



CORRELATION OF FETAL OUTCOME WITH NON-STRESS TEST IN HIGH RISK PREGNANCY

Obstetrics & Gynaecology

Dr Neha Singh	Consultant Obstetrics and Gynecology, Sushrrut Medica, Thane, Maharashtra
Dr Kirti Anima Kerketta	Senior Consultant and Unit Head, Department of Obstetrics and Gynecology, Bokaro General Hospital, Bokaro Steel City
Dr Kumari Archana	Senior Consultant, Department of Obstetrics and Gynecology, Bokaro General Hospital, Bokaro Steel City
Dr Amit Raj*	Consultant Spine and Trauma Surgery, Sushrrut Medica, Thane, Maharashtra *Corresponding Author

ABSTRACT

Aim: To evaluate the efficacy of non-stress test in a high risk pregnancy for fetal outcome and establishing it as an easy, non-invasive technique for antepartum fetal surveillance. **Methods:** 155 females booked or un-booked with more than 34 weeks of period of gestation with high risk pregnancies were included with written informed consent. **Result:** Non-Stress test has sensitivity of 72%, specificity of 98%, positive predictive value came out to be 95% while negative predictive value of 85.5% in high risk pregnancies after 34 weeks of gestation. **Conclusion:** NST is a valuable screening test for detecting fetal compromise in pregnancies that have a poor perinatal outcome. Though rate of operative delivery was high, fetal death rate was lower in population undergoing antepartum testing as compared to general untested population.

KEYWORDS

NST, High risk pregnancy, fetal surveillance, fetal wellbeing

INTRODUCTION:

Women with high risk pregnancy are at risk of delivering an asphyxiated new born which may result from abnormality in the fetal gas exchange leading to hypoxia and acidosis [1]. With timely detection of changes in fetal status and appropriate intervention can prevent perinatal mortality and morbidity. Non Stress Test (NST) is being extensively used in the cases of high risk pregnancies because of its advantage of being simple, non-invasive, and can be repeated easily [2,3,4,5]. Gestational age influences acceleration or reactivity of heart rate through autonomic nervous system [6]. NST involves the use of Doppler detected fetal heart rate acceleration coincident with fetal movements perceived by the mother. The basis of NST is the absence of fetal heart acceleration with fetal movements is associated with fetal hypoxemia [7]. The present study is to evaluate the role of non-stress test in a high risk pregnancy for fetal outcome, with the objective to see if an abnormal Non-Stress test can be used to predict adverse perinatal outcome and to see if Non-Stress test can adequately detect fetal distress at an early stage and thus help in decision making.

AIM AND OBJECTIVE:

1. To evaluate the role of non-stress test, a screening method in management of high risk pregnancies admitted in labor room
2. To study the correlation of non-stress test with fetal outcome
3. To assess the positive and negative predictive value of non-stress test.

MATERIAL AND METHODS:

The present study was performed at Bokaro General Hospital, Bokaro Steel City, Jharkhand, India, with approval from the ethical committee. The written informed consent was taken from all the 155 participants with high risk pregnancy after 34 weeks of gestation.

Inclusion criteria-

- Hypertensive disorders of pregnancy
- IUGR
- Anemia
- Decreased fetal movement
- Gestational diabetes
- Postdated pregnancy
- Bad obstetric history
- Oligohydramnios/polyhydramnios
- Antepartum hemorrhage
- Heart disease
- ART/precious pregnancy
- Thyroid in pregnancy
- IHC
- Elderly primi

- Teenage pregnancy
- PROM/PPROM
- Rh incompatibility

Exclusion criteria-

- Pregnant women with gestational age <34 weeks or in labor
- Eclampsia
- Multiple gestation
- Fetal congenital anomalies
- Intrauterine fetal death

METHODOLOGY:

The NST is safe for mother and the baby. All the females booked or un-booked with more than 34 weeks of period of gestation attending OPD or IPD and fulfilling the criteria will be explained about the test. Tocodynamometer Measures uterine contractions, placed at fundus of uterus without jelly. USB probe measures baby's heartbeat applied with jelly at site where maximum fetal heart sound is heard. When the mother feels the baby kick or move, she presses a button on the event marker probe so we can see how the baby's heartbeat changed while moving. The test will take about 20 minutes. The whole event is depicted over screen and is graphed over a specialized paper by printer for permanent record.

