

Non-stress test: A tests to assess the outcome of high-risk pregnancy

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Abstract

Background: The non-stress test is one of the most widely used techniques for antepartum fetal evaluation. The main principle behind this test is the presence of fetal heart rate acceleration with fetal movement .it recognizes the association of fetal neurological status to cardiovascular reflex responses as it is one of the factors that disappears earliest during the progressive fetal compromise. **Methods:** For ante-partum evaluation of high-risk pregnancies, the non -stress test (NST) was performed to predict favourable or adverse fetal outcome. This study was carried out on 100 women with high-risk pregnancies between period of august 2013 and May2016, in the department of obstetrics and gynaecology, B.R.S.H Kolkata by CTG as per NICE guideline. **Results:** Out of 100 patients as per NST result 22% were found non-reactive and 78% were found reactive. The risk of intrapartum fetal distress (IPFD) was 8.31times more for patients with non-reactive NST result as compared to the patients with reactive NST result and the risk was significant. Proportion of NICU admission was higher in non-reactive group (9.1%) as compared to reactive group (3.8%). proportion of perinatal deaths was higher in NR group (4.5%) as compared to R group (1.3%). **Conclusion:** However, it is just not enough to have a live baby but rather a live healthy baby without any birth related disability or complication research work aimed at developing such tests which would detect and prevent neurodevelopment defects are desirable. Till date NST is directed only at prevention of stillbirths.

Keywords: Non stress test, Fetal heart rate, Fetal movement.

Abbreviations: NST-non stress test, LSCS- lower segment caesarean section- non reactive, IPFD-intrapartum fetal distress.

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Introduction

The Antepartum assessment of foetal well-being has become essential for all pregnancies. The motto of the modern obstetrics is the healthy mother with a healthy child. To achieve these many biochemical and biophysical methods have been advised. Main aim of antepartum surveillance is to detect fetal distress, fetal death and avoidance of unnecessary interventions (ACOG)[1]. NST is simple, inexpensive, non-invasive test, most widely used easily performed and interpreted test. It is relation of the FHR and the FM, recorded with the help of ultrasound devise including Doppler. NST should be offered to all high-risk women. Maternal risks include Pre-eclampsia, Diabetes, APH, Post caesarean pregnancy, post-term pregnancy, Other medical conditions like- SLE. Fetal risk includes Preterm labour, IUGR, Multiple pregnancy, Oligohydramnios, Meconium-stained liquor, Intrauterine infection, Abnormal doppler findings. Risk Factors arising during labour like Augmented labour, Epidural anaesthesia, and Meconium-stained liquor. Boehm FH et al[2] suggested that the patients who are at risk for fetal stress should be evaluated on a twice-a-week basis when the non- stress test is used as the primary test.

Methods and Materials

This was a cross sectional prospective observational study, conducted at B.R. Singh railway hospital between November 2013 to May 2015.

Hundred high-risk Women with singleton, non- anomalous pregnancies of 32 weeks or more of gestation attending both emergency and registered patients attending antenatal OPD & admitted in indoors were enrolled in this study. Both labour and non-labour patients were included in the study. Test was done on the day of admission and subjects were followed -up till delivery. Based on high-risk factors NST was recorded weekly, biweekly, on alternate days or even daily basis. NST was performed using a Cardiotocograph with 2 MHZ transducer for duration of 20 min. if non -reassuring within these 20 minutes further extended up to 40 minutes. Non -reactive test considered as positive test and reactive test was considered as negative. Reactive test was rescheduled for repeat test on a weeks' time, non-reactive repeated within 24 hours. Persistent nonreactive pattern was considered for delivery.

Inclusion Criteria

Women with singleton, non- anomalous pregnancies of 32 weeks or more of gestation, NST performed within 3- 7 days prior to delivery, all pregnant women at risk for intrauterine compromise like IUGR, Pre-eclampsia, chronic hypertension, diabetes mellitus, Decreased fetal movements, severe anaemia, post-dated pregnancy, Rhisoimmunisation, PROM, advanced maternal age (>35 yrs.), renal disease, cardiac disease and BOH.

