ORIGINAL ARTICLE

A STUDY OF FETAL OUTCOME BASED ON NST IN POST DATED PREGNANCY

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HOW TO CITE THIS ARTICLE:
M. Krishnaveni. " A study of fetal outcome based on NST in postdated pregnancy". Journal of Evidence based Medicine and Healthcare; Volume 2, Issue 13, March 30, 2015; Page: 2087-2099.

ABSTRACT: OBJECTIVES: Postdate pregnancy is the most common indication for Antepartum fetal heart rate testing because of its increased perinatal morbidity and perinatal mortality. Immediate neonatal problems such as asphyxia, meconium aspiration, respiratory distress, seizures and metabolic derangements are particularly common. Postdated patients accounted for 1/3 of the pregnancies requiring caesarean section for fetal distress because these fetuses tolerate labour poorly. **MATERIALS AND METHODS:** The study population considered of 100 inpatients whose pregnancy was beyond 41 weeks and underwent Antepartum fetal heart rate testing and delivered within seven days from the last NST at Vani vilas Hospital attached to Bangalore Medical College and Research Institute. Study period: 16.01.2014 to 15.01.2015. **RESULTS:** NST's were recorded for 100 patients out of which 82 were reactive and 18 were non-reactive. The patients were induced in all 82 reactive patients before induction CPD was ruled out and the state of Cervix was assessed and primed in some cases. Out of 82 reactive cases 47 delivered vaginally, 9 Forceps delivery, 26 cases underwent LSCS for Various indications. Out of 18 non- reactive cases there was no CPD in any patients. 2 Patients delivered vaginally, another 16 cases under went LSCS (Fetal distress-10, Meconium-03, Cord Factor-03). **CONCLUSION:** NST is used as a primary antepartum surveillance test in postdate patients. At our Institution, the reactive NST has proved a reliable indicator of fetal well-being. However when viewed at the reports it shows that reactivity alone is insufficient to assure fetal well-being. The presence FHR decelerations during and NST was associated with a less favourable outcome for the fetus.

KEYWORDS: NST- Non Stress Test, CPD- Cephalo Pelvic Disproportion, CST- Contraction Stress Test, LSCS- Lower Segment Caesarean Section, FD- Fetal Distress, R-Reactive, NR-Non Reactive, TR- Test Result, ND-Normal Delivery, VD- Vaginal Delivery, FD-Forceps Delivery, PROM- Premature Rupture Of Membranes, NS- Not Studied, PIH- Pregnancy Induced Hypertension, APH- Antepartum Hemorrhage , AFVI Amniotic Fluid Volume Index.

INTRODUCTION: When the pregnancy is prolonged, due to an increased risk in utero-placental dysfunction, as a high perinatal morbidity and mortality rate. Induction of labour in these patients could lead to an increase in premature deliveries or caesarian sections for failed inductions. As a result fetal surveillance has been used in the post-date patient until there is evidence of fetal compromise or the cervix is favourable for induction. As a means of assessing fetal well-being in the postdate pregnancy, several approaches have been advocated, which include Biophysical, Biochemical or a combination of the two. But when compared with other methods the Non-Stress Test as several advantages over the other methods.

POST DATE PREGNANCY: DEFINITION: Uniform criteria are lacking as to the precise definition of post maturity. Literally, any pregnancy which has passed beyond the expected date of delivery is called a prolonged or post-dated pregnancy.

INCIDENCE: With Naegeles rule 80% deliver at Term. In post-maturity overall incidence is 2-10%, Delivery beyond 290 days is < 2%.
Anderson et al., showed that a known date of l

Complications of post maturity

a. During Pregnancy : Hypoxia

b. During Labour : Baby Tolerate labor poorly
Prolonged labor
Asphyxia
Intracranial hemorrhage (big baby and non-moulding of the head)
Shoulder dystocia
2-5 fold increased operative delivery
(forceps or caesarean section)
Scanty liquor amni and less wartons jelly in the cord favour cord compression.

c. Following Birth : Meconium Aspiration syndrome
-Atelectasis
-Hypoglycemia (metabolic Instability)
-Temperature Instability
-Polycythemia
-Neurological damage
-Growth retardation (developmental disturbance)

d. Average Perinatal : Term1-2%

Death rate Post Term 5-7%

CLIFFORD STAGING SYSTEM (1952) [1]

STAGE I	: Changes of skin-wrinkled and peeling but not Meconium stained.
STAGE II	: All findings of Stage I with meconium stained fluid and signs of fetal distress. The meconium staining affects the fetal skin, placental membrane and umbilical cord.
STAGE III	: The infant and the placenta are typically stained yellow because of meconium had been passed for several days earlier and the bile base has broken down. These signs are related to placental insufficiency.

