

# A Prospective Study on Impact of Non Stress Test in Prediction of Pregnancy Outcome

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**Abstract** This prospective study was done at Department of Obstetrics and Gynecology, Manipal College of Medical Sciences, Pokhara, Nepal to identify effectiveness of NST in detecting high risk fetus thus preventing perinatal morbidity and mortality. The cohort of 125 pregnant mothers from 37 completed weeks to 42 weeks irrespective of risk factors, were subjected to NST for 20 minutes and extended to 40 minutes to avoid fetal sleep cycle. NST was categorized into Cat I, II and III according to NICHD. Fetal distress, meconium stained liquor was higher in Cat III group. There was more intervention in Cat II and Cat III group. Total number of patients who underwent LSCS was 51. Most common indication for LSCS (53%) was for fetal distress out of which 85% had NST of Cat II (37%) and Cat III (48%). For detecting high risk fetus, NST is a simple screening procedure and is helpful in decreasing perinatal morbidity and mortality.

**Keywords:** Non Stress Test (NST), Perinatal Morbidity, Perinatal Mortality

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## 1. Introduction

Maternal mortality has reduced in a developing country like Nepal and focus is shifting towards fetal health. According to American College of Obstetricians and Gynecologists (ACOG) committee, the aim of antepartum fetal surveillance is to prevent fetal death [1]. For almost four decades, antepartum fetal surveillance technique by assessment of fetal heart rate patterns is in clinical use. Continuous electronic fetal monitoring may not be possible in low resourced countries like Nepal and hence Non Stress Test may be a better alternate option.

Freeman (1975) and Lee and colleagues (1975) introduced the non stress test to describe acceleration of fetal heart rate is a sign of fetal health in response to fetal movement [2]. This test involved the use of Doppler detected fetal heart rate acceleration coincident with fetal movements perceived by the mother. In this study NST was used for routine antepartum fetal surveillance to catch up those fetuses that might be at risk and provide prompt intervention thus giving the best outcome in mothers and fetus.

### Inclusion Criteria

1. Singleton pregnancy
2. Gestational age between 37 completed weeks to 42 weeks.

## 2. Method and Methodology

This was a prospective study done at the department of Obstetrics and Gynecology, Manipal Teaching Hospital, Pokhara, Nepal from December 2014 to May 2015.

### 2.1. Approval of Ethical Committee

The study was approved by the Institutional Ethics Committee. The entire participants were individually counseled. Strict confidentiality in participation was maintained. From each individual informed consent was taken.

### 2.2. Procedure

For all the pregnant ladies between 37-42 weeks detailed history and examination was done. Informed consent was taken. After admission in the maternity ward all of them were subjected to a 20 min CTG trace, which was extended to 40 min period to account for fetal sleep cycle before concluding it as insufficient fetal reactivity. 72 hours prior to delivery the NST test results were considered again. NST was categorized as per National Institutes of Health Workshops recommended Three-Tier category into Cat I, Cat II and Cat III [2].

### 2.3. National Institutes of Health Workshops Three-Tier Classification System

**2.3.1. Category I FHR Tracings (Normal)**

Includes all of the following:

- Baseline of 110 to 160 bpm
- Moderate baseline variability
- Late or variable decelerations are absent
- Early decelerations may be present or absent
- Accelerations may be present or absent

**2.3.2. Category II FHR Tracings (Indeterminate)**

FHR tracings which were not categorized as category I or category III

**2.3.3. Category III FHR Tracings (Abnormal)**

Include either:

- Sinusoidal pattern

or

- Absent FHR variability and any of the following:
  - Recurrent late decelerations
  - Recurrent variable decelerations
  - Bradycardia

**2.4. Mode of Delivery**

(Vaginal, Instrumental, Caesarean Section) and neonatal outcome with APGAR score of baby, admission in the Neonatal Intensive Care Unit and perinatal mortality were noted.

**2.5. Sample Size Calculation**

In a pilot study done prior to the study showed the Proportion in group I [APGAR score > 7 at 1 min in NST Cat I] = .9, Proportion in group II [APGAR score > 7 at 1 min in NST Cat II] = .6, Risk difference = 0.3, Power(%) = 80, Alpha Error (%) = 5, Side = 2, Required sample size for each arm = 32. [3]

Statistical Package for the Social Sciences (SPSS) for Windows Version 16.0 was used to analyze the data. X<sup>2</sup> was used while calculating the data [4].