Exclusion criteria

Gestational age less than 32 weeks, malpresentation, patient with cephalopelvic- disproportion, congenital anomaly of the fetus detected on routine ultrasound scanning, intrauterine fetal death, antepartum haemorrhage were excluded from study.

Statistical analysis

It was performed with help of Epi info (TM) 3.5 .3. χ^2 test was used to test the association of different variables with the study groups. Z- test

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was used to test the significant difference between two proportions. T-test was used to compare the means. Odds ratio (OR) with 95% confidence interval (CI) was calculated to measure the different risk factors. Diagnostic accuracy, Sensitivity, Specificity, Positive Predictive value of test were also calculated. p value of <0.05 was considered Statistically significant.

Results

A total of 100 females with high-risk pregnancy were included in the study. Table 1 shows distribution of high-risk pregnancy according to clinical high-risk factors. Most of the patients were with pre-eclampsia (23%) followed by severe anemia (21%), IUGR (17%) and decreased FM (10%). only 1% had RH isoimmunization.

Table 1: Distribution of high-risk pregnancy cases according to clinical high-risk factor

Pre-eclampsia-	23	23.0%
Severe anemia	21	21.0%
IUGR	17	17.0%
Decreased FM	10	10.0%
GDM	8	8.0%
PROM	5	5.0%
Advanced maternal age	5	5.0%
BOH	5	5.0%
Prolonged pregnancy	5	5.0%
Rh isoimmunization	1	1.0%
Total	100	100.0%

Out of 100 patients as per NST result 22% were found non-reactive and 78% were found reactive

Table 2: Distribution of NST results

NST result	number	%
Non-reactive	22	22.0%
Reactive	78	78.0%
Total	100	100.0%

Pregnant women in our study were in the age group of 18-39 years. The mean age of NR group was 25.72±6.11 years and R group was 26.66±5.87 years. Proportion of primigravida was higher in NR group (36.4%) as compared to R group (23.1%) in our study. The mean gestational age in cases with reactive NST and non-reactive NST result were 37.98±0.56 weeks and 38.15±1.19 weeks respectively

Table 3: Demographic profile

Age Group	Non-reactive (22)	Reactive (78)	Total (100)
<20	4 (18.2%)	11(14.1%)	15
21-29	12(54.5%)	36(46.2%)	48
30-39	6	31(39.7%)	37
Gravida			
Primi	8(36.4%)	18(23.1%)	26
Multi	14(63.6%)	60(76.9%)	74
Gestational age			
37.0-40.0	19(86.4%)	77(98.7%)	96
>40.0	3(13.6%)	1(1.3%)	4

The patients were followed up for mode of delivery. There were 39 patients (39%) who underwent LSCS and 61 patients (61%) delivered vaginally. In this study 22 cases (28.2%) with reactive NST underwent LSCS whereas 17 cases (77.3%) with nonreactive NST underwent LSCS. 9 cases (40.9%) with nonreactive NST and 13 cases (59.1%) with reactive NST developed intrapartum fetal distress (IPFD), for which they underwent LSCS. The risk of intrapartum fetal distress (IPFD) was 8.31times more for patients with non-reactive NST result as compared to the patients with reactive NST result and the risk was significant. Proportion of NICU admission was higher in non-reactive group (9.1%) as compared to reactive group (3.8%). proportion of perinatal deaths was higher in NR group (4.5%) as compared to R group (1.3%).

Table 4: Mode of delivery

Mode of delivery			
L.S.C. S	17(77.3%)	22(28.2%)	39
NVD	5(22.7%)	56(71.8%)	61
Intrapartum fetal distress			
Present	9(40.9%)	6(7.7%)	15
Absent	13(59.1%)	72(92.3%)	85
NICU admission	2(9.1%)	3(3.8%)	5

There was no significant association between perinatal outcome and groups (p=0.91). Proportion of perinatal deaths was higher in NR group (4.5%) as compared to R group(1.3%). The risk of death was 3.66 times more for patients with non-reactive NST result as compared to the patients with reactive NST result [OR=3.66(0.22,61.11); p=0.91] and the risk was not significant.