A series of changes occur in the Amniotic fluid, placenta and fetus with prolongation of pregnancy.

The postdated pregnancy is studied under two divisions:

1. Physiologic changes associated with prolonged gestation.

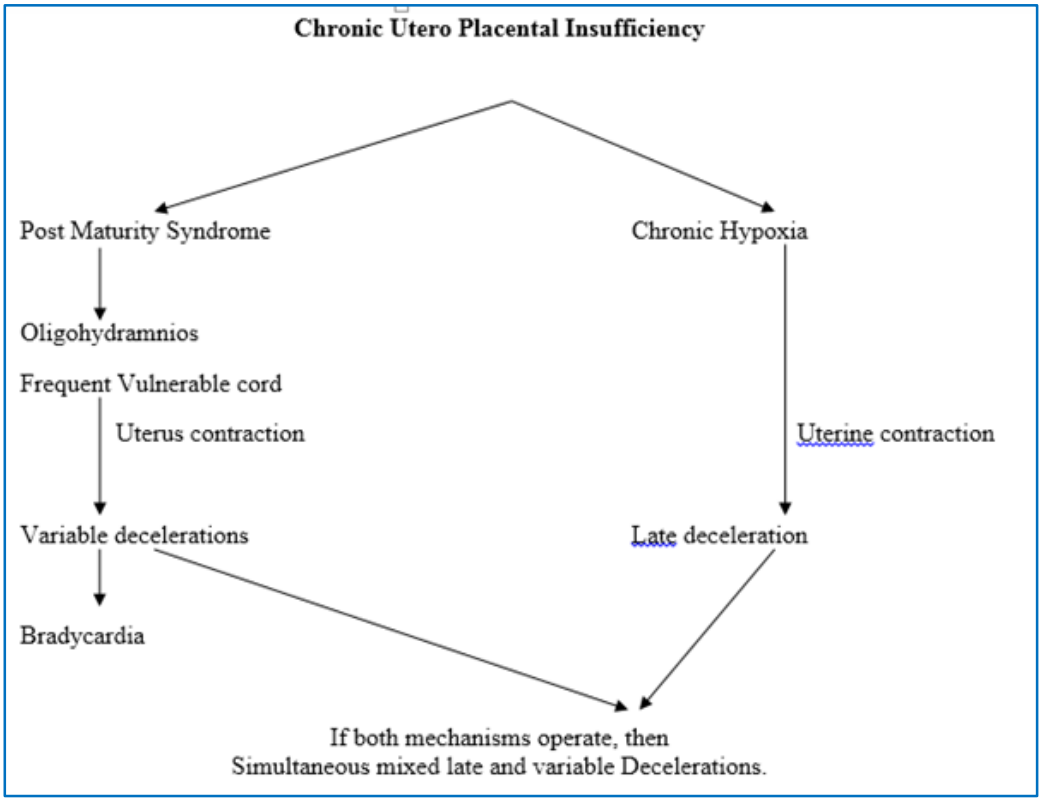
a. Amniotic fluid changes.
b. Placental changes.
c. Fetal changes (Macrosomia, Post maturity signs)

2. Fetal problems with prolongation of pregnancy.

a. Intrapartum fetal distress.
b. Meconium Aspiration.
c. Fetal trauma.
d. Post Maturity syndrome.

The use of cervical ripening agent has reduced the perinatal morbidities.

PLACENTAL CHANGES: In post term pregnancies, chronic progressive utero placental insufficiency has been postulated to be mechanism of fetal distress and / or death. The expected fetal distress pattern would be that of repetitive late deceleration.



FLOW CHART 1: CHRONIC UTERO PLACENTAL INSUFFICIENCY

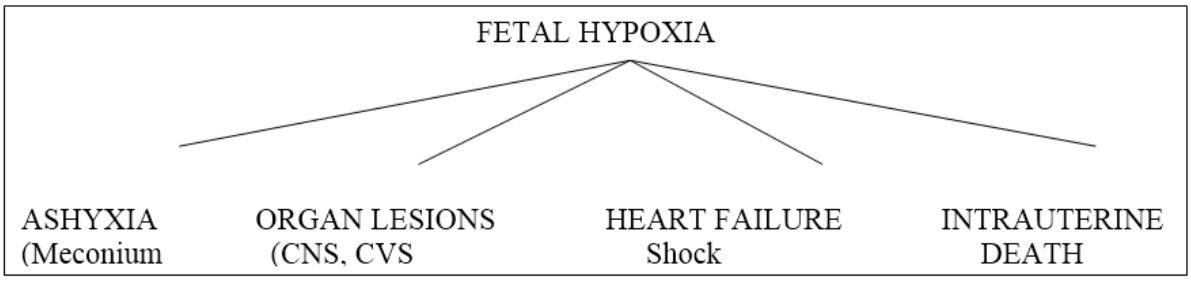
The peak of placental function is reached at 36 weeks of gestation Amniotic fluid volume decreases rapidly from 38th week on and oligohydramnios is usually a sign of insufficient placental function.

