Prediction of Foetal Well-being with Non-stress Test

J RAHMAN[a], HA BEGUM[b]

Summary:

Introduction: *Non-stress test (NST) is the most common antenatal test performed to assess the foetus at risk of intrauterine hypoxia. On the other hand non-reactivity detected by NST increases the interferences of pregnancy by Caesarean section.*

Methodology: *A cross sectional descriptive study was carried out in the department of Obstetrics and Gynaecology at Dhaka National Medical College between July2007 and June 2008.*

Objectives: *The objectives of the study were (1) To observe the mode of delivery in cases of non-reactive non stress test (NST) and (2) To evaluate perinatal outcome of non-reactive NST.*

Results: *A total 137 high risk pregnant women were included in the study. Age of the women ranges from 16 to 32 years. The mean age of the women was 23.74 ± 3.71 year. Among them 44.53% were primaegravida and 55.47% were multigravida.*

Gestational age was between 35 and 42 weeks and mean gestational age was 38.34±1.42 weeks. Regarding foetal reactivity 61.3% (n=84) were reactive and 38.7 % (n=53) were non-reactive. Among the babies of non reactive NST 98.11% and 1.89% were delivered by caesarean section and vaginal delivery respectively. Whereas, 48.81% and 51.19% babies of reactive NST were delivered by caesarean section and vaginal delivery respectively. The percentage of caesarean section was much higher in non-reactive NST cases in comparison to that of reactive NST which was statistically highly significant (p value 0.0000). One minute after birth APGAR scoring revealed that 56.6% and 43.4% newborn of non-reactive NST had no depression(APGAR score 7-10) and mild depression (APGAR score 4-6) respectively. On the other hand 65.47% and 34.5% newborn of reactive NST had no depression and mild depression respectively at one minute after birth. Therefore, small difference was noticed in the neonatal status between the reactive and non-reactive NST which had no statistical significance (p value 0.507). Evaluation of the neonates with APGAR scoring done 5 minutes after birth revealed mild depression (APGAR score 4-6) in 24.53% and 20.24% of non-reactive and reactive NST cases respectively and no depression (APGAR score 7-10) was found in 75.47% and 70.76% in reactive and non-reactive NST respectively. So, 5 minutes after birth the neonatal status among reactive and non-reactive NST made no significant difference (p value 0.9266).

Conclusion: *Neonatal evaluation revealed that all foetuses were not compromised as detected by NST. Relying on NST the rate of Caesarean section has been increased. Reassessment of the foetal conditions was needed with the help of other techniques. Therefore NST alone is insufficiently predictive of neonatal outcome.*

Key word: *Non reactive NST, Caesarean section, Neonatal outcome*

(J Banagladesh Coll Phys Surg 2015; 33: 65-69)

Introduction:

The most commonly and widely accepted used antenatal test of foetal well-being is cardiotocography (CTG) – either contraction stress test (CST) or non-stress test (NST).

a. Dr Jahanara Rahman, Associate Professor, Obstetrics and Gynaecology, Dhaka National Medical College.

b. Prof. Hosne Ara Begum, Professor of Obstetrics and Gynaecology, Dhaka National Medical College.

Address of Correspondence: Dr Jahanara Rahman, Associate Professor, Obstetrics and Gynaecology, Dhaka National Medical College, 53/1 Johnson Road, Dhaka-1100, Bangladesh. Contact no: 01819239259, Email: jahanararahman64@gmail.com

Received: 12 November, 2013 **Accepted:** 18 April, 2014

NST is primarily a test of foetal condition, where as CST is a test of utero-placental function. Nonstress test (NST) is a screening method used in pregnancy to identify foetus at risk of developing hypoxia.[1] Grossly its interpretation can be inferred as reactive and non-reactive NST. Reactive NST (normal) means presence of two or more fetal heart rate accelerations within a 20-minute period, with or without fetal movement discernible by the woman. Whereas nonreactive NST is presence of less than two fetal heart rate accelerations within a 20-minute period.[2] Time is extendable to 40 minutes before saying nonreactive.[3] A non-reactive nonstress test does not necessarily mean it is abnormal. Many times, the fetus is asleep during

the procedure. To encourage movement, the mother may be given something to eat or drink to awaken the fetus or the person performing the test may use a buzzer to stimulate movement. However, a non-reactive test could indicate the fetus is not getting enough oxygen. Low levels of oxygen are often caused by problems with the umbilical cord or placenta. It is generally done when the foetus is at least 28 weeks. Indications for having NST test are decreased fetal movement, post date, multiple pregnancy, insulin dependent diabetes, high blood pressure, kidney disease, heart diseases, thyroid dysfunction, intrauterine growth retardation (IUGR), oligohydramnios, polyhydromnios, and previous history of foetal loss during the second half of the pregnancy. Depending on the reason, some women may need to be tested once or more every week until the baby is born.[4] It was originally thought that CTG would be an asset in detecting early poor fetal outcomes, indicating the need for interventions to help improve chances of survival for newborn infants. However, available data suggest that when CTG is used as non-stress test, it can lead clinicians to use unnecessary or inappropriate interventions.[5]