Table 5: Perinatal outcome

Died	1(4.5%)	1(1.3%)	2
Good	21(95.5%)	77(98.7%)	98

Discussion

The purpose of this study was to test the

ability of NST to predict pregnancy outcome and early neonatal outcomes. There was no significant difference between the two NST groups regarding the maternal age and gravidity which was similar to many published studies such as by Dellinger et al. The risk of non-reactive test result was 12.15 times more for the patients with gestational age > 40 weeks as compared to the patients with gestational age < 40 weeks. Tong Li George Rhoads KitawDemissie and John Smulian[3] conducted a case-control study to examine the efficacy of non-stress testing in preventing fetal death in post-term pregnancy. They found that non-stress testing was used in 30.9%, of the 126 cases and in 28.5% of the 375 controls. Their results do not support the efficacy of non-stress testing in post-term pregnancies. A more detailed evaluation of this widely used screening procedure is needed. In our study out of 78 patients having reactive NST, 22 (28.2%) patients had caesarean section, while out of 22 patients, having non-reactive NST, 17 (77.3%) patients had caesarean section. The risk of LSCS was 8.65 times more for patients with non-reactive NST and the risk was significant. The reason for high incidence of caesarean section in this study in spite of normal test result was due to obstetrical indications, like history of previous caesarean section, severe pre-eclampsia and severe intrauterine growth. Phelan JP[4] also supports that the reactive group experienced a favourable fetal outcome; the non-reactive group demonstrated a significant increase in the overall caesarean sections rate, the rate of caesarean section for fetal distress, and the perinatal mortality rate. Based on our experience, the NST continues to be a valuable procedure for the assessment of fetal well-being in our high-risk pregnancies while Gourounti K, Sandal J[5] found that the intrapartum admission cardiotocography in women at low obstetric risk increase the risk of caesarean section and instrumental delivery. There 3 out of 78 normal NST infants and 2 out of 22 abnormal NST infants were admitted into NICU and showed that there was no significant association between NICU admission and groups. The risk of NICU admission was 2.50 times more for patients with non-reactive NST results as compared to the patients with reactive NST result and the risk was not significant. So sensitivity, specificity, positive predictive value, negative predictive value of perinatal outcome was, 50.0%, 78.5%, 4.5%, 96.1%, respectively which is comparable with the studies by Ocak V, et al[6]. 59.50 % and 11 %. This low sensitivity and PPV OF NST makes it less suitable to predict the perinatal outcome in newborn infants. Sharbaf FR et al[7] also found that negative predictive value of AT for neonatal death and NICU admission was 100 % and 96% respectively. Sensitivity and PPV of NST for is 40 % and 9.1 % respectively. There was no significant association between perinatal outcome and groups (p=0.91%) hence, the sensitivity of NST was 50.0%, specificity and NPV of NST in our study are 78.5 % and 96.1% respectively. Salamalekis E[8] assess the predictability of the NST (reactive or nonreactive) in terms of fetal outcome, and concluded that a reactive test was found to be a good predictor of the healthy fetus also specificity of the test was found to be 85.4%. Specificity is ability of test to correctly identify those who don't have disease.

Conflict of Interest: Nil Source of support: Nil

Conclusion

Even though, NST is recommended, quick and cheap but not an efficient tool to monitor the fetal outcome. Therefore, other test like doppler study, continuous recording of the fetal electrocardiogram, fetal pulse oximetry or fetal scalp sampling with immediate determination of blood gases or lactates should be preferred over NST. Current studies show that the routine use of EFM leads to an increased caesarean section risk and operative vaginal delivery rate. In developing countries like India where advanced equipment for fetal monitoring are not available, NST is a useful non-invasive screening test to detect fetal distress and for timely referral of the high-risk patient to a higher centre. Because of the low sensitivity and positive predictive value rates the nonreactive test may identify high risk cases, but it was not helpful as a stand-alone modality in decision making. Further studies are needed to set the validity and reliability standards for NST.

Ethical approval

The study was approved by the Institutional Ethics Committee

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