Table 1: Parameter Of Evaluation

	Reassuring	Non-reassuring
Baseline fetal heart rate	110-160	Less than 100 More than 160
Beat to beat variability	>5 beats in 20 min	<5 beats in 40-90 min
Acceleration	>2	<2
Deceleration	No deceleration Early deceleration	Variable deceleration Late deceleration
Fetal movement	Present	Absent

RESULT:

Majority of the study population i.e. 68 (43.8%) belong to 26-30 years category followed by 44 (28.4%) subjects are from 21-25 years' category, 36 (23.2%) subjects having age >30 years and least prevalence of 7 (4.5%) mothers belong to 18-20 years. The mean age among study group was found to be 27.9 ± 4.4 years.

Table 2- Maternal Age Distribution Among Study Subjects

AGE	FREQUENCY	PERCENTAGE
18-20	7	4.5%
21-25	44	28.4%

26-30	68	43.8%
>30	36	23.2%

Highest number of study subjects i.e. 111 (71.6%) were identified in 37-40 weeks of gestational age. Around 32 (20.6%) subjects belong to 34-37 weeks of gestational age. Only 12 (7.7%) subjects were in category of >40 weeks of gestational age. Mean gestational age in study population was found to be 39.43±2.34 weeks.

Table 3 - Distribution Of Study Sample According To Gestational Age

GESTATIONAL AGE IN WEEKS	FREQUENCY	PERCENTAGE
34- 37	32	20.6%
37-40	111	71.6%
>40	12	7.7%
TOTAL	155	100%
MEAN AGE	39.43 ± 2.34	

Maximum subjects among study group were primigravida 90 (58.06%) followed by G2 in 41 (26.4%) subjects and least in ≥G3 -24 (15.5%) subjects.

Table 4- Distribution Of Study Sample According To Gravidity

GRAVIDITY	FREQUENCY	PERCENTAGE
G1	90	58.06%
G2	41	26.4%
G3	24	15.5%
More than and equal to 3	155	100%

Majority of the study subjects i.e. 133 (85.8%) had positive booking status while 22 (14.2%) were un-booked.

Table 5: Distribution Of Study Sample According To Booking Status

STATUS	FREQUENCY	PERCENTAGE
BOOKED	133	85.8%
UNBOOKED	22	14.2%
TOTAL	155	100%

Among all the subjects, 109 subjects had single high risk factor. Out of which, 20% had non-reassuring non-stress test. Out of 46 subjects with multiple high risk factors, 47.8 % had non reassuring Non-Stress test. There was increased association between multiple risk factor with non-reassuring NST. Abnormal Non-Stress test increases with an increase in the number of high-risk factors, while the percentage of the normal Non-Stress test is high with only one high-risk factor.

Table 6- Correlation Of Number Of High Risk Factors With Result Of Non-stress Test

	REASSURING NST	NON REASSURING NST	TOTAL
SINGLE HIGH RISK FACTOR	87(80%)	22 (20%)	109(100%)
MULTIPLE HIGH RISK FACTORS	24 (52.17%)	22(47.8%)	46(100%)

Out of 155 subjects, 111(72%) had reassuring NST and 44 (28%) had non-reassuring Non-Stress test. Commonest risk factor was IHC 26(17%), gestational hypertension associated with other risk factors 19(12%), and preeclampsia 14 (9%). Hypertensive disorder of pregnancy accounted 33 (16%). Most common risk factor associated with non-reassuring NST was hypertensive disorders of pregnancy (22%), IUGR with and without associated risk (20%), IHC (11.36%), postdated pregnancy and subjects presenting with less fetal movement were 9% each. GDM (6.82%), hypothyroidism (4.5%), abruption placentae (2.2%) and Rh incompatibility (2.2%).

