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# Study of Non-Stress Test (NST) As an Admission Test for Maternal and Fetal Outcome in Pregnancy beyond 32 Weeks – Prospective Observational Study at Tertiary Care Center

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## A B S T R A C T

***Introduction*:** Antenatal fetal surveillance is essential for improving outcomes in high-risk pregnancies. The Non-Stress Test (NST) plays a critical role in assessing fetal well-being by evaluating heart rate responses to fetal movements. ***Aim and Objectives***: The aim of this study is to evaluate the effectiveness of NST in predicting outcomes in pregnancies beyond 32 weeks. The objectives include assessing the correlation between NST findings and maternal outcomes, evaluating its association with fetal outcomes.***Materials and Methodology***: This prospective observational study was conducted in the labor room of the Department of Obstetrics and Gynaecology at GMC Akola over 18 months. It included 107 pregnant women beyond 32 weeks of gestation. Data collection involved medical history, obstetric examination, and NST results. Outcomes such as delivery mode, birth weight, APGAR scores, NICU admissions, and hospital stay were recorded. Statistical analysis was performed using descriptive statistics and chi-square tests.***Result***: The study found 84(79%) of NSTs were reactive, indicating healthy fetal heart rates, while 23(21%) were nonreactive. Reactive NST cases showed better neonatal outcomes, including higher Apgar scores, lower rates of NICU admissions, and higher survival rates compared to nonreactive cases. Nonreactive NSTs were associated with increased risks of meconium-stained liquor, oligohydramnios, intrauterine growth restriction (IUGR), and fetal distress.***Conclusion***: NST serves as an important indicator for identifying high-risk pregnancies and guiding clinical decisions. In resource-limited settings, nonreactive NSTs can aid in monitoring and referral decisions. Overall, NST is essential for assessing fetal well-being and can help reduce perinatal morbidity and mortality**.**

## INTRODUCTION

The role of antenatal fetal surveillance has become crucial for improving outcomes in high-risk pregnancies [1], with advancements reducing perinatal mortality and morbidity. Historically, fetuses were seen merely as outcomes of pregnancy, but modern obstetrics treats them as patients, necessitating detailed monitoring. The Non-Stress Test (NST) is a key tool used to assess fetal well-being by measuring heart rate responses to fetal movements, indicating brain oxygenation and overall fetal health. This test, safe and non-invasive, is crucial for detecting issues such as intrauterine growth restriction and ensuring timely intervention. NST, integrated into the Biophysical Profile, offers a cost-effective, reliable method for monitoring fetal status, aiding in decision-making for pregnancies beyond 32 weeks to reduce perinatal risks [2-5].

## AIM AND OBJECTIVES

**Aim:** To investigate the effectiveness of Non-Stress test (NST) as an admission test for predicting maternal and fetal outcomes in pregnancies beyond 32 weeks of gestation.

**Objectives:** 1. To assess the correlation between NST as admission test and maternal outcomes. 2. To evaluate the association between NST as admission test findings and fetal outcomes.

## MATERIALS AND METHODS

The present study is prospective observational study done in labour room, Department of Obstetrics and Gynaecology, GMC Akola for duration of 18 months on all pregnant women beyond 32 weeks of gestation presenting in labor. Study include total 107patients in which data is collected by Comprehensive assessment upon arrival, including medical history, obstetric examination, and Non-Stress Tests (NSTs) as admission test. NST is categorised as reactive (normal), non-reactive (abnormal), and suspicious (equivocal). Fetal heart rate and uterine contractions recorded using external transducer**.**

For NST test patients were positioned reclining for a 20-minute, extending to 40 minutes if initial results were non-reactive. Fetal movements were monitored using a fetal kick counter. Study result are assessed in terms of delivery mode, birth weight, APGAR scores at 1, 5 min, NICU admissions, hospital stay duration, and discharge day. Data was analyzed using descriptive statistics and presented in tables. Chi-square test was used to examine associations between variables and statistical significance was set at a p-value < 0.05.

**Inclusion Criteria:**

- Pregnant women with a gestational age (GA) >32 weeks by Last Menstrual Period (LMP) or dating scan, presenting inlabor

**Exclusion Criteria:**

- GA <32 weeks
- Congenital anomalies in the baby
- Multifetal pregnancies
- Cases managed conservatively

**RESULTS**

The study include 107 cases out of which, The majority of cases (58%)62 were in the 15-25 age group, (39%)42were aged 25-35, and only (3%)3 were 35-45 years old, indicating a higher incidence among younger women. Most pregnancies were term 87(81%), followed by preterm 12(11%) and postdate 8(7%), showing that most pregnancies reached full term. 39(36%) were primigravida (first-time pregnancies) and 68(64%) were multipara (women with previous pregnancies), highlighting a predominance of women with prior pregnancies. A majority cases 84(79%) had reactive NSTs, indicating healthy fetal heart rates, while 23(21%) were nonreactive, requiring additional monitoring or intervention.

