

Study of Non-Stress Test as a Screening Tool in Low Risk Pregnancies at Term Gestation

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Abstract

Introduction: Various antepartum surveillance method aim at early detection of fetal distress preventing intrauterine fetal death. Non Stress Test is one such tool used for screening antenatal patients. In this study non stress test is used to screen and monitor fetus of low risk mothers, to detect fetal distress take necessary intervention and correlate fetal outcome with test results.

Materials and Method: This was a prospective longitudinal study conducted in Shalini Tai Meghe hospital and Research Centre, Wanadongiri, Nagpur from august 2019 till August 2020. 180 Antenatal patients with 37 completed weeks in labour and with no high risk factors were included in the study. Non Stress Test was performed on the patients and according to NICE guidelines, the result was interpreted as normal or abnormal.

Results: Out of 180, 130 patients had normal Non-Stress Test and 46 patients had abnormal Non Stress Test. The percentage of normal delivery was 60.4% in normal non stress test group and 23.91% in abnormal non stress test group, where as the percentage of caesarean section was 33.58% in normal non stress test group and 63.04% in abnormal non stress test group. The most common indication for caesarean section in abnormal non stress test group was fetal distress with 68.96%. Meconium stained liquor was present in 73.91% patients with abnormal non stress test, with negative predictive value 72.34%, sensitivity 73.91% and specificity 72.34%. APGAR score < 7 at 5 minutes was present in 34.78% patients with abnormal non stress test group, with negative predictive value 81.36%, sensitivity 34.78% and specificity 97.76%. 18 babies from abnormal non stress test group were admitted in NICU with no perinatal mortality.

Conclusion: Non stress test is a reliable screening tool for detecting high risk fetus in low risk mothers. The probability of adverse outcome like meconium stained liquor, low APGAR score, NISU admission increases with abnormal non stress test.

Keywords: APGAR score, NISU, stress test, liquor and risk fetus.

Introduction

Maternal mortality has been drastically reduced in developing countries and now modern obstetricians are

more focused on maternal as well as fetal wellbeing. Originally, fetus was still deemed a conception result, but today the fetus is deemed another patient, and it often needs as much supervision as mother's well being. Intra partum monitoring of fetal health is one of the main component of contemporary obstetrics education. Approximately 50 % of fetal mortality happens in low risk mothers without obvious cause.⁽¹⁾

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Prof E. H. Hon and Prof. Caldeyro Barcia invented cardiotocogram (CTG) for fetal monitoring ⁽²⁾. In the

western countries, continuous fetal monitoring is being used extensively but due to economic constraints, it is not feasible in most of the developing countries like ours for practicing it. Ingemarsson et al.^[3] has described an alternative, in the form of Admission Test (AT) or Non stress test (NST) which is a short recording of FHR by cardiotocogram and uterine contractions of 15-20 minutes, at the time of admission in labour ward.

Non Stress Test is a non invasive, patient friendly, highly simple to perform and results are easily interpreted. The test detects transient FHR acceleration

associated with fetal movements affecting the cerebral cortex and is caused by physiological and pathological effects on the brain of the fetus.

NST could be used as a screening technique to diagnose preexisting fetal hypoxia, and to schedule early intervention to avoid perinatal adverse outcome. The present research was performed to forecast the perinatal result by conducting NST as an admission test to minimize fetal morbidity and mortality by early diagnosis and intervention

Nice (2007) Classification of FHR trace feature^[4]:

Feature	Baseline	Variability	Deceleration	Acceleration
Reassuring	110-160	≥5	None	Present
Non-reassuring	100-109 161-180	<5 for 40-90min	Typical variable deceleration with over 50% of contraction, occurring for over 90min Single prolonged deceleration for up to 3min	The absence of acceleration with otherwise normal trace is of uncertain significance
Abnormal	<100 >180	<5 for 90min	Either atypical variable decelerations with over 50% of contractions or late decelerations, both for over 30 minutes Single prolonged deceleration for more than 3 minutes	The absence of acceleration with otherwise normal trace is of uncertain significance

Categorise cardiotocography traces as follows:

- **Normal:** All features are reassuring
- **Suspicious:** 1 non-reassuring feature and 2 reassuring features
- **Pathological/abnormal:** –1 abnormal feature or 2 non-reassuring features⁽⁴⁾

Aim of the Study: To study the role of Non Stress Test as a screening tool in management of low risk pregnancies in labor.

Materials and Method

Antenatal patients with 37 completed weeks in labour and with no high risk factors were included in the study. High risk pregnant patients like pre eclampsia, severe anaemia, heart disease, gestational diabetes mellitus, antepartum eclampsia, twins, previous lscs, intrauterine growth restriction were excluded from the study.