**3. Results**

The maximum number of patients (71) belonged to 20 to 35 years age group. There were 43 patients aged more than 35 years and 11 were less than 20 years of age. The mean age was 25 years. 58% of patients were primi gravida and 42% were multigravida. More than half (57%) of the patients were between 37 weeks to 39 weeks of gestation and remaining 43% were from 40 to 42 weeks period.

Of the total 125 pregnant mothers 81% had Cat I NST, 9% had Cat II and 10% had Cat III NST. In terms of neonatal weight 87% were born with normal weight. 11% babies weighed <2.5 kg and 2% were >4 kg. False negative rate of NST defined as fetal death within 1 week of reactive NST is <1% [2]. In this study false negative

rate is 0.9% according to which Category I NST is a good predictor of fetal outcome.

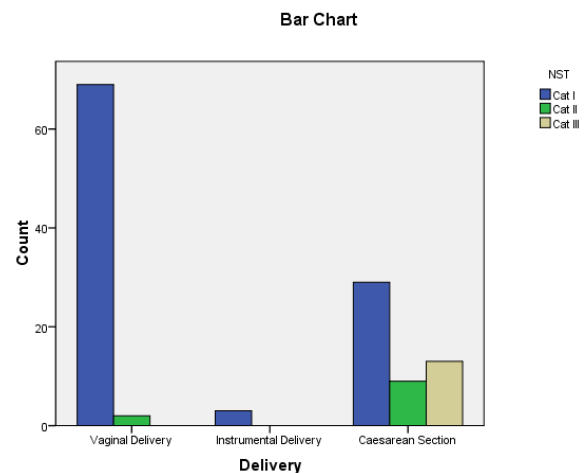


Figure 1. Distribution of NST with Mode of Delivery

69 (68.3%) of pregnant mothers with Cat I had vaginal delivery, 3 (3%) of them had instrumental delivery and 29 (28.7%) of them had LSCS of which 4 was done for fetal distress and 25 for other reasons. In Cat II, 2 (18.2%) had vaginal delivery and 9 (81.8%) had LSCS and all 13 (100%) patients with Cat III NST had LSCS.

Operative deliveries were more common in Cat III group (p value 0.001)

Table 1. Distribution of NST with Fetal Outcome

Result	Cat I	Cat II	Cat III	p value	
APGAR score >7 at 1 min	93(92.1%)	7(63.6%)	4(30.8%)	0.001	
APGAR score <7 at 1 min	8(7.9%)	4(36.4%)	9(69.2%)		
APGAR score >7 at 5 min	99(98%)	9(81.8%)	7(53.8%)	0.001	
APGAR score <7 at 5 min	2(2%)	2(18.2%)	6(46.2%)		
Admission to NICU	Yes	7(6.9%)	4(36.4%)	10(76.9%)	0.001
	No	94(93.1%)	7(63.6%)	3(23.1%)	
Neonatal Death	Yes	0	0	1(7.7%)	0.01
	No	101	11	12	

92.1% from category I group had APGAR score more than 7, 7.9% of them had APGAR less than 7 whereas 69.2% in category III had APGAR score less than 7 at 1 min, 30.8% had APGAR score more than 7. 98% in Cat I had APGAR score more than 7 at 5 minute whereas 46.2% had APGAR less than 7 at 5 minute.

There were 10 babies (76.9%) in cat III, 4 babies (36.4%) from cat II and 7 babies (6.9%) from Cat I who required NICU admission.

1(7.7%) baby from cat III had perinatal mortality.

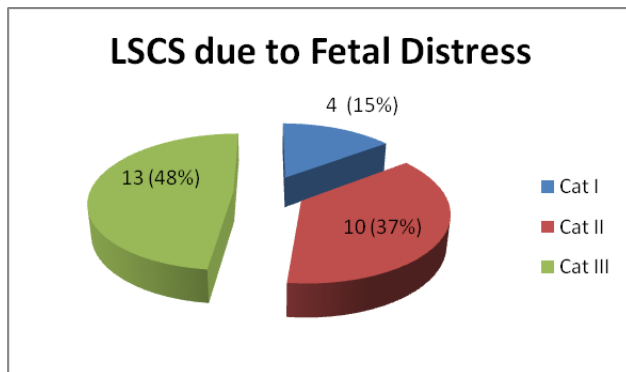
Cat II and Cat III NST is significantly related to poor APGAR score and Cat I to good APGAR score.(p value 0.001).