The distribution of babies by gender showed no significant difference between reactive and non-reactive NST groups. Reactive NSTs were significantly associated with higher birth weights, with 62(74%) of babies in this group weighing above 2.5 kg compared to 12(52%) in the non-reactive group (p-value 0.0013). This suggests that reactive NSTs are linked to a higher proportion of normal birth weights.

**Table 1: Distribution according to NICU admission with NST**

| NICU admission | Reactive NST | Nonreactive NST | Total | P-value |
|---|---|---|---|---|
| YES | 16(19%) | 14(61%) | 30 | <0.0001 |
| NO | 68(88%) | 11(12%) | 77 | |
| Total | 84(100%) | 23(100%) | 107 | |

14 (61%) of non-reactive NST cases and 16(19%) of reactive NST cases admitted. The p-value of <0.0001 indicates a strong correlation between non-reactive NST results and increased NICU admissions. There was a significant association between NST reactivity and neonatal death outcomes. All babies with reactive NSTs survived (0% NND), while 17.4%(4 out of 23 nonreactive NST) experienced neonatal death. The p-value of <0.0001 confirms a strong link, emphasizing that reactive NSTs are associated with a significantly lower risk of neonatal death. These results underscore the importance of NST reactivity in predicting neonatal outcomes. Reactive NSTs are linked to better birth weights, lower NICU admissions, and reduced neonatal mortality, highlighting their role in assessing fetal health and guiding clinical decisions.

**Table 2: Distribution of multiple intraoperative finding probably that can affect NST outcome**

| Intra operative finding | Reactive NST | | Non-reactive NST | | Total | |
|---|---|---|---|---|---|---|
| | No of cases | % of cases | No of cases | % of cases | No of cases | % of cases |
| Scanty liquor | 1 | 17% | 5 | 83% | 6 | 100 |
| MSL | 11 | 46% | 13 | 54% | 24 | 100 |
| Loop of cord around neck | 2 | 28.5% | 5 | 71.5% | 7 | 100 |
| Placental calcification | 2 | 40% | 3 | 60% | 5 | 100 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Hypercoiled umbilical cord | 0 | 0 | 1 | 100% | 1 | 100 |

The study found significant associations between NST reactivity and various adverse conditions. Reactive NSTs were linked to lower incidences of meconium-stained liquor (13% vs. 56.5%), oligohydramnios (1.2% vs. 21.8%), loop of cord around the neck (2.38% vs. 22%), and hypercoiled umbilical cord (0% vs. 9%), with p-values indicating high statistical significance. In contrast, non-reactive NSTs were more frequently associated with these complications. Placental calcification showed a less pronounced but still significant difference, with 13% of non-reactive cases exhibiting this condition compared to 2% of reactive cases. Additionally, non-reactive NSTs were significantly more common in cases of intrauterine growth restriction (30% vs. 5%). These findings underscore the critical role of NST in identifying fetuses at risk for these adverse outcomes.

**Table 3: Distribution of mode of delivery and fetal distress with NST**

| | **Reactive NST** | **Nonreactive NST** | **P-Value** |
|---|---|---|---|
| Mode of Delivery(at end of study) | 56 (63.1%) LSCS<br>28 (36.9%) VD | 23 (100%) LSCS<br>0 VD | <0.0001 |
| NVD trial and LSCS on Admission | 38 (45.24%) NVD<br>46 (54.76%) LSCS | 12 (52.17%) NVD,<br>11 (47.83%) LSCS | |
| IntrapartumFetal Distress during VD trial | 10 (26%) Yes,<br>28 (74%) No | 12 (100%) Yes,<br>0 No | <0.0001 |

The study revealed significant differences in delivery modes and fetal outcomes based on NST results. All non-reactive NST cases resulted in lower segment cesarean sections (LSCS), while 56(63.1%) of reactive NST cases had LSCS, and 28(36.9%) had vaginal deliveries. This highlights a strong association between non-reactive NST and the necessity for cesarean delivery, with a p-value of <0.0001. Additionally, 26%(10 out of 38 VD trial cases) of reactive NST experienced intrapartumfetal distress, compared to 100% (12 out of 12cases of VD trial) of non-reactive NST, further emphasizing the predictive value of NST in identifying at-risk fetuses during labour.

