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To determine the incidence of normal, suspicious and pathological non-stress test (NST) in full term pregnant women in a tertiary healthcare centre

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Abstract
All fetuses undergo physiological stress in the process of labour. Various techniques of foetal surveillance have been developed. Non stress test at admission may be used as an effective screening technique, to detect fetuses at risk. It is a noninvasive technique that can be used to identify compromised fetal. Prior to onset of labour also some fetuses may have stress that may be identified by NST at admission. Foetal surveillance is needed to ensure fetal wellbeing with minimum intervention. Intermittent auscultations may be used in low risk, but it cannot determine accelerations, baseline FHR, decelerations, baseline variability. Thus, taking NST helps to detect the ability of fetus to respond to stress. Hence, it may be useful to prevent neurological injuries like cerebral palsy. Thus, NST at admission has been accepted widely. It is considered as first investigation for fetal surveillance in some studies to decrease perinatal mortality. In busy labour wards, with limited resources, it plays an important role for selection of patients requiring continuous monitoring.
Aim and Objectives: To determine the incidence of normal, suspicious and pathological NST in full-term, pregnant women.
To state the role of NST at admission in determining pregnancy outcome in full-term pregnancies.
Material and Method: It was a prospective cohort study conducted in Bangalore Baptist Hospital during November 2020 to September 2021in 680 women.
Results: Among the studied full term pregnant women attending tertiary health care center 77.06% had normal NST, 21.77% had suspicious NST and 1.18% had pathological NST. There was statistically significant association (p value <0.05) between NST at admission and risk factors, mode of delivery, category of LSCS and APGAR at 1 min and 5 min.
Conclusion: We concluded that NST at admission can be used as a screening tool to identify patients who are at risk and need more vigorous monitoring.

Keywords: Non stress test, fetal surveillance, fetal distress, term pregnancy, NICU

Introduction
In recent years, availability of various fetal surveillance techniques and improvement in perinatal care has led to a decrease in perinatal mortality. The main aim of these various antepartum surveillance techniques is to ensure a reduction in fetal morbidity and mortality [1]. Different antenatal fetal surveillance techniques have been used to ensure early identification of women at risk. Various techniques commonly used are fetal movement assessment, non-stress test (NST), biophysical profile (BPP), maternal uterine artery doppler velocimetry along with fetal umbilical artery Doppler velocimetry [2, 3]. The objective of these various antepartum fetal surveillance techniques is to ensure the well-being of the fetus and help in early detection of neonatal injury [4]. Maximum cases of still birth have been found in antepartum period. India is one of countries that have high stillbirth burden. It is amongst the four countries (i.e., India, China, Pakistan, and Bangladesh), having 51% of the total stillbirths in the world [5]. In developing country like India, which has large population but limited resources, the fetal surveillance techniques used should be cost-effective to ensure screening of large population adequately. The non stress test (NST) plays an important role in such circumstances as it is simple, non-invasive and cost effective. Admission test which has been described by Ingemarsson *et al.* has been used in busy labour room historically as an important screening

technique [6]. Labour Admission Test (LAT) is used to identify foetuses at risk and ensure timely intervention and intensive monitoring for them [7]. About half (50%) of the fetal death occur without any apparent cause in the low risk mothers [8]. Non stress test detects hypoxia and hence is used for the assessment of fetal wellbeing [9]. NST can be used to predict perinatal outcomes and hence has been included in the biophysical profile as well. It depends on the coordination between the cardiovascular system and central nervous system of the foetus. In an adequately oxygenated fetus and functioning central nervous system with cardiovascular system, fetal movements are noted in the form of accelerations on the NST trace. It is less time consuming test and there are no contraindications for its use. It can be done by trained paramedical staff in an outpatient setting [10, 11]. It can be used in term pregnancy, to determine preexisting foetal hypoxia to ensure timely intervention to improve perinatal outcomes, by decreasing antepartum and intrapartum foetal death.