Table 7: Correlation Of High Risk Factors With Result Of Nst

		R		NR	
High risk	Number of subjects	N	%	N	%
IUGR	4(2.5%)	2	1.80	2	4.55
IUGR ASSOCIATED WITH OTHER RISK FACTORS	14(9%)	7	6.31	7	15.91

GESTATIONAL HYPERTENSION	19(12%)	12	10.81	7	15.91
PREECLAMPSIA	14(9%)	7	3.60	7	6.82
LESS FETAL MOVEMENT	8(5%)	4	3.60	4	9.09
POSTDATED PREGNANCY	12(8%)	8	7.21	4	9.09
OLIGOHYDRAMINOS	9(6%)	8	7.21	1	2.27
ANEMIA	3(2%)	3	2.70	0	0.00
GDM	12(8%)	9	8.11	3	6.82
IHC	26(17%)	21	18.92	5	11.36
ELDERLY PRIMIGRAVIDA	6(3%)	6	4.50	0	0.00
HYPOTHYROIDISM IN PREGNANCY	17(9%)	15	10.81	2	4.55
PREGNANCY FOLLOWING ART	2(1%)	2	1.80	0	0.00
BOH	3(2%)	3	2.70	0	0.00
Rh INCOMPATIBILITY	2(1%)	1	0.00	1	2.27
TEENAGE PREGNANCY	2(1%)	2	1.80	0	0.00
ABRUPTIO PLACENTAE	2(1%)	1	0.90	1	2.27
TOTAL	155(100%)	111	100	44	100

Among 133 subjects with positive booking status, 98(74%) had reassuring Non-Stress test result while 35 (26%) had non-reassuring Non-Stress test findings.

Out of 22 subjects with unbooked status, 13 (59%) had reassuring Non-Stress test result while 9 (41%) had non-reassuring Non-Stress test findings.

On comparing Non-Stress test findings according to booking status, statistical significant association ($p < 0.05$) was observed between Non-Stress test results and booking status indicating higher reassuring results in booked subjects.

Table 8 - Correlation Of Booking Status With Result Of Non-Stress Test Among Study Subjects

	BOOKED		UNBOOKED	
	Frequency	Percentage	frequency	Percentage
REASSURING	98	74%	13	59%
NON REASSURING	35	26%	9	41%
Total	133	100%	22	100%
	Chi square test = 7.196, $p = 0.043^*$ (statistical significant association)			

Most of the subjects with non-reassuring Non-Stress test underwent LSCS (98%) and only 2% were delivered vaginally. However, 25% of reassuring group were delivered vaginally and 75% underwent LSCS. Statistical significant difference ($p < 0.05$) was observed in relation to different modes of delivery in non-reassuring NST group. Rate of LSCS was 98% and vaginal delivery was (2%)

Table 9: Correlation Of Mode Of Delivery With Result Of Non-Stress Test

MODE OF DELIVERY	REASSURING (n=111)		NON REASSURING (n=44)	
	FREQUENCY	%	FREQUENCY	%
VAGINAL DELIVERY	28	25%	1	2%
LSCS	83	75%	43	98%
TOTAL	111	100%	44	100%
	Chi square test = 14.65, $p = 0.015^*$ (statistical significant difference)			

Most common indication of LSCS among non-reassuring group was fetal distress accounting for 44.1% followed by failed IOL (32.5%) and severe preeclampsia (13.9%) while in reassuring group, fetal distress constituted 10.8%, failed IOL was 36.1%. Severe preeclampsia accounted for 12%. 2.32% subjects with meconium stained liquor had non-reassuring NST where as 2.4% belonged to reassuring group. Subjects who underwent LSCS for previous LSCS as an indication, 6.9% had non-reassuring NST and 12% had reassuring NST.