Increased risk in post maturity due to:

1. Cessation of fetal and placental growth around 41 to 42 weeks of gestation.
2. Increased degenerative placental lesions in post-term gravidas.
3. Decreased amniotic fluid volume and increase in incidence of meconium staining of amniotic fluid.
4. Decreased fetal oxygen (Lowered oxygen content in venous cord blood) and nutrient supply (waste of fat deposits, wrinkled skin, etc.,)
5. Increased pathologic processes within the fetoplacental unit.
6. Increased rates of fetal distress and perinatal death of post-term gravidas as reported by most investigators.

1.	Over-all incidence of fetal post maturity 2-10% a. Term gravidas-3%
2.	Perinatal Mortality rates a. Overall 13-36% b. Between weeks 42-44 : 3-15%
3.	Distribution of perinatal mortality rates a. Before onset of labor :9-30% b. During labour :45-93% c. All intrauterine deaths :75% d. After birth :7-25% (respiratory distress : brain, heart, liver, adrenal damage)
4.	Postnatal morbidity :16-46% (respiratory distress, mainly)
5.	Congenital malformations and stillbirth rates a. Post maturity : 9% b. All gestational ages :6%
6.	Amniotic fluid changes a. Volume: reduced to 250ml or below (normal term values: 800ml) b. Fat cells: increase or orange-staining fat cells over 50% (normal term values: 10-50%)
7.	Vaginal smear :appearance of parabasal cell (normal term values: 0/85-95/5-15)
8.	Fetal heart rate pattern: prolonged deceleration in cases of severe fetal asphyxia.
9.	Lowered urinary estriol excretion : 30% excrete less than 12 mg. of estriol per 25 hours into the urine (normal term values : 15-23mg. Per 24hours)
10.	Myometrium a. Persistent quiescence (" Progesterone block") b. During labor :Sluggish performance (uterine inertia).
11.	Umbilical venous cord blood

	a. Decreased oxygen saturation: below 40% (normal term values: 55-70%); oxygen content below 8 vol. % (normal term values: 12 vol%) b. Hemoglobin concentration increased: 16.8-20.5 gm. Per 100 ml. (normal term values: 15-18.6 gm. Per 100 ml.)



FLOW CHART 2: FETAL HYPOXIA

AMNIOTIC FLUID VOLUME CHANGES:

38 Weeks	1000ml
Term	800 ml
42 Weeks	480 ml
43 Weeks	250-330 ml
44 Weeks	160 ml

AFVI: If AFVI is < 5 (Oligohydramnious) then there is increased incidence of meconium liquor, fetal acidosis, caesarean section for fetal distress, perinatal morbidity and mortality and low agar score.

Reduced AFV increases the perinatal mortality by 2% and low APGAR score incidence increased to 10%.

NST is the most commonly employed antepartum evaluation test for the fetal wellbeing. The rationale underlying this test is that the presence of spontaneous fetal heart rate acceleration (FHR) associated with fetal movements is an indicator of fetal wellbeing.

Advantages:

1. Non-invasive.
2. Outpatient procedure.
3. Inexpensive.
4. Simple.
5. Easy to perform.
6. Physician is not necessary.
7. Trained personal is sufficient.
8. Less time consuming.
9. Easily accepted by patients.
10. Can be repeated.

In 1975, Roger K. Freeman and Lee[2] used the term NST.

Indications:

1. Postdate pregnancy.
2. Chronic Hypertension.
3. Decreased fetal movement.
4. Hypertensive disease of pregnancy.
5. Insulin dependent diabetes (A-D).
6. PIH.
7. Suspected Fetal dysmaturity.
8. Rh iso immunization.
9. APH.
10. Sickle cell anaemia.

Contraindication: Nil

The following is as set of criteria for interpretation of the NST

1. **REACTIVE:** Two acceleration of 15 beats per minute lasting 15 seconds associated with fetal movement, twenty minutes of observation. If this criteria are not met, stimulation by motion sound (vibro acoustic by using artificial larynx) or glucose ingestion can be employed.
2. **SUSPICIOUS TEST:** Less than two accelerations (15 bpm, 15 secs) with movement, or accelerations but unassociated with movement.
3. **NON-REACTIVE:** None of the criteria for reactive tests, met no acceleration and often poor variability.
4. **UNINTERPRETABLE:** Insufficient data obtained during testing period. Depending on the test results:

Reactive	-	Evaluation weekly until delivery
Non-reactive	-	To be followed by a OCT or CST
Suspicious NST	-	Further evaluation by repeat NST within 24 hours or CST
Uninterpretable	-	Requires further test of fetal wellbeing (i.e., BPP, OCT or CST).