Materials and Methods

Study site*:* Study was conducted in Bangalore Baptist Hospital
Study design: Prospective Cohort Study
Study population: Term patient, getting admitted for delivery at Bangalore Baptist Hospital, Bangalore

Inclusion criteria

1. Singleton pregnancy.
2. Women with the gestational age of 37 weeks or higher.
3. Cephalic presentation.

Exclusion criteria

1. Elective LSCS.
2. Foetus with a congenital anomaly.
3. IUFD (intrauterine foetal demise)
4. Multiple pregnancies

Sample Size: As per the study done by Thobbi VA *et al.*, assuming the prevalence of suspicious and pathological LAT in full term pregnancies 18% and absolute error of 3% the calculated sample size was 680 [12].

Study instrument: Non-Stress Test (NST): NST examination requires 20 minutes. Participants were kept in supine position and with an abdominal belt, a fetal heart rate monitor was attached. The participants were asked to click a button to record any fetal movements. Results were interpreted as per NICE guidelines.

Study procedure: Study was conducted at Bangalore Baptist Hospital. Informed consent was obtained from all the mothers enrolled in the study, consent was taken before onset of labour or in postpartum period, to ensure that patient doesn't have labour pain at time of consenting for participating for the study. The women getting admitted in the labor ward had a detailed history-taking, which was followed by a thorough physical examination. After the consideration of the inclusion and exclusion criteria, for 20 minutes, short electronic FHR tracing was performed along with uterine activity. Women with suspicious tests underwent repeat NST after conservative measures like intravenous fluid administration, oxygen inhalation and lateral positioning. All women enrolled were monitored until delivery data and outcomes were collected and recorded in detail.
The outcomes were: 1) To determine normal, suspicious and pathological NST. 2) Caesarean rate for foetal distress for suspicious or pathological NST and the rate of instrumental delivery. 3) Percentage of the patient with suspicious NST who do not improve with conservative measures. 4) Perinatal outcome in terms of:

- Meconium stained liquor,
- APGAR score at 1 minutes and 5 minutes,
- Neonatal complications like meconium aspiration syndrome or respiratory distress syndrome,
- Admission to neonatal intensive care unit (NICU),
- Cause of NICU admission
- Length of stay in NICU.

Results

In this study conducted in Bangalore Baptist Hospital 680 women were included. Majority of the subjects were in the age group between 26 and 30 years (45%).

- In the study 57.7% were primigravida, 42.21% were multigravida.
- 51.03% women had no risk factors.
- 77.06% women had normal NST, 21.77% had suspicious NST and 1.18% had pathological NST.
- 46.47% had spontaneous labour and 53.53% were induced.
- 53.53% women had normal vaginal delivery, 16.76%had instrumental delivery and 29.71% underwent LSCS.
- 55.94% women underwent LSCS in view fetal distress, 21.29% for CPD and rest for other causes.
- 35.15% had category 1 LSCS, 62.87% had category 2 LSCS, and 1.98% had category 3 LSCS.
- 6.47% had MSAF 1, 6.18%had MSAF 2,2.79% had MSAF 3 and 84.56 5 had clear liquor.
- 3.68% women had APGAR <=6 at 1 minute and 1.03% had APGAR <= 6 at 5 minutes.
- 44.41% had birth weight 3 kg to 3.5 kg.
- 11.47% babies required NICU admission.

Discussion

In our study we included 680 patients who were admitted at term pregnancy for delivery. Most women were in age group of 26-30yrs (45%). There were 57.7% primigravida and 42.21% multigravida in our study. In the study 49% women had risk factors, 51% had no risk factor. Out of the total 51.03% patients had no risk factors while 44.12% had 1 risk factor and 4.85% had 2 risk factors. Presence of risk factors and NST was found to be significantly associated, in our study.
There were 77.06% woman who had normal NST, 21.76% suspicious who improved with conservative management and 1.03% did not improve. 1.18% had pathological NST. In study conducted by Vidya A. Thobbi, *et al.* [12] they found Non-Reassuring Admission Test 82% patients 9.3% had suspicious admission test and 8.8% patients had pathological admission test. Mohd Rasheed *et al.* [13] also found Normal FHR test in 74% patients, while 17.8% had indeterminate admission test and 8.2% had abnormal admission test. Thus, results in our study were consistent with previous studies. There were 46.47% patients with spontaneous onset of labour and 53.53% were induced.
It was found that mode of delivery was significantly associated with NST (p value <0.001). 53.53% woman had NVD and 16.76% had instrumental delivery and 29.71% had emergency LSCS. 57% women with normal NST had NVD, 44% suspicious NST and 25% pathological NST had NVD whereas LSCS were 26% in normal NST group, 42% in suspicious and 38% in