Table 10: Indication Of Lscs In Study Group

INDICATION	REASSURING (n=83)		NON REASSURING (n=43)	
	FREQUENCY	%	FREQUENCY	%
Fetal distress	9	10.8	19	44.1
Malpresentation	4	4.8	0	0
MSL	2	2.4	1	2.32
Failed IOL	30	36.1	14	32.5
Severe preeclampsia	10	12	6	13.9
Previous LSCS	10	12	3	6.9
Precious pregnancy	2	2.4	0	0
CPD	15	18.07	0	0
Abruptio placenta	1	1.2	0	0
TOTAL	83	100	43	100

Among 155 study subjects, 111 with reassuring NST, 97(87%) had normal color Doppler result while 14 (13%) subjects had abnormal color Doppler result. Out of 44 subjects with non-reassuring NST 10(23%) had abnormality in color Doppler and 30(77%) normal color Doppler.

Table 11: Correlation Of Color Doppler Result With Non-stress Test

DOPPLER	REASSURING NST	NON REASSURING NST
NORMAL DOPPLER	97(87%)	34(77%)
ABNORMAL DOPPLER	14(13%)	10(23%)
TOTAL	111(100%)	44(100%)

Mean amniotic fluid index was 11.36 cm in reassuring group while it was 10.37 cm in non-reassuring group. Significant association was found between non-stress result and amniotic fluid index. ($p < 0.025$)

Table 12: Mean Amniotic Fluid Index Among Study Group

	REASSURING Mean (SD)	NON REASSURING Mean (SD)	Unpaired 't' test	p value, Significance
AFI	11.36 (2.36)	10.37 (2.41)	$t = 2.264$	$p = 0.025^*$

In reassuring group, all neonates had Apgar score >7 at 5 min while in subjects with non-reassuring NST, 6 (14%) neonates had Apgar score <7 and 38(86%) had APGAR >7 at 5 min.

Table 13: Correlation Of Neonatal Apgar At 5 Min With Result Of Non-stress Test

	REASSURING		NON REASSURING	
	FREQUENCY	%	FREQUENCY	%
APGAR >7 at 5 min (n=149)	111	100%	38	86%
APGAR <7 at 5 min (n= 6)	0	0%	6	14%
N=155	111	100%	44	100%

On distribution of neonatal birth weight for gestational age, it was observed that in 111 subjects which belong to reassuring Non-Stress test results, appropriate size for gestational age (AGA) was seen in 67%, small for gestational age (SGA) and large for gestational age (LGA) were 16% and 17% respectively. Among 44 subjects with non-reassuring NST, small size for gestational age (SGA) – 41%, Appropriate for gestational age (AGA) 48%, LGA -11%. On association of birth weight of neonates for gestational age with non-stress test results, there was highly statistical significant association ($p < 0.001$) obtained with SGA having high proportion (45%) of NR NST while LGA had only 2.5% of NR NST

Table 14: Correlation Of Neonatal Birth Weight With Result Of Non-stress Test

	REASSURING (n=111)		NON REASSURING (n=44)	
	Frequency	Percentage	FREQUENCY	PERCENTAGE
AGA	74	67%	21	48%
SGA	18	16%	18	41%
LGA	19	17%	5	11%
TOTAL	111	100%	44	100%
Chi square test value = 17.55, $p < 0.001^{**}$ Highly statistical significant association				

In the present study 19% neonates in reassuring Non-Stress test group required NICU admission while 45% neonates in non-reassuring NST were admitted in NICU. Meconium stained liquor was observed in 6% reassuring Non-Stress test and 39% in non-reassuring NST group. Still births were not reported in either group

Table 15: Correlation Of Neonatal Outcome With Result Of Non-Stress Test

NEONATAL OUTCOME	REASSURING (n=111)		NON REASSURING (n=44)	
NICU ADMISSION (YES)	21	19%	20	45%
APGAR <7 at 5 min	0	0	6	14%
MECONIUM GRADING	7	6%	17	39%
STILL BIRTH	0	0%	0	0%