Methodology:

A Cross sectional descriptive study was carried out at in-patient department of Obstetrics and Gynaecology of Dhaka National Medical College Hospital between July 2007 and August 2008 with the objectives to observe the mode of delivery in cases of non-reactive non stress test (NST) and to evaluate perinatal outcome of non-reactive NST.

High risk pregnant women of gestational age between 36 and 42 weeks admitted in the hospital with hypertensive disorders, diabetes mellitus, hypothyroidism, heart diseases and patients had complaint for decreased foetal movements were included in this study purposively. History was taken from the respondents regarding their age, parity, duration of pregnancy, presence of the above mentioned medical disorder and foetal movement by face to face interview. A pre-structured questionnaire was used for collecting data on demographic and obstetric characteristics from the respondents.

During examination the pregnant women were kept at left lateral or semi-recumbent position. An ultrasound transducer for recording of FHR located to obtain best foetal heart signal and tocodynamometer for recording of uterine activity was placed on maternal abdomen at the fundus of uterus. Recording was carried out over a period of 20 minutes at first. If non-stress test remained non-reactive external stimulus was given by palpation or gentle movement of foetus. Then another 20 minutes test was performed. Records were interpreted by senior obstetricians.

Respondents were followed up till delivery and the newborns were observed to see any depression by APGAR scoring.

Results:

During this study period a total 137 high risk pregnant women were included in the study. Age of the women ranges from 16 to 32 years. The mean age of the women was 23.74 ± 3.71 years. Among them 44.53% were primaegravida and 55.47% were multigravida. Gestational ages of the fetuses were between 35 and 42 weeks and mean gestational age was 38.34±1.42 weeks. More than 67 %(n=93) and 32.12% (n=44) babies were born by caesarean section and normal delivery respectively. Indications of caesarean section were Obstetric and non reactive NST in 44% and 56% cases respectively. NST records showed foetal reactivity in 61.3 % (n=84) and non-reactivity in 38.7% (n=53) cases. Among the cases of non-reactive NST 98.11% and 1.89% babies were delivered by caesarean section and vaginal delivery respectively. On the other hand, among the reactive NST cases, 48.81% and 51.19% babies were delivered by caesarean section and vaginal delivery respectively. The percentage of Caesarean section was higher in non-reactive NST than that of reactive NST which was statistically highly significant (P value 0.0000). APGAR scoring 1 minute after delivery, revealed no newborn with severe depression. More than 56% newborns of non reactive NST had no depression (APGAR score 7 to 10) and 43.4% of them had mild depression (APGAR score 4 to 6). On the other hand 65.47% and 34.5% newborns of reactive NST had mild and no depression respectively at 1 minute after birth. No significant difference was noticed in the neonatal status between the reactive and non-reactive NST cases at 1minute after birth (p value 0.507). At 5 minutes after birth, evaluation of the neonates with APGAR scoring was done again which revealed mild depression (APGAR score 4-6) in 24.53% and 20.24% of non-reactive and reactive NST cases respectively and no depression (APGAR score 7-10) in 75.47% and 70.76% respectively. So, after 5 minutes the differences of the neonatal status among reactive and non-reactive NST were not significant (p value 0.9266).

Table-I

Characteristics of Mothers and newborns:

Maternal age (in years)	Minimum	Maximum	Mean
	16	32	23.74 ±3.71
Gestational age (in weeks)	35	42	38.34 ± 1.42
Birth weight(in Kg)	1.8	3.8	2.77 ± 1.32

Sex of newborn	Male		Female	
	n	%	n	%
	78	57	59	43

Parity	Primae		Multi	
	n	%	n	%
	61	44.53	76	55.47

Table-II

Foetal reactivity and mode of delivery

	NVD		LSCS	
	n	%	n	%
Non-reactive NST n=53	1	1.89	52	98.11
Reactive NST n=84	43	51.19	41	48.81

The percentage of Caesarean section was more in non-reactive NST than that of reactive NST which is statistically highly significant. (Chi^2: 30.85, Degree of freedom 1, P value 0.0000)

Table-III

Foetal reactivity vs APGAR score 1 minute after birth

Foetal reactivity	APGAR score (0-3)		(4-6)		(7-10)	
	n	%	n	%	n	%
Non-reactive NST	0	0	23	43.4	30	56.6
Reactive NST	0	0	29	34.5	55	65.47

APGAR score of newborns of non-reactive and reactive NST shows no significant difference. Chi2 test was done which was not also statistically significant.

