Section: Obstetrics and Gynaecology

Original Research Article

NON-STRESS TEST AND PERINATAL OUTCOME IN HIGH RISK PREGNANCY

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ABSTRACT

Background: NST is simple, cheap, non-harmful, easily repeated, and cost effective with low maintenance profile. NST is a very effective method to investigating the intrauterine growth retardation (IUGR), late pregnancy, premature birth, multiple pregnancy, Rh sensitivity, diabetes, liver disease, decreased bowel movements, oligohydramnios etc. Objectives were to evaluate the efficacy and role of antenatal NST in improving perinatal outcome in high-risk pregnancies.

Materials and Methods: A prospective cohort study was done on 200 antenatal women with one or more risk factors for a period of 1 year to evaluate the perinatal outcome by NST is used for predicting perinatal outcome, it has high sensitivity for APGAR Score, NICU admission and low birth weight of the baby.

Results: Distribution of high risk cases according to last NST pattern total number of reactive cases are 121(60.5%) and non reactive cases are 79(39.5%). In reactive NST pattern (121) cases, 41 cases had normal delivery (33.8%). 71 cases had caesarean section (58.6%). Among the non reactive NST patients (79) 11 had normal delivery (13.9%), 64 has caesarean section (81%). Correlation of last NST pattern with perinatal outcome, Reactive category 12 cases (9.9%) had low birth weight and 17.72% (14 cases) had low birth in Non reactive cases, 8 cases (6.6%) had meconium staining with reactive NST and 9 cases (11.39%) had meconium staining with non-reactive NST. 1 case (0.8%) had perinatal death in reactive cases and 5 had non-reactive NST category ie., 6.32%. predictability of abnormal NST for fetal distress in labor are sensitivity 23.14%, specificity 12.66%, positive predictive value 28.87 %and negative predictive value of 9.71% Similarly predictability of abnormal NST for APGAR <6 are sensitivity 85.95. specificity 2658. positive predictive value 64.20 and NPV-55.26. LBW had sensitivity 90, specificity 17.72, PPV 62.6 and NPV 53.8. NICU admission in non-reactive NST pattern found out to have sensitivity 51.2, specificity 32.9, PPV- 53.9 and NPV-30.5. In meconium stained liqour, sensitivity 6.6, specificity 88.6, PPV-47, NPV 38.2, perinatal death. Sensitivity -0.8, specificity 93, PPV-16.7, NPV-38.

Conclusion: Present study reveals significant difference between reactive and nonreactive NST in terms of Apgar scores and NICU admissions in both the groups. Hence judicious use of NST will certainly help in timely identification of at-risk fetuses thereby avoiding unnecessary delay in intervention.

Keywords: Non-stress test (NST), Bad obstetrics history(BOH), Cardio tocogrphy(CTG).

INTRODUCTION

Globally, every year there are three million still births and three million neonatal deaths. The causes are multiple but main ones are preterm birth, infection and trauma significant proportion is due to antenatal, intra-partum or postnatal hypoxia.[1,2] As more than two thirds of fetal deaths occur before the onset of labor as a result of the antenatal complications pregnancy, it would be ideal to follow the practice of extending the fetal monitoring to antenatal period also in an effort to prevent the complications and fetal deaths.[3] There is lack of awareness in the rural population regarding importance of regular antenatal visits hospitalization in high risk cases if required and approach to health care in time at the onset of labor hence this topic has been selected.