Meconium stained liquor was seen in 17 neonates. 6 neonates had Apgar <7 at 5 min and fetal distress was found in 19 subjects in non-reassuring NST group. There were 7 neonates with meconium staining in reassuring group while had fetal distress. No still birth in both the group

Table 16: Correlation Of End Result With Result Of Non-stress Test

	NON REASSURING NST	REASSURING
MECONIUM STAINED LIQUOR	17	7
APGAR <7 AT 5 MIN	6	0
FETAL DISTRESS	19	9
STILL BIRTH	0	0

Performance of non-Non-Stress test was correlated with fetal outcome. The study showed Non-Stress test has sensitivity of 72%, specificity of 98%. The positive predictive value came out to be 95% while negative predictive value of 85.5%. Hence, non-stress test can be used as a screening test to identify fetal distress so that early intervention and mode of delivery can be planned.

Table 16 : Performance Of Non-stress Test With End Result

	SENSITIVITY	SPECIFICITY	PPV	NPV
RESULT OF NST	72%	98%	95%	85.5%

DISCUSSION:

Obstetricians have long searched for methods of antepartum fetal surveillance that would be noninvasive, accurate and yield immediately available results. In the past, efforts are made to improvise fetal surveillance methods to identify those fetuses requiring intervention, to prevent death or damage and allowing us not to interfere with those pregnancies doing well, letting healthy fetuses go to term. In this study, 155 patients with high-risk pregnancy were evaluated by non-stress test at Bokaro General Hospital, Jharkhand. Most of the antenatal mothers belong to age group between 26-30 years and the mean age was found to be 27.9 ± 4.4 years which is almost comparable to other studies. The mean age in study conducted by Singh S et al was 25.09 ± 3.78 years [11]. In study conducted by Bhutiyan A et al, the mean age of study participants was 28.63 years and a SD of 4.841 years [12]. In the present study, 155 high risk pregnant patients with gestational age >34 weeks underwent Non-Stress test. The mean gestational age among study group was 39.43 ± 2.34 weeks which is comparable to study conducted by Bhutiyan A et al, where the mean age of study participants was 268 days and a SD of 4 days i.e. $38.2 \text{ weeks} \pm 4 \text{ days}$ [12]. In study conducted by Singh S et al 30% of the study subjects belong to 37-40 weeks gestation. The mean gestational age in high risk cases with reactive NST and non-reactive NST result were 38.5 ± 2.1 weeks. Maximum subjects in present study were primigravida (n=90) 58.6% which was also seen in other studies. In study conducted by Patange RP 52.6% were primigravida [13]. In study of Singh S et al, 56% were primigravida. Majority of the study subjects i.e. 133 (85.8%) were booked at our hospital while 22 (14.2%) were unbooked and attended emergency. Similar results were seen in study conducted by Patange RP et al, where 83.33% of the patients were booked while 16.67% of the patients were unbooked. Among all the subjects, 109 had single high risk factor. Out of 109, 80% had reassuring NST while 20% had non-reassuring NST. Among 46 subjects with multiple high risk factors, 47.8 % had non-reassuring NST and 52.2% had reassuring