pathological NST group. In study conducted by Vidya A. Thobbi, *et al.* [12] pattern of the admission test and LSCS was found to be statistically significant (p<0.01). Caesarean delivery was found in 55.5% of patients with suspicious or pathological admission test when compared to 6.1% patients with normal admission test. Mohd Rasheed *et al.* [13] found statistically significant difference in the mode of delivery and different category of CTG findings was observed (p<0.001). Similar findings were observed in study done by Richa U. Lohana *et al.* [14] Thus, we conclude findings in our study are similar to various studies conducted earlier.

55.94% of women had underwent LSCS in view of fetal distress. 21.29% underwent LSCS in view of cephalopelvic disproportion. While other indications were observed in remaining patients. Indications of LSCS was not significantly associated with NST (p value 0.177) in our study. However, in study conducted by Vidya A. Thobbi, *et al.* 31.6% babies with normal admission test had fetal distress, while in patients with suspicious admission test 25.3% babies and in pathological admission test group 43.0% babies had fetal distress. Overall association of abnormal pattern in admission test and fetal distress was found to be statistically significant (p<0.01). Richa U. Lohana *et al.* [14] also found same findings in their study.

Out of total 35.15% LSCS were category 1 LSCS, 62.87% were category 2 LSCS and 1.98% were category 3 LSCS. Category LSCS was significantly associated with NST (p value 0.007). 47% patient with suspicious and 100% patients with pathological NST had Category 1 LSCS whereas 69% normal NST had category 2 LSCS. There is not much literature comparing association of NST and different category of LSCS. In our study we conclude that Normal NST is associated with Category 2 LSCS, whereas suspicious and pathological NST was associated with Category 1 LSCS.

6.47% had MSAF1, 6.18% had MSAF 2, 2.79 had MSAF 3 and 84.56% had clear liquor. Color of liquor was not significantly associated with NST (p value 0.926) in our study. However, Mohd Rasheed *et al.* [13] and Richa U. Lohana *et al.* [14] found significant association between colour of liquor and NST.

It was found that 3.68% had <6 APGAR at 1 min and 96% had APGAR >6 in our study. 97% babies had APGAR >6 at 1 minutes in normal NST group, 96% in suspicious whereas only 38% in pathological NST group had APGAR at 1 minute >6. APGAR score at 1 min was significantly associated with NST. Mohd Rasheed *et al.*, Vidya A. Thobbi, *et al.* and Richa U. Lohana *et al.* also found in their study statistical significance between APGAR score at 1 minute and NST.

In both normal and suspicious group APGAR at 5 min was >6 in all patients, while 38% only in pathological group had APGAR >6 at 5 minutes. APGAR score at 5 min was significantly associated with NST (p value <0.001) in our study. Mohd Rasheed *et al.*, Vidya A. Thobbi, *et al.* and Richa U. Lohana *et al.* also found in their study statistical significance between APGAR score at 5 minute and NST.

Most babies had weight 3 to 3.5 kg (44.41%). 11.47% babies required NICU admission. NICU admission rate was more with pathological NST 38%, but it was not significantly associated (p value 0.068). However, Mohd Rasheed *et al.*, Vidya A. Thobbi, *et al.* and Richa U. Lohana *et al.* found in their study statistical significance between NICU admission and NST.

In our study 50% were admitted for <24 hours and 50% for >24hrs. Length of stay in NICU was not significantly associated with NST (p value 0.834). It was found that 83.33% babies were admitted for fetal distress, 16.67% were admitted for other cause. Cause of stay was also not associated significantly with NST (p value 0.233).

In our study we conclude that association of risk factors, mode of delivery, category of LSCS, APGAR at 1 min and 5 min were statistically significant. However, association of NICU admission and colour of liquor was not found to be statistically significant.

