

Original Research Article

# The role of the non-stress test as a method to evaluate the outcome of term pregnancy at a tertiary care hospital in India

Aishwarya Ghogare<sup>1,\*</sup>, Sujata Pavan Jadhav<sup>1</sup>, Pavan Pralhadrao Jadhav<sup>2</sup> and Swati Nagapurkar<sup>1</sup>

<sup>1</sup> Department of OBGY, JIIU's IIMSR Warudi, Jalna, Maharashtra, India.

<sup>2</sup> Department of Orthopedics, Superspeciality Hospital, Aurangabad, Maharashtra, India.

\* Correspondence: aashghogare@gmail.com

Received: 17 March 2023; Accepted: 22 May 2023; Published: 28 May 2023.

**Abstract: Background:** The non-stress test is the most widely used test for the assessment of fetal health and reflects oxygenation of the brain. Fetal movements during testing are identified by maternal perception and are recorded. NST is based on the hypothesis that the heart rate of a fetus who is non-acidotic, non-impaired will temporarily accelerate in response to fetal movements. The fetal heart rate normally is increased or decreased by autonomic influences mediated by sympathetic or parasympathetic impulses from brain stem centers. NST uses minimum thresholds of FHR acceleration frequency to distinguish healthy from compromised fetuses. The value of "reactivity" or accelerations associated with fetal movement may vary considerably with the composition of the population tested, gestational age, the frequency of test repetition, and the use of other baseline FHR features in the evaluation of the test.

**Methodology:** The study was conducted at Department of OBGY in a tertiary care hospital in India for a duration of one year. 100 pregnant woman with pregnancy from 37 weeks to 42 weeks of gestation were included in the study. The electronic fetal monitor is used for NST. The NST was categorized as Reactive and Non-Reactive. Reactive In a 20-minute period, two or more fetal heart rate accelerations of at least 15 beats per minute above the baseline heart rate. If the NST came out to be non-reactive, NST was repeated for another 20 minutes and if it still remained Non-reactive then Biophysical profile was done for that patient and the decision was taken according to the result of the biophysical profile score.

**Results:** The mean age of patients was  $26.72 \pm 4.58$  years. Out of 100 NST, -67 (67%) NST were reactive while 23 (23.18%) were non-reactive. Women admitted with reactive NST had significantly higher vaginal delivery rates i.e. (42% vs. 14%). Operative delivery in non-reactive NST group was significantly higher than the reactive NST group, i.e., (86% vs. 58%). All 100 babies were born alive irrespective of the NST status and 13% (13) required NICU admission. The individual parameters of poor fetal outcome like meconium stained liquor, Apgar score <7 at 5 minutes had increased incidences in the non-reactive group.

**Conclusion:** The "NST at admission" is a straightforward and uncomplicated procedure for determining the fetal status antenatally. Its responsiveness ensures a positive outcome for both the mother and the fetus, while non-responsiveness raises the risk of operative delivery and NICU hospitalization.

**Keywords:** Pregnancy; NST; Fetus; Reactive; Non-reactive.

## 1. Introduction

In modern obstetrics, antenatal fetal surveillance is becoming an increasingly popular field for timely intervention to ensure good fetal outcomes. The non-stress test (NST) is the most widely used test for assessing fetal health and reflects the oxygenation of the brain. Fetal movements during testing are identified by maternal perception and recorded. NST is based on the hypothesis that the fetal heart rate (FHR) of a non-acidotic and non-impaired fetus will temporarily accelerate in response to fetal movements. The fetal heart rate is normally influenced by autonomic impulses from brain stem centers, mediated by sympathetic or parasympathetic influences. NST uses minimum thresholds of FHR acceleration frequency to distinguish healthy fetuses from compromised ones. The value of "reactivity" or accelerations associated

with fetal movement may vary considerably with the composition of the tested population, gestational age, the frequency of test repetition, and the use of other baseline FHR features in test evaluation [1–3].

## 2. Interpretation of Non-Stress Test:

The interpretation of the NST involves the following four main components [4–8]:

- Base line fetal heart rate
- Beat-to-beat variability of fetal heart rate
- Accelerations of fetal heart rate
- Decelerations of fetal heart rate

Approximately 50% of antepartum fetal deaths without an apparent cause occur in patients without any risk factors. Therefore, there is a need to develop a test for screening all pregnancies. Traditionally, obstetricians classified pregnant women as "low risk" and "high risk." While many well-organized methods are available for managing the high-risk group, we need more efficient methods to identify pregnant women in distress within the low-risk group. The idea behind conducting this study using NST as a tool for routine antepartum fetal surveillance is to monitor pregnancies that are otherwise considered normal, thus aiming to achieve the best outcomes for mothers.