NST. There was association between multiple risk factor with non-reassuring NST which was also seen in study done by Patange RP et al where 50% abnormal Non-Stress test was seen in subjects with 3 high risk factors and 10% in group with only 1 high risk factor. Most common high risk factor in this study group was intrahepatic obstetric cholestasis associated with and without other high risk factor (17%), Hypertensive disorders of pregnancy (16%) as second common high risk factor, which was also seen in the study conducted by Patange RP et al (15.3%) and study by Shreya S et al had pre-eclampsia and eclampsia as the commonest high risk factor (39%). However highest percentage of non-reassuring NST was seen (hypertensive disorders of pregnancy) hypertension and pre-eclampsia (23%) followed by IUGR and IUGR associated with other risk factor (20.5%). Subjects presenting with less fetal movement (5%) and postdated pregnancy were 8%. Most common high risk factor in the study by Patange RP et al was overdue pregnancy (60.6%), which was only 8% in present study. This may be attributed to high number of booked cases who were regularly followed up and was planned for delivery by 40 weeks of gestation. Study of Bhutiyani A et al showed PET (18%) as second most common high risk factor (18%) and gestational hypertension accounted (n=2) 4.3% which in our study is included in hypertensive disorders of pregnancy. Of the total 155 high risk pregnant patients, 44 (28.3%) had non-reassuring NST and 111 (71.6%) had reassuring Non-Stress test which is comparable to study done by Singh S et al which had 60% reassuring and 40% non-reassuring Non-Stress test result. This result is consistent with the study done by Himabindu et al which showed 70% reactive and 30% non-reactive NST [14]. Munshi D et al had similar result 54% had reactive NST and 46% had non-reactive NST. Among 155 study sample, 133 (86%) were booked at our hospital, of which 26% (35) had non-reassuring NST, 74% (98) had reassuring NST. 22 subjects who attended emergency ward with unbooked status, 41% showed non-reassuring NST. Statistical significant association ($p < 0.05$) was observed between stress test results and booking status indicating higher reassuring results in booked subjects. In present study, LSCS was done in 97.5%. Only 1 (2%) with non-reassuring NST was delivered vaginally. Most common indication of LSCS among Non-reassuring NST was fetal distress (44.1%) followed by failed induction of labour (32.5%). In study of Singh S et al, 90% subjects with non-reactive NST underwent LSCS and most common indication was fetal distress, while 10% delivered vaginally. In study of Himabindu P et al, 46% underwent LSCS. Most common indication was failed IOL (12%) followed by fetal distress (11%). In reassuring group of present study, 25% were delivered vaginally while 75% underwent LSCS. In study of Singh S et al, 76.7% of antenatal women delivered vaginally and 23.3% of antenatal women delivered with caesarean section in reactive NST group. Most common indication of LSCS in this group was failed IOL (36.1%). All subjects in this study were further evaluated with ultrasonography and umbilical artery color Doppler. Of 40 subjects with non-reassuring NST, 10 (25%) had abnormal color Doppler study while 30 (75%) had normal color Doppler result.

Among reassuring NST group (111), 97 (87%) had normal color Doppler and only 14 (13%) had abnormal Doppler result which was consistent with study conducted by Verma U et al and WJ Ott who concluded that color Doppler in association with NST improves the sensitivity and specificity to detect fetal hypoxia and distress [15,16]. Mean amniotic fluid distribution among study group. Study group with non-reassuring NST had a mean value of 11.5 cm and reassuring NST group had 10.5 cm as mean AFI. There was clinical significance suggesting liquor can affect the fetal condition. In study of Bhutiyani A et al, 10.9% had low liquor in non-reactive group where as 6.5% had low liquor in reactive group and found that Non-Stress test have very highly significant association with quantity of liquor in high risk group as compared to low risk group. Among the non-reassuring Non-Stress test group neonatal outcomes were compared. On comparing neonatal birth weight among the two groups, 18 (45%) out of 44 were below 2.5 kg which was comparable with studies of Bhutiyani A et al where, 33.3% neonates in high-risk group with non-reassuring NST were below 2.5 kg birth weight. In study by Lohana et al, 12 babies were below 2.5 kg birth weight, of which 41.67% belonged to non-reassuring NST group [17]. In a study by Bano I et al, 31.8% of the babies with reactive NST had low birth weight where as in this study 16% were below 2.5 kg in reassuring group [18]. A low one minute Apgar score does not correlate with infants future outcome. Hence Apgar at 1 min has not been included in the study. Long term neurological correlation is obtained at 5 min score which is of more value. In this study, among all the neonates with non-reassuring NST,