Admission in Neonatal Intensive Care Unit is more likely from Cat III NST (p value 0.001).

Table 2. Distribution of NST with Meconium Stained Liquor

Liquor Clear	No	90	5	5	100	0.001
	% within NST	89.1%	45.5%	38.5%	80%	
Meconium Stained Liquor	No	11	6	8	25	
	% within NST	10.9%	54.5%	61.5%	20%	
Total	No	101	11	13	125	
	% within NST	100%	100%	100%	100%	

Only 10.9% in Cat I had meconium stained liquor whereas 54.5% in Cat II and 61.5% in Cat III had meconium stained liquor at delivery. Meconium stained liquor is more common with Cat III NST (p value 0.001).



**Figure 2.** Correlation of NST with LSCS Due to Fetal Distress

Total number of patients who underwent LSCS was 51. Out of these 27 (53%) had LSCS for fetal distress being the most common indication for LSCS in this study. 13 (48%) out of 27 mothers who underwent LSCS for fetal distress had Cat III NST.

## 4. Discussions

Among the 125 pregnant mothers who were included in the study 81% had Cat I NST, 9% had Cat II and 10% had Cat III NST. In the study done by Gurung G et al 73% had reactive, 23% had equivocal and 4% had ominous result [5].

False negative rate of NST defined as fetal death within 1 week of reactive NST is <1%. In this study false negative rate is 0.9% according to which Cat I NST is a good predictor of fetal outcome.

Rate of intervention is high in Cat II and Cat III group as shown in our study where rate of LSCS was 28.7% in Cat I as compared to 91.6% in Cat II, Cat III group. In the study done by Patel S et al LSCS rate was 14.84% in Reactive group and 66.66% in Non reactive group [6] It was similar to the study done by Verma A, Bhide AA where Reactive NST had less intervention [7,8].

Operative delivery was more common in non reactive NST in the study done by Hafizur R [9] and Ingemarsson I [10].

In the study done by Kulkarni A [11] and Bhat [12] similar findings were noted.

Phelan's (1981) [13] study found an increase in overall caesarean rate in patients with non reactive NST.

Total number of patients who underwent LSCS was 51. Most common indication for LSCS (53%) being fetal distress out of which 85% had preceding NST of Cat II (37%) and Cat III (48%) which was similar to the study done by Lohana R U et al where 75% had preceding nonreactive NST [14].

There were 10 babies (77%) in category III, 4 babies (36.4%) from category II and 7 babies (6.9%) from category I who required admission in NICU which denotes low risk babies according to category I NST required less NICU admission with similar findings in the study by Gurung G et al [5].

1(7.7%) baby from cat III had perinatal mortality.

92.1% from category I group had APGAR score more than 7, 8% of them had APGAR less than 7 whereas only 30.8% in category III had APGAR score more than 7 at 1 minute and 69.2% had APGAR score less than 7. 98% in Cat I had APGAR score more than 7 at 5 minute whereas 46.2% had APGAR less than 7 at 5 minute. Similar to the study done by Patel S et al where patients with reactive NST having APGAR >7 was 96.5%, 3.5% had APGAR less than 7 at 1 minute. In 5 minute 38.9% had APGAR less than 7 [6].

In the study of Eden et al (1988) 98% had good APGAR score [15].

In a study conducted by Bano et al [16] the APGAR score <7 at 5 minutes was 3.4% in the reactive NST group whereas 42.8% in the non reactive group which is quite similar to this study.

In study by Lawrence D Devoe [17] these findings were similar.

In this study 10.9% in Cat I had meconium stained liquor at delivery whereas 54.5% in Cat II and 61.5% in Cat III had same. In the study done by Patel S et al 7.7% of reactive NST and 44.4% of nonreactive NST had meconium stained liquor [6]. This was also similar to the study done by Lohana et al [14].

## 5. Conclusion

Non stress test is a simple, non invasive test. In our study probability of adverse outcome such as meconium stained amniotic fluid, low APGAR score, NICU admission increased with Cat III NST. Hence this simple test could be a good option to use in low resource country like Nepal to screen antenatal cases and early intervention measures for reducing perinatal morbidity.

## List of Abbreviations

**NST:** Non Stress Test

**Cat I, II & III:** Category I, II and III

**LSCS:** Lower Segment Cesarean Section

**NICHD:** National Institute of Child Health and Human Development

## Declaration of Conflicting Interests

The authors declare that there is no potential conflicts of interest with respect to the research, authorship and /or publication of this article

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