Chi2 0.44, Degree of freedom 1 and p value: 0.507

Table-IV

Foetal reactivity vs APGAR score 5 minutes after birth

Foetal reactivity	APGAR score (0-3)		(4-6)		(7-10)	
	n	%	n	%	n	%
Non-reactive NST (n=53)	0	0	13	24.53	40	75.47
Reactive NST (n=84)	0	0	17	20.24	67	79.76

APGAR score of newborns of non-reactive and reactive NST five minutes after birth shows no significant difference. Chi2 test was done. One expected cell <5, Yates corrected chi2 001 and p value: 0.9266 which was not also statistically significant.

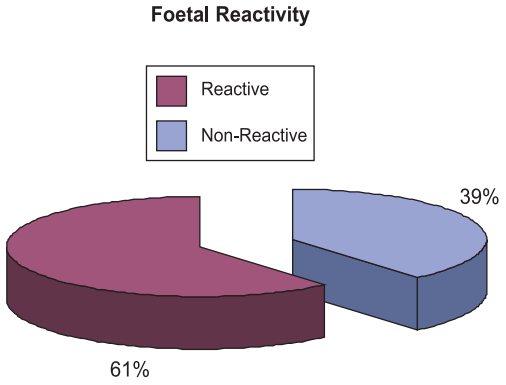

Fig.-1: *Distribution of the population according to foetal reactivity*

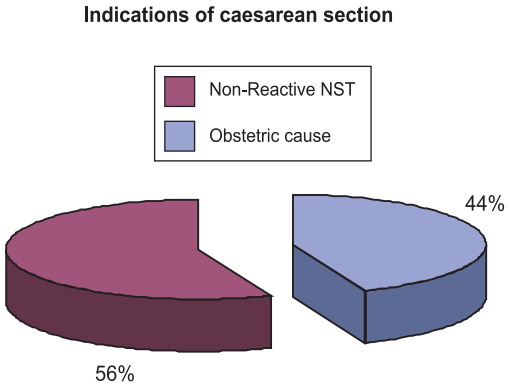

Fig.-2: Distribution of the cases of caesarean section according to indication

Discussion:

The present study was carried out among 137 high risk pregnancies. Non-reactive NST was found among 39% cases (fig1). Bhide A and coworker found 33.57% non-reactive NST among the high risk cases in a study which was similar to our finding.[4] In pregnancy medical disorder like hypertension, diabetes mellitus, heart diseases, kidney disease etc cause placental insufficiency and ultimately are responsible for foetal distress. In this study foetal distresses are detected as non reactive non-stress test (NST).

The study found that higher percentage of caesarean sections were performed among the cases of non-reactive NST than in reactive NST. Among the caesarean sections 56% were performed due to Non reactive NST and 44% due to other obstetric causes (Fig 2). We found that 98.11% babies of non-reactive NST were born by caesarean section and only 1.89% of them were born by normal vaginal delivery. In comparison, 48.81 % and 51.19% babies of reactive NST were born by caesarean section and normal vaginal delivery respectively (Table-II). Therefore the study found increased incidence of caesarean section due to non reactive NST which was statistically highly significant (Chi^2: 30.85, Degree of freedom 1, P value 0.0000). Similarly, a Cochrane Database of systemic review found high incidence of caesarean section due to non reactive NST.[6] An evaluation of NST in Nigeria also found that women who received a non-reactive NST were significantly more likely to deliver by Caesarean section than normal vaginal delivery.[7] Another study showed that over-reliance on the test has led to increased misdiagnoses of fetal distress and hence increased caesarean deliveries.[8]

In present study neonates were evaluated by APGAR scoring at 1 and 5 minutes after birth. Severe depression (APGAR score 0-3) was absent among the newborns of both reactive and non-reactive NST. We found mild depression (APGAR score 4-6) in 43.4% and 34.5% among the neonates of non-reactive and reactive NST respectively at 1 minute after birth. No depression (APGAR score 7-10) was noticed in 56.6% and 65.47% neonate of non-reactive and reactive NST respectively at 1 minute after birth. (Table-III) Therefore small differences were detected among the status of the newborns of non-reactive and reactive NST and the differences were not statistically significant (p value 0.507) also. Again, at 5 minutes after birth evaluation of the neonates with APGAR scoring was done which revealed mild depression (APGAR score 4-6) in 24.53% and 20.24% of non-reactive and reactive NST cases respectively and no depression (APGAR score 7-10) in 75.47% and 79.76% babies of non-reactive and reactive NST respectively (Table-IV). So, after 5 minutes the differences of the neonatal status among reactive and non-reactive NST were not significant (p value 0.9266).Therefore NST could not predict foetal reactivity properly in this study. Grivell RM also found NST insufficiently predictive of neonatal outcome in Cochrane Database of Systematic Reviews.[9]