NST is primarily a test of fetal condition and it differs from CST which is a test of uteroplacental function. It is one of most widely used primary testing method for assessment of fetal wellbeing and has also been incorporated into system. It is not only simple and in expensive, it is also noninvasive and easily performed and interpreted. It consumes less time and has no contraindication for testing.[3,4] More importantly, it can be used to screen a large population quickly in an OPD and can be performed by trained paramedical staff. The present study aims to evaluate the efficacy and diagnostic value of NST for antenatal surveillance in high-risk pregnancy. In this study we intend to evaluate the effectiveness and role of NST for assessing the perinatal outcome of fetuses in high risk pregnancies reporting to the outpatient. This study can pick up the high risk cases, regular monitoring can be done timely action can be taken to yield a better perinatal outcome. This study is carried out in a tertiary care center, where maximum inflow of patients is from rural background in this center facilities like pediatrician anesthetist NICU set up, operation theatre Lab facilities ultrasound are all available found the clock. Hence. better perinatal care ensured.

MATERIALS AND METHODS

This study was carried out in the antenatal ward, labour room, postnatal ward and NICU in the department of Obstetrics and gynecology from January 2015 to June 2016. It is a prospective cohort stud. Total 200 patients having one or more risk factors like post dated pregnancy IUGR gestational hypertension, GDM, PROM, BOH, anemia previous LSCS, Rh negative pregnancy were selected and studied. Ethical clearance taken from the ethical committee of institution and study proceeded

Inclusion Criteria: Singleton pregnancy, Primigravida, Multigravida, age 18-35 yrs, Non-anomalous fetuses, Gestational age 32 weeks with one or more risk factors like Gestational hypertension, IUGR, GDM, PROM, pervious caesarean section, anemia, BOH. Post dated pregnancy, Rh-negative mothers.

Exclusion Criteria: Pre/postnatal diagnosis of a fetal chromosomal or structural abnormality, women with multiple gestation, women with uterine malformation, women with gestational age <34 weeks.

High risk cases selected from the outpatient department, informed consent taken admitted if required based on severity of disease, bi weekly NST done Doppler study done weekly, appropriate treatment for the disease started. All other basic investigations in antenatal profile done. Based on last NST within one week of delivery and the pertaining risk factor of the patient, mode of delivery decided either as elective caesarean section, emergency caesarean section, normal vaginal delivery or instrumental vaginal delivery are conducted. APGAR noted at 0 and 5min, Neonates with low APGAR score, meconium staining of liquour low birth weight and other complications are admitted immediately in NICU and neonate with pathological jaundice, sepsis Neonatal seizures etc are admitted later on If required. All neonates followed up for 6 weeks after delivery -perinatal outcome has been decided based on the parameters like fetal distress during labor, APGAR score, NICU admission, Low birth weight, meconium staining of liquor. perinatal death.

Method of performing NST

Non-stress test is a non-invasive procedure of antepartum fetal surveillance BPL, NST machine is used, patient is placed in left lateral position. On a bed two transducers are placed over the abdomen, the one for FHR is placed at the position where FHS is heard by auscultation and the probe for tocograph is placed over the fundus of the uterus and with this electronic monitor, both the fetal heart and the uterine contractions are recorded in the form of a graph. Trace is take for 20 minutes continuously and is interpreted after 20 minutes.

Interpretation of NST

It contains four variables

1. Baseline FHR-Normal values :110-160 bpm.
2. Beat to beat variability- Fetal heart rate variability from baseline (Normal variability 5-25 beats / second).
3. Accelerations - Increase in fetal heart rate from the baseline by atleast 15 beats/min lasting for atleast 15 seconds. Two accelerations in a 20 min trace is satisfactory.
4. Decelerations It is decrease in FHR from the baseline by atleast 15 beats/min lasting for 15 seconds, There should not be any deceleration in FHR in a normal NST. There are different types of decelerations.

1. **Early deceleration:** Begins at start of uterine contraction and end with contraction. This is due to fetal head compression.
2. **Variable deceleration:** Deceleration noticed any time irrespective of uterine contraction. A sign of umbilical cord compression.

3. **Late deceleration:** Begins at peak of contraction and ends long after it. This is a sign of fetal hypoxia due to uterus or placental insufficiency. This is the most worrisome deceleration.