Informed written consent were taken from the patients. Detail history, general examination, systemic examination and obstetric examination was done. Routine blood investigations were done.

Non stress test was performed on the patient with patient in supine position. The Doppler transducer was strapped to the abdomen at the location where fetal heart sound was distinctly heard. The tocodynamometer was strapped at the fundus of the uterus. The fetal movement probe was given to the patient to press at the the time of fetal movement. Record was taken for full 20 minutes. Tracings were categorized according to NICE guidelines⁽⁴⁾ as normal, suspicious and abnormal or pathological.

If NST was normal, monitoring was carried out with intermittent auscultation of fetal heart sounds. Repeat NST was done after 3 hours. If NST was suspicious, further extended NST was done for the patient for 40 minutes after following corrective measures like - patient

given left lateral position, oxygen was given, patient was hydrated with I.V fluids. If extended NST was found to be still suspicious continuous monitoring with NST carried out till NST turns out to be normal. If NST turns abnormal, artificial rupture of membranes was attempted and decision for termination of pregnancy by LSCS, or instrumental delivery was taken depending on amount and color of liquor and stage of labour.

Results

Total 180 antenatal patients in first stage of labour were included in the study. Maximum patients were in the age group of 21- 30 years i.e 82.22%. 11.11% patients were more than 35 years of age and 6.66 % patients were 18-20 years of age .51.66 % patients were primigravida and 48.33% were multigravida. Out of 180, 134 (74.4%) patients had normal NST recordings. 46 patients (25.55%) had abnormal NST out of which 26 had suspicious NST and 20 had pathological NST.

Table 1: Correlation of mode of delivery with admission NST

	Normal NST	Abnormal NST	
Ftnd	81(60.4%)	11 (23.91%)	92
Instrumental Delivery	8 (5.9%)	6 (13.04%)	14
Lscs	45 (33.58%)	29 (63.04%)	74
Total	134	46	180

As seen in the table, out of 134 patients with normal NST, 81 patients (60.4%) had full term normal delivery, 8 patients (5.9%) had instrumental delivery and 45 patients (33.58%) had caesarean section. Out of

46 patients with abnormal Non Stress Test, 11 patients (23.91%) had full term normal delivery, 6 patients (13.04%) had instrumental delivery and 29 patients (63.04%) had caesarean section.

Table 2: Indication of LSCS in all types of NST

Indication of LSCS	Normal NST (n=134)	Abnormal NST (n=46)
Fetal Distress	3(6.66%)	20 (68.96%)
Others	42 (93.33%)	9 (31.03%)
Total	45	29

In normal Non Stress Test Group, out of total 45 caesarean sections, 3 patients (6.66%) had caesarean section due to fetal distress. In patients with abnormal

Non Stress Test, out of 29 caesarean sections, 20 patients (68.96%) had caesarean sections for fetal distress.

Table 3: Correlation of NST with Meconium stained liquor

Status of Liquor	Normal NST (n= 134)	Abnormal NST (n=46)	Total (n= 180)
Liquor Clear	121(90.29%)	12 (26.08%)	133(73.88%)
Meconium Stained Liquor	13 (9.70%)	34 (73.91%)	47(26.11%)

As seen from above table, liquor was clear in 121 patient (90.29%) with normal Non Stress Test, where as 13 patients (9.70%) with normal Non Stress Test had meconium stained liquor. Out of 46 patients with abnormal Non Stress Test, clear liquor was present in

13 patients (9.70%) while meconium stained liquor was present in 34 patients (73.91%). Out of total 180 patients 73.88 % patients had clear liquor while 26.11% patients had meconium stained liquor.

Table 4: Correlation of NST with APGAR Score

APGAR Score	Normal NST	Abnormal NST
APGAR>7 AT 1 MIN	128(95.5%)	21(45.65%)
APGAR<7 AT 1 MIN	6(4.47%)	25(54.34%)
APGAR>7 AT 5 MIN	131(97.76%)	30(65.2%)
APGAR<7 AT 5 MIN	3(2.23%)	16(34.78%)

The table depicts the correlation between NST and APGAR score. At 1 minute, APGAR score was equal to or more than 7 in 128 babies (95.5%) and APGAR was less than 7 in 6 babies (4.47%) among patients with normal Non Stress Test. In babies of patients with abnormal Non Stress Test, 21 babies (45.65%) had APGAR at 1 minute, equal to or more than 7 and 25 babies (54.34%) had 1 minute APGAR less than 7. At 5 minutes, 3 babies showed improved APGAR more than 7, in normal NST group. So finally at end of 5 minutes, only 3 babies with low APGAR less than 7 were admitted in neonatal intensive care unit.