Relying on non-reactive NST 56% of the population underwent caesarean sections. But, neonatal evaluation found 56.6% and 75.47% of the non-reactive NST babies had no depression at 1 and 5 minutes after birth respectively. Caesarean sections might not be necessary for many of these cases. Immer Bansil and coworkers also found in a study that unnecessary caesarean section is done relying on NST.[10]

In our study, the cases were high risk pregnancy and moreover the detection of non-reactive NST revealed that the foetus were at risk. Further evaluation of the at risk fetuses by sonographically related techniques like biophysical profile or Doppler velocimetry could not be availed in this study place. Therefore the obstetricians had to take decision relying on NST for termination of pregnancy by caesarean section to save the lives of the at risk fetuses which ultimately increased the rate of caesarean section.

Limitation of the study:

Whenever non reactive NST is found it should be reassessed with the help of Doppler velocimetry or biophysical profile. But Doppler velocimetry was not done here due to non availability of the investigation technique in this study place. Moreover many of the women belonged to low socio-economic condition and could not afford the cost of biophysical profile. NST is done with free of cost in this study place. As all these were high-risk pregnancies and reassessment of the non-reactive NST was not possible due to the above mentioned causes, in an intention to save the lives of at risk foetuses caesarean section was done in most of the cases which must not be practiced routinely.

Conclusion:

The study revealed that relying on NST the rate of Caesarean section was increased.

Neonatal outcome showed that in some cases caesarean sections were not needed.

Therefore, NST alone is insufficiently predictive of neonatal outcome. Caesarean section should not be done rationally with the only indication of Non reactive NST. Reassessment of non-reactive NST should be done by Doppler velocimetry or biophysical profile. This attempt was made with small number of study population. Large scale studies of longer duration and reliable interpretation of NST is necessary to get a real picture.

References:

1. Freeman RK, Anderson G, Dorchester W. A prospective multi-institutional study of antepartum fetal heart rate monitoring. I. Risk of perinatal mortality and morbidity according to antepartum fetal heart rate test results. American Journal of Obstetrics and Gynecology 1982; 143:771-777.
2. Association of women's Health, Obstetric, and Neonatal Nurses (2005). In Audrey Lyndon, Linda Usher Ali. Fetal Heart Monitoring: Principles and Practices (3rd ed.). Dubuque, IA: Kendall/Hunt Publishing Co. IBSN 978-0-7575-6324-1.
3. Bhide A, Bhattacharya MS. Predictive value of the non-reactive nonstress test in evaluating neonatal outcome. J Postgrad Med 1990;36:104-5
4. American Pregnancy: Fetal Non-Stress Test (NST) - http://www.americanpregnancy.org/prenataltesting/non-stresstest.html
5. Boehm FH, Salyer S, Shah DM, Vaughn WK. Improved outcome of twice weekly non stress testing. Obstetrics & Gynecology 1986; 67(4):566-568.
6. Alfirevic, Zarko; Devane, Declan; Gyte, Gillian ML (2006). Alfirevic, Zarko. ed. "Continuous cardiotocography (CTG) as a form of electronic fetal monitoring (EFM) for fetal assessment during labour". *Cochrane Database of Systematic Reviews*. doi:10.1002/14651858.CD006066
7. Fawole AO, Sotiloye OS, Oladimeji AO, Alao MO, Hunyinbo KI, Sadoh EA, Ololorin EO. Antenatal cardiography: experience in a Nigerian tertiary hospital. Nigerian Postgraduate Medical Journal 2008; 15:19-23.
8. Goddard, R. (2001). "Electronic fetal monitoring". *BMJ* 322 (7300): 1436–1437
9. Grivell RM, Alfirevic Z, Gyte GML, Devane D. Antenatal cardiotocography for fetal assessment. Cochrane Database of Systematic Reviews 2010; Issue 1. Art. No.: CD007863; DOI: 10.1002/14651858.CD007863.pub2.
10. *Immer*-Bansil, F.F.*Immer*, S. Henle, S.Sporri and S. Petersen-Felix. *Unnecessary* emergency *Caesarean section* due to *silent CTG* during anaesthesia? Br J Anaesth 2001;87:791-3