15% had Apgar <7 at 5 min where as 85% of neonates had Apgar >7 at 5 min. Among the reassuring NST group none had Apgar <7 at 5 min which is comparable to study conducted by Lohana et al, in which the non-reactive group had 60% neonates with low Apgar scores, 40% had good Apgar score at 5 min i.e. >7. And similar results were observed in study conducted by Bano I et al, 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. Overall incidence of good Apgar may be observed due good neonatal resuscitation efforts between 1 min and 5 min. Also operative intervention may be attributed to good neonatal Apgar. On comparing other parameters, 49% of neonates required NICU admission among non-reassuring group where as 51% of neonates requiring NICU admission had reassuring NST. This is due to NICU admission for observation in neonates born to high risk mothers like GDM, preterm deliveries and SGA babies. In a study by Bano I et al, 3.6% of the pregnant mothers with reactive NST required NICU admission, whereas 28.5% of the fetus born to pregnant mothers with non-reactive strip required NICU admission. In a study by Lohana et al, 13 babies were shifted to NICU, 69.23% babies had non-reactive strip, 4 babies required ventilator support, 75% of them had a non-reactive strip. Meconium stained liquor was seen in 64% in non-reassuring NST group and 36% in reassuring group which is comparable to study conducted by Lohana et al, which had meconium stained liquor in 33.33% of non-reactive NST compared to 8.24% of reactive NST. There was no still birth. This may be attributed to early recognition of distress and timely intervention as seen with study of Kelly and Kulkarni who estimated a 44% potential saving among monitoring [19]. Bano I et al also had no perinatal mortality [18]. Neonatal outcome for correlation of result Non-Stress test took into account 4 factors. Meconium staining of liquor was seen in 17 neonates, Apgar <7 at 5 min was seen in 6 and 19 had fetal distress. Performance of non-stress test was evaluated which showed sensitivity of 72%, specificity of 98%, PPV came out to be 95% and NPV was 85.5%. Similar study was done by Munshi D et al and concluded sensitivity of 71.4%, specificity of 98%, PPV 60%, NPV 77%. This suggests that when NST is nonreactive, early delivery by either vaginal or caesarean route is indicated. Thus NST results can help in early decision making to achieve optimal maternal and fetal outcome.

CONCLUSION:

Non-Stress test can be used as an effective screening method to identify high risk fetuses and segregate the population that is at risk of perinatal mortality and morbidity. Reactive NST is reassuring and indicates fetal wellbeing and non-reactive NST along with other modalities like BPP and color Doppler can be used to identify high risk fetuses. The potential advantage of NST is that, it identifies fetuses at risk and hence early intervention and mode of delivery can be planned. The use of NST in monitoring high risk pregnancies may result in an increase in the incidence of operative delivery as seen in our study but it can be effectively used in high risk pregnancies because a reactive NST, can reliably identify a healthy fetus and an abnormal (non-reactive) NST should alert the clinician to consider the possibility of fetal compromise and has to be followed up by other adjunctive tests (Biophysical profile, color Doppler) to help further improve obstetric outcome. In conclusion, NST is a valuable screening test for detecting fetal compromise in pregnancies that have a poor perinatal outcome. Though rate of operative delivery was high, fetal death rate was lower in population undergoing antepartum testing as compared to general untested population. We are able to save the babies in cases of non-reactive non-stress tests by prompt decision to deliver when the baby was salvageable.

REFERENCES:

