color Doppler study while 30(75%) had normal color Doppler result. Among reassuring NST group (111), 14(13%) had abnormal Doppler result which was consistent with study conducted by Verma U et al and WJ Ott who concluded that color Doppler in association with NST improves the sensitivity and specificity to detect fetal hypoxia and distress.^{15,16}

Mean amniotic fluid distribution among study group with non-reassuring NST 10.5cm and reassuring NST group had 11.5 cm as mean AFI. There was clinical significance suggesting liquor can affect the fetal condition. In study of Bhutiyani A et al, 10.9% had low liquor in non-reactive group where as 6.5% had low liquor in reactive group and found that Non-Stress test have very highly significant association with quantity of liquor in high risk group as compared to low risk group.

On comparing neonatal birth weight among the two groups, 18(45%) out of 44 were below 2.5 kg which was comparable with studies of Bhutiyani A et al where, 33.3% neonates in high-risk group with non-reassuring NST were below 2.5kg birth weight. In study by Lohana et al, 12 babies were below 2.5kg birth weight, of which 41.67% belonged to non-reassuring NST group.¹⁷ In a study by Bano I et al, 31.8% of the babies with reactive NST had low birth weight where as in this study only 16% were below 2.5 kg in reassuring group.¹⁸

As long term neurological correlation is obtained with 5 min Apgar score hence it is included in this study. Among neonates of non-reassuring NST group in this study, 15% had Apgar <7 at 5 min where as 85% of neonates had Apgar >7 at 5min. Among the reassuring NST group none had Apgar <7 at 5 min as in study conducted by Lohana et al, non-reactive group had 60% neonates with low Apgar scores, 40% had good Apgar score at 5 min i.e. >7. Overall incidence of good Apgar may be observed due good neonatal resuscitation efforts between 1 min and 5 min. Also operative intervention may be attributed to good neonatal Apgar.

On comparison, 49% of neonate required NICU admission among non-reassuring group where as 51% of neonates admitted in NICU among reassuring NST group. This is due to NICU admission for observation in neonates born to high risk mothers like GDM, preterm deliveries and SGA babies. In a study by Bano I et al, 3.6% of the pregnant mothers with reactive NST required NICU admission, whereas 28.5% of the fetus born to pregnant mothers with non-reactive strip required NICU admission. In a study by Lohana et al, 13 babies were shifted to NICU, 69.23% babies had non-reactive strip.

Meconium stained liquor was seen in 64% in non-reassuring NST group and 36% in reassuring group which is comparable to study conducted by Lohana et al, which had meconium stained liquor in 33.33% of non-reactive NST compared to 8.24% of reactive NST. There was no still birth in either group. This may be attributed to early recognition of distress and timely intervention as seen with study of Kelly and Kulkarni who estimated a 44% potential saving among monitoring.¹⁹ Bano I et al also had no perinatal mortality.¹⁸

Correlation of neonatal outcome with result Non-Stress test took into account 4 factors. Meconium staining of liquor was seen in 17 neonates, Apgar <7 at 5 min was seen in 6 and 19 had fetal distress.

Performance of non-stress test was evaluated which showed sensitivity of 72%, specificity of 98%, PPV came out to be 95% and NPV was 85.5%. Similar study was done by Munshi D et al and concluded sensitivity of 71.4%, specificity of 98%, PPV 60%, NPV 77%. This suggests that when NST

is nonreactive, early delivery by either vaginal or caesarean route is indicated. Thus NST results can help in early decision making to achieve optimal maternal and fetal outcome.

The use of NST in monitoring high risk pregnancies may result in an increase in the incidence of operative delivery as seen in our study but it can be effectively used in high risk pregnancies because a reactive NST, can reliably identify a healthy fetus and an abnormal (non-reactive) NST should alert the clinician to consider the possibility of fetal compromise and has to be followed up by other adjunctive tests (Biophysical profile, color Doppler) to help further improve obstetric outcome.

Conclusion:

Non-Stress test can be used as an effective screening method to identify high risk fetuses and segregate the population that is at risk of perinatal mortality and morbidity. Reactive NST is reassuring and indicates fetal wellbeing and non-reactive NST along with other modalities like BPP and color Doppler can be used to identify high risk fetuses. The potential advantage of NST is that, it identifies fetuses at risk and hence early intervention and mode of delivery can be planned. In conclusion, NST is a valuable screening test for detecting fetal compromise in pregnancies that have a poor perinatal outcome. Though rate of operative delivery was high, fetal death rate was lower in population undergoing antepartum testing as compared to general untested population. In cases of non-reactive non-stress tests by proper planning and prompt decision to deliver we could save many babies.

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