In abnormal Non Stress Group, 25 babies (54.34%) had APGAR score less than 7 at 1 minute. After 5 minutes, 9 babies showed improved APGAR of more than 7. So at the end of 5 minutes 16 (34.78%) babies

had APGAR less than 7 and were admitted to neonatal intensive care unit.

Table 5: Correlation of NST with fetal outcome

	Normal NST	Abnormal NST
Admission in NICU	4(2.98%)	18(39.13%)
Neonatal Death	0	0

4 babies (2.98%) were admitted to neonatal intensive care unit from normal Non Stress Test group, out of which 3 babies had low APGAR and 1 baby had good APGAR more than 7. 18 babies (39.13%) from abnormal Non Stress Test group were admitted to neonatal intensive care unit, out of which 16 babies had low APGAR, 2 babies had good APGAR with congenital anomalies. There was no neonatal death.

Performance Characteristics of Non Stress Test:

	Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
APGAR < 7 AT 1MIN	54.34%	95.52%	80.64%	85.90%
APGAR < 7 AT 5MIN	34.78%	97.76%	84.21%	81.36%
MSL	73.91%	90.29%	72.34%	90.97%
NICU Admission	39.13%	97.01%	81.81%	82.27%

Discussion

In our study, total 180 patients were studied. Out 180, 134 patients (74.44%) had normal Non Stress Test while 46 patients (25.55%) had abnormal Non Stress Test. In study conducted on similar subject, by Phelan

et al⁽⁵⁾, 85.4% had reactive Non Stress Test and 14% had nonreactive and 0.6% had unsatisfactory Non Stress Test. In Studies by Shrestha et al⁽⁶⁾ and Panda et al⁽⁷⁾ 10% and 14% had abnormal Non Stress Test respectively.

In this study, 60.4% patients had full term normal

delivery in normal NST group while 23.91% patients had normal delivery in abnormal NST group. 33.58% patients had caesarean section in normal NST group and 63.04% patients had caesarean section in abnormal NST group. This is comparable to study by Eden et al⁽⁸⁾ where, caesarean section rate in reactive group was 23.2%, however in non reactive group caesarean section rate was lower as compared to our study i.e 37.7%.

Meconium stained liquor was found in 9.7% patients with normal Non Stress Test and 73.91% patients with abnormal Non Stress Test. In study done by Lohana et al⁽⁹⁾, in reactive Non Stress Test Group, meconium stained liquor was present in 8.24% of reactive NST group which is comparable to our study while, in non reactive NST group the percentage of meconium stained liquor was 33.33% which is less compared to our study. The variation in gestational age of patients and number of post dated pregnancies can be accountable to the difference. The sensitivity and negative predictive value of the test for meconium stained liquor was 73.91% and 90.97% respectively, which is comparable to study by Bano et al⁽¹⁰⁾ which showed negative predictive value to be 90.9%, and study by Khooshideh et al⁽¹¹⁾ which showed sensitivity of 62%.

APGAR score < 7 at 1 min was present in 4.47% babies of normal Non Stress Group patients and 54.34% babies of abnormal Non Stress group patients. APGAR score < 7 at 5 min was present in 2.23% babies of normal Non stress test group patients and 34.78% babies of abnormal Non Stress Test group patients. This was comparable to study done by Bano et al⁽¹⁰⁾ which had APGAR<7 at 5min to be 3.4% in reactive group and 42.8% in non reactive group.

For APGAR<7 at 5 minutes, the negative predictive value was 81.36% and specificity was 97.76% comparable to study done by Bano et al⁽¹⁰⁾ with 98.8% negative predictive value and 90.6% specificity respectively. The negative predictive value and specificity of APGAR<7 at 5 minutes is also comparable with the values of 95.23% and 83.33% respectively in study by Bhide et al⁽¹²⁾

4 babies (2.98%) were admitted to neonatal intensive care unit from normal Non Stress Test group and 18 babies (39.13%) from abnormal Non Stress test group. This is comparable to study by Bano et al⁽¹⁰⁾ where, 3.6% babies were admitted from reactive nst group and 28.5% babies from non reactive Non Stress Group test.

Conclusion

Non stress test is a simple, noninvasive screening test which can be used to detect at risk babies in low pregnancies. It is easy to perform and the results are simple to interpret. It aids in early diagnosis of fetus with risk or hypoxia and helps in planning timely intervention. It is of great help in detecting meconium stained liquor with good precision. Non Stress Test is also a good predictor for babies with low APGAR score needing nicu facility so timely termination of pregnancies can be planned. Thus Non Stress Test is a useful tool to avoid obstetric litigation as parental expectation of a good outcome is extremely high.

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