According to NICE guidelines, NST is said to be reassuring when BHR is 110-160, variability >5 no decelerations and 2 accelerations in 20 min. lt is Non reassuring if BHR is 100-109 or 160-180, variability <5 for more than 40 min and <90 min, typical variable decelerations and no accelerations.

It is said to be abnormal if BHR <100 or 180, variability<5 for 90 min atypical variable or late decelerations or single prolonged deceleration for more than 3 min. CTG is said to be normal if all the four features are reasuuring. Suspicious if one feature is non reassuring and pathological if one or more features are abnormal.

Statistical Methods: Data was transferred to an Excel 2007 spread sheet and analysed by SPSS(statistical package for social sciences version 170) An unpaired student t-test was applied to evaluate the correlation between these variables. level of significance considered was p<0.05.

RESULTS

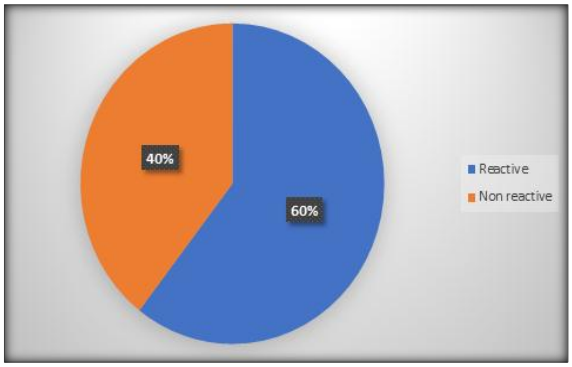

Figure 1: Distribution of high risk cases according to last NST pattern

Distribution of high risk cases according to last NST pattern total number of reactive cases are 121(60.5%) and non reactive cases are 79(39.5%). [Figure 1]

Most common high risk factors in the patients included in study is IUGR Le., 61(30.596) followed by hypertensive disorder 34(17%), PROM 21(10.5%), Anaemia t16(8%) post dated pregnancy 16(8%). breech 14 (7%), prev. LSCS 12(6%, Rh negative (4.5%), GDM (3%), BOH 6(3%), short stature 6(25%). [Table 1]

Correlation of last NST pattern with mode of delivery . In reactive NST pattern (121) cases, 41 cases had normal delivery(33.8%). 71 cases had caesarean section (58.6%) and 9 had forceps delivery (7.4%). Among the non reactive NST patients (79) 11 had normal delivery (13.9%), 64 has caesarean section (81%) and 4 cases underwent forceps delivery (5%). [Table 2]

Correlation of last NST pattern with perinatal outcome, Out of 121 cases of reactive NST, 28 cases (23.2%) had fetal distress and 69 patients (87.34%) had fetal distress with non-reactive NST In Reactive NST, 17 cases had APGAR <6(14%) and 21 cases (26.58%) had APGAR <6 with Non-reactive category. Reactive category 12 cases (9.9%) had low birth weight and 17.72% (14 cases) had low birth in Non reactive cases, 8 cases (6.6%) had meconium staining with reactive NST and 9 cases (11.39%) had meconium staining with non-reactive NST. 1 case(0.8%) had perinatal death in reactive cases and 5 had non-reactive NST category ie., 6.32%. [Table 3]

Predictability of abnormal NST for fetal distress in labor are sensitivity 23.14%, specificity 12.66%, positive predictive value 28.87 %and negative predictive value of 9.71% Similarly predictability of abnormal NST for APGAR <6 are sensitivity 85.95. specificity 2658. positive predictive value 64.20 and NPV- 55.26 . LBW had sensitivity 90, specificity 17.72, PPV 62.6 and NPV 53.8. NICU admission in non-reactive NST pattern found out to have sensitivity 51.2, specificity 32.9, PPV- 53.9 and NPV-30.5. In meconium stained liqour, sensitivity 6.6, specificity 88.6, PPV-47, NPV 38.2, perinatal death. Sensitivity -0.8, specificity 93, PPV-16.7, NPV-38. [Table 4]