- O'Neill E, Thorp J. Antepartum evaluation of the fetus and fetal well being. Clinical obstetrics and gynecology. 2012 Sep;55(3):722.
- Restriction IG. Screening, Diagnosis and Management. SOGC practical Guideline. J. Obstet. Gynaecol. Can. 2013;35(8):741-8.
- Lear CA, Westgate JA, Ugwuamadu A, Nijhuis JG, Stone PR, Georgieva A, Ikeda T, Wassink G, Bennet L, Gunn AJ. Understanding fetal heart rate patterns that may predict antenatal and intrapartum neonatal injury. In Seminars in pediatric neurology 2018 Dec 1 (Vol. 28, pp. 3-16). WB Saunders.
- Smith CV, Phelan JP, Paul RH. A prospective analysis of the influence of gestational age on the baseline fetal heart rate and reactivity in a low-risk population. American journal of obstetrics and gynecology. 1985 Dec 1;153(7):780-2.
- Gegor CL, Paine LL, Johnson TR. Antepartum fetal assessment: a nurse-midwifery perspective. Journal of nurse-midwifery. 1991 May 1;36(3):153-67.
- CYPHER RL. Antepartum Fetal Surveillance and Prenatal Diagnosis. Core Curriculum for Maternal-Newborn Nursing E-Book. 2015 May 12:135.
- Cunningham FG, Leveno KJ, Bloom SL, Spong CY, Dashe JS, Hoffman BL, Casey BM, Sheffield JS. Obstetrica de Williams. McGraw Hill Brasil;2016-17.p551-556, 21st edition.
- Gabbe SG, Niebyl JR, Simpson JL, Landon MB, Galan HL, Jauniaux ER, Driscoll DA,

- Berghella V, Grobman WA. Obstetrics: normal and problem pregnancies e-book. Elsevier Health Sciences; 2016 Mar 18.
9. Pazos R, Vuolo K, Aladjem S, Lueck J, Anderson C. Association of spontaneous fetal heart rate decelerations during antepartum non-stress testing and intrauterine growth retardation. *Am J Obstet Gynecol*. 1982 Nov 1;144(5):574-7
 10. Druzin ML, Gratacos J, Paul RH, Broussard P, McCart D, Smith M. Antepartum fetal heart rate testing: XII. The effect of manual manipulation of the fetus on the nonstress test. *American journal of obstetrics and gynaecology*. 1985 Jan 1;151(1):61-4.
 11. Singh S, Premi HK, Gupta R. The role of non-stress test as a method to evaluate the outcome of high-risk pregnancy: a tertiary care center experience. *International Surgery Journal*. 2020 May 26;7(6):1782-7
 12. Bhutiyani A. Correlation of Non Stress Test with Fetal Outcome in High Risk Pregnancy at Tertiary Hospital: A Prospective Study (Doctoral dissertation, Sree Mookambika Institute of Medical Sciences, Kulasekharam).
 13. Patange RP, Patil SS, Shah PD, Kadam D, Chavan V. Non-Stress Test in High-Risk Pregnancy. *Int J Cur Res Rev* Vol. 2020 Sep;12(18):112.
 14. Himabindu P, Sundari MT, Pavani S. Evaluation of Non-stress test in Monitoring High Risk Pregnancies. *J Dental Med Sci*. 2015;14(4):40-2.
 15. Verma U, Garg R, Rani R, Jain M, Pathak A. Comparative Study of Foetal Colour Doppler versus Non-Stress Test as a Predictor of Perinatal Outcome in High Risk Pregnancy. *Obstet Gynecol Int J*. 2015;2(6):00065.
 16. Ott WJ. Comparison of the non-stress test with the evaluation of centralization of blood flow for the prediction of neonatal compromise. *Ultrasound in Obstetrics and Gynecology: The Official Journal of the International Society of Ultrasound in Obstetrics and Gynecology*. 1999 Jul;14(1):38-41.
 17. Lohana RU, Khatri M, Hariharan C. Correlation of nonstress test with fetal outcome in term pregnancy (37-42 Weeks). *Int J Reprod Contracept Obstet Gynecol*. 2013;2(4):639-45
 18. Bano I, Noor N, Motwani L, Arshad Z. Comparative study of nonstress test and fetal acoustic stimulation test in assessment of fetal well-being. *Journal of South Asian Federation of Obstetrics and Gynecology*. 2011 Apr 4;3(1):6-9.
 19. Kelly VC, Kulkarni D. Five years study of continuous monitoring on obstetrical service. *Obstet Gynaecol*. 1973;41:6-9.