## 3. Materials and methods

This prospective Observational study was conducted at Department of OBGY in a tertiary care hospital after getting the necessary ethical permissions from the Institutional Ethics Committee. The duration of the study was for one year. 100 pregnant women with pregnancy from 37 weeks till 42 weeks of gestation, having age between 19 to 35 years and singleton pregnancy were included in the study. Patient refusing to give consent, who cannot have a follow-up and belonging to high risk group were excluded from the study.

Patient was counselled and explained regarding the procedure. Detailed history was taken. Thorough general, systemic and obstetrical examination of the patients was done. Patients underwent routine investigations like hemoglobin, blood grouping, blood glucose levels, urine albumin, thyroid profile, HIV/HBsAg, Ultrasonography and were screened accordingly. Patients from 37 weeks till 42 weeks were selected and subjected to NST weekly from 37 weeks and the reading of the last weeks's strip was taken into account till she went into labor or with a strip showing non-reactive reading. Further, she was subjected to biophysical profile score and decision was taken accordingly. The electronic fetal monitor (cardiotocogram) is used for NST, it has a Doppler transducer for FHR monitoring & a pressure transducer for monitoring of uterine contractions & fetal movements, placed on the pregnant abdomen using belts. The NST was categorized as Reactive and Non-Reactive. Reactive in a 20-minute period, two or more fetal heart rate accelerations of at least 15 beats per minute above the baseline heart rate were recorded. Each acceleration lasts at least 15 seconds. If the NST came out to be non-reactive, NST was repeated for another 20 minutes. Still if it remained non-reactive, then biophysical profile was done for that patient and decision was taken according to the result of the biophysical profile score. If it was normal, then the patient was admitted and monitored thoroughly and if it was abnormal, decision for termination of pregnancy was taken.

All the collected data was entered in Microsoft Excel sheet and then transferred to SPSS software ver. 22 for analysis. Qualitative data were presented as frequency and percentages and analysed using chi-square test. Quantitative data was presented as mean and SD and compare by t-test. Correlation between variables was done by using Pearson's correlation test. P-value < 0.05 was taken as level of significance.

#### 4. Results and Discussion

Age group	Frequency	Percent
20 to 24 years	60	60%
25 to 29 years	26	26%
30 to 35 years	14	14%
Total	100	100%
Parity	Frequency	Percent
Primigravida	29	29%
Multigravida	71	71%
Total	100	100%
Gestational Age	Frequency	Percent
37 to 38 weeks	78	78%
39 to 40 weeks	15	15%
41 to 42 weeks	7	7%
Total	100	100%

Mode of delivery	NST		Total	P value
	Non reactive (19)	Reactive (81)		
NVD	12 (63%)	63 (78%)	75 (75%)	0.002
LSCS	7 (37%)	18 (22%)	25 (25%)	
APGAR score at 1 min				0.002
> 7	8 (42%)	69 (85%)	77 (77%)	
< 7	11 (58%)	12 (15%)	23 (23%)	
APGAR score at 5 min				
> 7	9 (47%)	71 (88%)	80 (80%)	0.002
< 7	10 (53%)	10 (12%)	20 (20%)	
Birth weight				0.001
< 2.5 kg	6 (32%)	8 (10%)	14 (14%)	
> 2.5 kg	13 (68%)	73 (90%)	86 (86%)	
Admission to NICU				0.001
Yes	5 (26%)	4 (5%)	9 (9%)	
No	14 (74%)	77 (95%)	91 (91%)	
Ventilator Support				0.002
Yes	2 (11%)	0 (0%)	2 (2%)	
No	17 (89%)	81 (100%)	98 (98%)	

Most of the study population was between 20-24 years (60%) of age group followed by 25 -29 years (26%). The mean age of the study population was  $25.12 \pm 4$  years. Most of the study population were Multigravida (71%) while primigravida was observed in 29%. Most of the study population had gestational age between 37-38 weeks (78%) followed by 39 to 40 weeks (15%).