Table 1: Distribution of high risk cases according to their risk factor

Risk factors	Number of cases	Percentages
IUGR	61	30.5%
PIH	34	17%
PROM	21	10.5%
Anemia	16	8%
Post dated pregnancy	16	8%
Breech presentation	14	7%
Prev. LSCS	12	6%
Rh negative	9	4.5%
Short stature	5	2.5%
BOH	6	3%
GDM	6	3%

Table 2: Correlation of last NST pattern with mode of delivery

NST pattern	Reactive(121)	%	Non-reactive(79)	%
Normal delivery	41	33.8%	11	13.92
Caesarean section	71	58.6%	64	81%
Forceps	9	7.4%	4	5%

Table 3: Correlation of last NST pattern with perinatal outcome

NST pattern	Reactive(121)	%	Non-reactive(79)	%	p- value
Fetal distress	28	23.1%	69	87.34 %	0.000*
APGAR <6	17	14%	21	26.58%	0.02722*
NICU admission	59	48.7%	26	32.9%	0.47
Low birth weight	12	9.9%	14	17.7%	0.266*
Meconium	8	6.6%	9	11.39%	0.23
Perinatal death	1	0.8%	5	6.32%	0.025

Table 4: Predictability of perinatal outcome with last NST pattern

Perinatal outcome	Sensitivity	Specificity	PPV(%)	NPV(%)
Predictability of perinatal outcome with last NST pattern				
Fetal distress	23.1	12.66	28.8	9.7
APGAR <6	85.9	26.5	64.2	55.2
NICU admission	51.2	32.9	53.9	30.5
Low birth weight	90	17.7	62.6	53.8
Meconium	6.6	88.6	47	38.2
Perinatal death	0.8	93	16.7	38

DISCUSSIONS

NST is simple, cheap, non-harmful, easily repeated, and cost effective with low maintenance profile. The probability of adverse outcomes such as meconium-stained amniotic fluid, low APGAR score, and NICU admission. A reactive NST is a reliable indicator of fetal wellbeing in term fetus.[5]

Present prospective study was conducted among 200 high risk cases, including risk factors like UGR, PIH, BOH GDM, Post dated pregnancy, PROM, Anemia, Breech presentation, previous LSCS. Short stature, Rh-negative status, Incidence of IUGR is highest i.e 30.5% followed by gestational hypertension. Antepartum fetal surveilliance plays a major role in managing these high risk cases for detecting early signs of compromise and timely action taken to deliver the baby. But the question is which test to use. NST was introduced is early 90s and remains the test of choice. since then to monitor FHR in antenatal period in high risk cases. According to the clinical studies done early NST has high specificity and low sensitivity.[6]

Among all the high risk cases 60.5% had reactive pattern of NST and 39.5% nonreactive.

Mode of delivery analyzed in terms of NST pattern 33.80% had normal delivery in reactive NST and 58.6% had caesarean section and 7.4% had instrumental delivery. The decision for C.S could be based on factors other than NST alike previous CS cases are not given trial. In spite of Nonreactive NST 13.92% had normal delivery rest 86% had caesarean section and forceps delivery timely action was taken in these cases and emergency caesarean section done. When NST pattern is corelated with the individual factors considered in deciding the perinatal outcome like fetal distress before or during labour. APGAR Score, NICU admissions, low birth weight, meconium stained liquor and perinatal deaths Among 121 cases of reactive NST 23.1% had fetal distress and among 79 cases of non-reactive NST 87.34% had fetal distress.14% of reactive cases had APGAR < 6 and 26.58% of Non reactive NST cases had low APGAR score. 48.76% of reactive NST cases were admitted to NICU and 32.91% of Non-reactive NST cases were admitted. The reason for high admissions in NICU in reactive cases could be the other pathologies like hyperbilirubinemia, neonatal sepsis etc after 2 or 3 days after birth. 9.9% of total reactive cases low birth weight babies (< 2 kgs) and 17.72% of non reactive cases had low birth weight. 6.6 of total reactive NST cases had meconium stained liquour and 11.39 of non reactive cases had the same. Among total 6 perinatal deaths, 1 death occurred in reactive NST pattern patient and 5 deaths in non-reactive NST pattern which is 6.329% of total non-reactive NST If deaths considered individually 16.67% of deaths occurred in reactive NST pattern and 83.33% occurred in Non-reactive NST pattern.