Table 1: Distribution of types of NST (n=680)

NST	No of patients	Percentage (%)
Normal	524	77.06
Suspicious	148	21.76
Pathological	8	1.18
Total	680	100

Table 2: Association of risk factors and NST

Risk factor	NST			Total	P-value
	Normal	Suspicious	Pathological		
Present	271 (52%)	59 (40%)	3 (38%)	333 (49%)	0.028
Absent	253 (48%)	89 (60%)	5 (63%)	347 (51%)	
Total	524 (100%)	148 (100%)	8 (100%)	680 (100%)	

Table 3: Association of mode of delivery and NST

Mode of delivery	NST			Total	P-value
	Normal	Suspicious	Pathological		
NVD	297 (57%)	65 (44%)	2 (25%)	364 (54%)	0.001
Instrumental	90 (17%)	21 (14%)	3 (38%)	114 (17%)	
LSCS	137 (26%)	62 (42%)	3 (38%)	202 (30%)	
Total	524 (100%)	148 (100%)	8 (100%)	680 (100%)	

Table 4: Association of indication of LSCS and NST

LSCS indications	NST			Total	P- value
	Normal	Suspicious	Pathological		
Fetal distress	70 (51%)	40 (65%)	3 (100%)	113 (56%)	0.177
Cephalopelvic Disproportion	30 (22%)	13 (21%)	0 (0%)	43 (21%)	
Others	37 (27%)	9 (15%)	0 (0%)	46 (23%)	
Total	137 (100%)	62 (100%)	3 (100%)	202 (100%)	

Table 5: Association of category of LSCS AND NST

Category of LSCS	NST			Total	P- value
	Normal	Suspicious	Pathological		
CAT I	39 (28%)	29 (47%)	3 (100%)	71 (35%)	0.007
CAT II	94 (69%)	33 (53%)	0 (0%)	127 (63%)	
CAT III	4 (3%)	0 (0%)	0 (0%)	4 (2%)	
Total	137 (100%)	62 (100%)	3 (100%)	202 (100%)	

Table 6: Association of colour of liquor and NST

Colour of liquor	NST			Total	P- value
	Normal	Suspicious	Pathological		
MSAF 1	34 (6%)	10 (7%)	0 (0%)	44 (6%)	0.926
MSAF 2	33 (6%)	9 (6%)	0 (0%)	42 (6%)	
MSAF3	13 (2%)	6 (4%)	0 (0%)	19 (3%)	
CLEAR	444 (85%)	123 (83%)	8 (100%)	575 (85%)	
Total	524 (100%)	148 (100%)	8 (100%)	680 (100%)	

Table 7: Association of apgar score at 1 min and NST

APGAR 1 MIN	NST			Total	P- value
	Normal	Suspicious	Pathological		
<=6	14 (3%)	6 (4%)	5 (63%)	25 (4%)	<0.001
>6	510 (97%)	142 (96%)	3 (38%)	655 (96%)	
Total	524 (100%)	148 (100%)	8 (100%)	680 (100%)	

Table 8: Association of apgar at 5 min and NST

Apgar 5 min	NST			Total	P- value
	Normal	Suspicious	Pathological		
<=6	2 (0%)	0 (0%)	5 (63%)	7 (1%)	<0.001
>6	522 (100%)	148 (100%)	3 (38%)	673 (99%)	
Total	524 (100%)	148 (100%)	8 (100%)	680 (100%)	

Table 9: Association of NICU admission and NST

NICU Admission	NST			Total	p- value
	Normal	Suspicious	Pathological		
Yes	61 (12%)	14 (9%)	3 (38%)	78 (11%)	0.068
No	463 (88%)	134 (91%)	5 (63%)	602 (89%)	
Total	524 (100%)	148 (100%)	8 (100%)	680 (100%)	

Table 10: Association of length of NICU stay and NST

Length of stay	NST			Total	P- value
	Normal	Suspicious	Pathological		
Less than 24 Hours	31 (51%)	7 (50%)	1 (33%)	39 (50%)	0.834
More than 24 Hours	30 (49%)	7 (50%)	2 (67%)	39 (50%)	
Total	61 (100%)	14 (100%)	3 (100%)	78 (100%)	