LSCS was the mode of delivery in 22% of reactive NST and 37% of non-reactive NST pregnant women and the difference was statistically significant. In 15% of the reactive strips had Apgar score <7 whereas 58% of the preceding non-reactive strips had Apgar score <7 at 1 min. In 12% of the reactive strips had Apgar score <7 whereas 53% of the preceding non-reactive strips had Apgar score <7 at 5 min. In 10% babies had birth weight <2.5 kg in reactive NST strips whereas 32% of the babies weighed non-reactive NST strips. NICU admission in babies was observed in 5% of reactive NST strips whereas 26% of non-reactive NST strips. Ventilatory support in babies was observed in 0% of reactive NST strips whereas 11% of non-reactive NST strips. In study conducted by Eden *et al.*, (1988), 23.2% delivered by caesarean section with reactive NST and 37.7% with nonreactive NST [9]. This is in correlation to the findings of Rochard *et al.*, and Schifrin *et al* which shows poor perinatal outcome in the babies with low Apgar scores [10,11]. In a study by Imam Bano *et al.*, 31.8% of the babies with reactive NST had Low birth weight, whereas 42.8% of the babies with non-reactive NST had low

birth weight. 3.6% of the pregnant mothers with reactive NST required NICU admission, whereas 28.5% of the pregnant mothers with Non-reactive strip required NICU admission [12].

## 5. Conclusion

From the above study we can conclude that, the "NST as a monitoring tool" of antenatal fetal well-being is a simple, non-invasive and uncomplicated procedure. Its responsiveness ensures a positive outcome for both the mother and the fetus, while non-responsiveness raises the risk of operative delivery, low APGAR score, and NICU hospitalization.

**Author Contributions:** All authors contributed equally to the writing of this paper. All authors read and approved the final manuscript.

**Conflicts of Interest:** "The authors declare no conflict of interests."

## References

- [1] Brown R, Patrick J: The non-stress test: How long is enough? *Am J Obstet Gynecol* 141: 646, 1981
- [2] Devoe, L. D., McKenzie, J., Searle, N. S., & Sherline, D. M. (1985). Clinical sequelae of the extended nonstress test. *American journal of obstetrics and gynecology*, 151(8), 1074-1078.
- [3] Devoe, L. D. (1982). Antepartum fetal heart rate testing in preterm pregnancy. *Obstetrics and Gynecology*, 60(4), 431-436.
- [4] Visser, G. H. A., & Huisjes, H. J. (1977). Diagnostic value of the unstressed antepartum cardiotocogram. *BJOG: An International Journal of Obstetrics & Gynaecology*, 84(5), 321-326.
- [5] Krebs, H. B., & Petres, R. E. (1978). Clinical application of a scoring system for evaluation of antepartum fetal heart rate monitoring. *American journal of obstetrics and gynecology*, 130(7), 765-772.
- [6] Lyons, E. R., Bylsma-Howell, M., Shamsi, S., & Towell, M. E. (1979). A scoring system for nonstressed antepartum fetal heart rate monitoring. *American Journal of Obstetrics and Gynecology*, 133(3), 242-246.
- [7] Devoe, L. D., Yanowitch, G., & Azor, H. (1981). The application of multiple-parameter scoring to antepartum fetal heart rate testing. *The Journal of Reproductive Medicine*, 26(5), 250-254.
- [8] Pearson, J. F., & Weaver, J. B. (1978). A six-point scoring system for antenatal cardiotocographs. *BJOG: An International Journal of Obstetrics & Gynaecology*, 85(5), 321-327.
- [9] Eden, R. D., Seifert, L. S., Kodack, L. D., Trofatter, K. F., Killam, A. P., & Gall, S. A. (1988). A modified biophysical profile for antenatal fetal surveillance. *Obstetrics and gynecology*, 71(3 Pt 1), 365-369.
- [10] Rochard, F., & Schifiine, B. S. (1976). Non Stressed fetal Heart Rate. *Obst and Gyn Clinics of North Am*, 26, 535.
- [11] Schifrin, B. S., Foye, G., Amato, J., Kates, R., & Mackenna, J. (1979). Routine fetal heart rate monitoring in the antepartum period. *Obstetrics & Gynecology*, 54(1), 21-25.
- [12] Imam Bano, Nasreen Noor, Lata Motwani, Zakia Arshad. Comparative study of Non stress Test and Fetal Acoustic Stimulation of Assessment of Fetal Well-being. 2012; 3 (2): 168-171.



© 2023 by the authors; licensee PSRP, Lahore, Pakistan. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC-BY) license (<http://creativecommons.org/licenses/by/4.0/>).