**Table 4: Distribution of APGAR Scores at 1 Minute and 5 Minutes by NST Type**

| **NST Type** | **APGAR Score < 7 at 1 min** | **APGAR Score ≥7 at 1 min** | **APGAR Score <7 at 5 min** | **APGAR Score ≥ 7 at 5 min** |
|---|---|---|---|---|
| Reactive | 8 cases (10%) | 76 cases (90%) | 0 cases (0%) | 84 cases (100%) |
| Non-reactive | 13 cases (57%) | 10 cases (43%) | 2 cases (9%) | 21 cases (91%) |
| Total | 21 cases (21%) | 86 cases (79%) | 10 cases (10%) | 97 cases (90%) |

The data illustrates significant differences in APGAR scores at 1 and 5 minutes between reactive and non-reactive NSTs. At 1 minute, a high percentage of reactive NSTs 76 (90%) had APGAR scores greater than 7, whereas only 10(43%) of non-reactive NSTs achieved this score. Conversely, 13(57%) of non-reactive NSTs had scores below 7 at 1 minute, compared to just 8(10%) of reactive NSTs. By 5 minutes, all reactive NSTs 84(100%) had APGAR scores greater than 7, showing a complete recovery, while 21(91%) of non-reactive NSTs achieved scores above 7, though 2(9%) still had scores below 7. Overall, reactive NSTs showed a consistently better outcome in APGAR scores, both initially and after 5 minutes, compared to non-reactive NSTs.

## DISCUSSION

In the current study, the majority of participants 62(58%) were aged 15-25 years, with fewer cases in the 25-35 age range 42(39%) and even fewer in the 35-45 range 3(3%). This trend towards younger age groups is consistent with findings from Singh S *et al*., and Lohana RU *et al*., [6], who similarly reported high incidences of pregnancy among younger women. However, Garg S *et al*., [7] observed a different distribution, with a larger proportion of their subjects in the 26-30 age range. This variation underscores a general trend towards younger pregnancies, though specific age distributions can differ.

Regarding gestational age, 87(81%) of pregnancies in the study were term, 12(11%) were preterm, and 8(7%) were postdate, indicating that most pregnancies reached full term. This finding aligns with general expectations of term pregnancies, though Nayak*et al*.,'s [8] study shows more variability in preterm and term birth rates across different groups. The distribution of gravida in the study showed that 68(64%) were multigravida and 39(36%) were primigravida, reflecting a higher proportion of women with previous pregnancies. This distribution is similar to Deshmukh S *et al*., [9] but contrasts with Sharma P *et al*., [10], who had more primigravida participants.

The Non-Stress Test (NST) results revealed that 84(79%) of cases were reactive, suggesting healthy fetal heart rates, while 23(21%) were nonreactive, indicating potential issues. This is consistent with Mehta N *et al*., and Choudhary

PK *et al*., though Kaur N *et al*., reported a higher nonreactive rate. Reactive NST cases generally had better outcomes, with 62(74%) of babies having birth weights above 2.5 kg, whereas nonreactive cases had more variability in birth weight. Significant differences were observed in NICU admissions and survival rates, with 30(28%) of cases requiring NICU admission and a higher survival rate in reactive NST cases 84(100%) compared to nonreactive NST cases 19(82.6%).

The study found a significant difference in APGAR scores at 1 minute between reactive and non-reactive NSTs (p-value <0.0001). This finding is consistent with previous studies, such as those by Sharma P *et al*., [10] and Bano S *et al*., which also reported better outcomes for reactive NSTs. Among the 84 cases with reactive NSTs, the distribution of scores at 5 minutes was: 10% scored 7, 54% scored 8, 35% scored 9, and 2% scored 10, with no scores below 7. In contrast, among the 23 non-reactive NST cases, 9% scored 6, 48% scored 7, and 43% scored 8, with none scoring 9 or 10. These results align with findings from Eden RD *et al*., and Rogar*et al*., who reported high APGAR scores in reactive NSTs and associated non-reactive NSTs with increased morbidity and mortality. Overall, the study confirms that non-reactive NSTs are linked to poorer APGAR scores, while reactive NSTs are associated with better outcomes.

## CONCLUSION

The study underscores the vital role of Non-Stress Tests (NSTs) in predicting neonatal outcomes. Reactive NSTs were linked to higher Apgar scores at 1 and 5 minutes, reflecting better fetal health. Conversely, nonreactive NSTs were associated with increased risks of meconium-stained liquor, oligohydramnios, intrauterine growth restriction (IUGR), and fetal distress. These findings emphasize the significance of NST reactivity in evaluating fetal well-being and making clinical decisions.

NSTs are a simple, non-invasive, and cost-effective method for monitoring fetal health. A reactive NST is reassuring, indicating a healthy fetus, while a nonreactive NST can help identify high-risk patients who may need continuous monitoring or urgent intervention. In settings with limited resources, a nonreactive NST can guide decisions about further monitoring or referral to highercenter. However, in well-equipped facilities, it should not be solely relied upon as a definitive indicator of fetal distress.

Overall, antepartum fetal monitoring, including NST, is crucial for assessing fetal health and can contribute to reducing perinatal morbidity and mortality when used effectively. NSTs should be employed based on clinical indications to identify fetuses requiring additional monitoring during labor.

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