All these data put together, sensitivity, specificity. positive predictive value. negative predictive value of NST are calculated in relation to perinatal outcome individually. When NST pattern is taken into account and compared with fetal distress, predictability of abnormal NST for fetal distress in labor are sensitivity 23.14%, specificity 12.66%, positive predictive value 28.87 %and negative predictive value of 9.71% Similarly predictability of abnormal NST for APGAR <6 are sensitivity 85.95. specificity 2658. positive predictive value 64.20 and NPV-55.26. LBW had sensitivity 90, specificity 17.72, PPV 62.6 and NPV 53.8. NICU admission in non-reactive NST pattern found out to have sensitivity 51.2, specificity 32.9, PPV- 53.9 and NPV-30.5. In meconium stained liqour, sensitivity 6.6, specificity 88.6, PPV-47, NPV 38.2, perinatal death. Sensitivity -0.8, specificity 93, PPV-16.7, NPV-38. There is correlation of NST with fetal distress L.B.W, NICU admission, perinatal death were stastically significant.

High specificity and positive predictive value Imply that it is a reliable diagnostic test for assessing fetal well being, as a negative or reactive test is unlikely to be associated with adverse perinatal outcome.[7] On the other hand, lesser sensitivity and NPV imply that is relatively less reliable as a screening test for in identifying a compromised fetus as a Nonreactive fetus, needs further evaluation for confirming fetal compromise.

Hardik Amin,[1] showed round 58% participants of high-risk group and 82% of low-risk group had 'reactive' and NST tracings respectively. Almost 36% participants of high-risk group and 16% of low-risk group were delivered baby by LSCS method. Around 24% participants of high-risk group and 10% of low-risk group had meconium-stained amniotic fluid. Around 66% babies of participants of high-risk group and 24% of low-risk group were admitted in NICU.

A study done by Himabindu et al,[5] noted the sensitivity, specificity, PPV, NPV of NST test was 82.3%, 80.7%, 46.6%, 95.7% respectively. Biswas et al,[8] noted the sensitivity, specificity, PPV, NPV of NST test was 72.7%, 72.7%, 30.7%, 94.1% respectively in their study. In the study by Mehta et al,[9] the sensitivity, specificity, PPV, NPV of NST test was 67.6%, 80.8%, 90.9%, 46.5% respectively. Vermal et al,[10] found the sensitivity, specificity, PPV, NPV of NST test was 76%, 60%, 55.8%, 62.5% respectively. Our results were comparable with study done by Chaudhary et al,[11] (sensitivity 50%,specificity 86.3%, PPP 38.3%, NPV 92.6%).

The antenatal surveillance of high-risk pregnancies with NST can effectively screen for identification of high-risk fetuses and segregate the population that is at risk for perinatal mortality and morbidity. The potential advantage of NST is that, it is cost effective, easy to use, comfortable to mother and tell about acute fetal hypoxia hence a decrease in decision to delivery time can be made for those patients with fetal distress so that a major improvement in the outcome among parturient can be achieved with abnormal (non-reactive) NST results.[12,13]

CONCLUSION

In predictability of perinatal outcome by NST positive predictive value is high which indicates it is a reliable diagnostic technique to predict the positive outcome of the fetus. NST is a best, non invasive screening technique to evaluate the perinatal outcome which is not time consuming, and requires a skilled personnel. NST is a valuable screening test for detecting fetal compromise in pregnancies that have a poor perinatal outcome.

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