Table 11: Association of cause of NICU admission and NST

Cause of stay	NST			Total	P- value
	Normal	Suspicious	Pathological		
Fetal distress	53 (87%)	10 (71%)	2 (67%)	65 (83%)	0.233
Others	8 (13%)	4 (29%)	1 (33%)	13 (17%)	
Total	61 (100%)	14 (100%)	3 (100%)	78 (100%)	

Conclusion

In our study it was concluded that incidence of normal (77.06%) NST was highest followed by suspicious (21.76%) and pathological (1.18%) NST, respectively. Most of the NST that were suspicious, improved with conservative measures. Women with normal NST were associated with lower LSCS rate and more normal or instrumental mode of delivery when compared with suspicious and pathological NST. Pathological NST were associated with higher LSCS rates. Fetal outcomes were good with normal NST. Women with normal NST had good APGAR scores when compared with women with suspicious or pathological NST. NICU admissions were more with pathological NST, though were not significantly associated. Hence, we conclude NST at admission can be used as a screening tool to identify patients who are at risk and need more vigorous monitoring. Intermittent FHR monitoring can be offered to women with normal NST test at admission. This ensures better utilization of the limited available resources.

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Conflict of Interest

Not available

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Not available

References

1. William‟s obstetrics, 21st edition, McGraw Hill Medical Publishing Division; c2001. p. 1096-1103.
2. Williams KP, Farquharson DF, Bebbington M, Dansereau J, Galerneau F, Wilson RD, *et al*. Screening for fetal well-being in a high-risk pregnant population comparing the nonstress test with umbilical artery Doppler velocimetry: a randomized controlled clinical trial. American journal of obstetrics and gynecology. 2003 May 1;188(5):1366-1371.
3. Liston R, Sawchuck D, Young D. No. 197a-fetal health surveillance: antepartum consensus guideline. Journal of Obstetrics and Gynaecology Canada. 2018 Apr 1;40(4):e251-271
4. Esin S. Factors that increase reactivity during fetal nonstress testing. Current opinion in obstetrics and gynecology. 2014 Apr 1;26(2):61-66
5. Stanton C, Lawn JE, Rahman H, Wilczynska-Ketende K, Hill K. Stillbirth rates: delivering estimates in 190 countries. The Lancet. 2006 May 6;367(9521):1487-1494.
6. Ingemarsson I, Arulkumaran S, Ingemarsson E, Tambyraja RL, Ratnam SS. Admission test: a screening test for fetal distress in labor. Obstetrics and Gynecology. 1986 Dec 1;68(6):800-806
7. Devane D, Lalor JG, Daly S, McGuire W, Cuthbert A, Smith V. Cardiotocography versus intermittent auscultation of fetal heart on admission to labour ward for assessment of fetal wellbeing. Cochrane Database of Systematic Reviews. 2017(1).
8. Yucel A, Yilmazer M, Acar M. Comparison of doppler indices and non-stress test values according to fetal sex in normal term pregnancies. The Medical Journal of Kocatepe. 2005;6(1):19-24.
9. Radhika P, Rai L. Fetal Doppler verses NST as Predictors of Adverse Perinatal outcome in Preeclampsia and IUGR. J Obstet Gynecol India. 2006;56:134-138.
10. Solum T. Antenatal Cardiotocography: Methods, interpretation and clinical application. Acta Obstetricia et Gynecologica Scandinavica. 1980 Jan 1;59(sup96):1-31
11. Thacker SB, Berkelman RL. Assessing the diagnostic accuracy and efficacy of selected antepartum fetal surveillance techniques. Obstetrical & gynecological survey. 1986 Mar 1;41(3):121-41.
12. Thobbi VA, Deshpande GR and Chavadi S. Role of admission test in pregnancy. Al Ameen J Med Sci 2018; 11(2):101-106.
13. Mohd R, Srivastava AK. Labour admission test: a screening test for foetal distress in labour. Int J Reprod Contracept Obstet Gynecol 2017;6:452-456
14. Lohana RU, Khatri M, Hariharan C. Correlation of nonstress test with fetal outcome in term pregnancy (37-42 Weeks). Int J Reprod Contracept Obstet Gynecol. 2013;2(4):639-645

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