Interpretations also depend on:

a. Base line fetal heart rate.
b. Variability of the fetal heart rate.
b. Presence or absence of accelerations.
c. Presence or absence of decelerations.
d. Absence of fetal movement.

READING THE TRACINGS: Five components of the tracing can be identified

1. Baseline heart rate.
2. Periods of speeding up or accelerations, generally a sign of fetal health.

3. Periods of slowing down or decelerations, which could be mechanical or chemical and always require special attention.
4. Oscillations along the baseline for frequency.
5. Amplitude of oscillations, which generally implies an alert central nervous system (CNS) and absence of myocardial depression and also depends on the fetal movement tracings.

NON-REACTIVE NST: Extension of tests to 120 minute usually reduce the incidence of non reactive test by 50%After lunch and time passage of outpatient non-reactive NST's were repeated and 75% showed a reactive pattern. The false positive NST has commonly resulted from inadequate length of observation. The non-reactive pattern incidence in more in preterm fetuses.
In case of persistent non-reactive NST back up tests like CST, BPP can be done.

HOW OFTEN TO DO IN INDIVIDUAL CASES:

1. Weekly in normal cases, at 41 weeks.
2. Biweekly in post datism, GDM, Rh immunization, IUGR.
3. Daily after 42 weeks.

MATERIALS AND METHODS: The study population considered of 100 inpatients whose pregnancy was beyond 41 weeks and underwent Antepartum fetal heart rate testing and delivered within seven days from the last NST at Vani vilas Hospital attached to Bangalore Medical College and Research Institute. Study period: 16.01.2014 to 15.01.2015.

Inclusion criteria:

a. A history of regular menses.
b. Certainty of last menstrual period (LMP).
c. Pregnancy beyond 41 weeks.
d. No history of oral contraception recently.
e. No history of investigation of infertility.
f. No history of induction of ovulation.

Exclusion Criteria:

a. Twin pregnancy.
b. Breech pregnancy.
c. Infants with congenital anamoly.
d. Chorioamnionitis cases.

The majority of these patients met three or more of this criteria and all met the exclusion criteria.

Informal written consent was obtained from the patients.

During the study period the technique for performance and the interpretation of the NST and CST remained the same.

FHR testing was performed during the post prondial period and no sedation was given in previous four hours. During the test, the patient was maintained in a semi-fowler position. FHR, uterine contractions and fetal movements were recorded with COROMETRICS Fetal Monitor. (Model no. FM9534)

Fig. 1: MODEL FM9534 COROMETRICS

Blood pressure was checked for every 10 minutes.

Reactive pattern was not found within 20 minutes, the fetus was stimulated either with abdominal palpation or with the administration of a glucose containing beverage.

If acceleration were not seen within 40 minutes from the onset of testing the pattern was deemed non-reactive.

RESULTS: Out of 100 patients in the study group 82 were Reactive and 18 were Non-Reactive. The patients were induced in all 82 Reactive patients before induction CPD was ruled out and the state of cervix was assessed and primed in some cases.

Out of 18 Non- Reactive cases there was no CPD in any patients. 11 patients directly taken up for caesarean section.

In the remaining 7 patients CST was done. Out of this 2 were positive and landed with caesarean section. In the remaining 5 patients, patient was allowed for vaginal delivery and in one induced with cerviprime gel. These 5 cases were also taken up for surgery because of fetal distress during the course of labour.

The pregnancy outcome was evaluated according to the following criteria.

a. Caesarean section.
b. Frequency of caesarean section for fetal distress.
c. Apgar score less than 7 at 1 and 5min.
d. Presence of meconium stained fluid.
e. Abnormal cord position (Nuchal or body cord or velamentous insertion).
f. And signs of post maturity (loss of subcutaneous fat, wrinkling or peeling of skin, meconium staining of skin, long nails).

Depending on the test results the cases were classified into reactive (82) and non-reactive (18). The mother and baby were followed up till discharge from hospital.

Group	Age Yrs	Para 1		Para 2		Para3		Para4	
		No.	%	No.	%	No.	%	No.	%
I	18-20	37	37	5	5	-	-	-	-
II	21-30	14	14	28	28	10	10	4	4
III	31-35	-	-	2	2	-	-	-	-

TABLE 1: CLASSIFICATION ACCORDING TO AGE (100)

Depending on the age group the 100 cases were divided into Group I, Group II, and Group III. Depending on the parity the 100 cases were grouped into para 1, para 2, para 3 and para 4.Depending on the test results 100 cases were grouped as reactive (82) and non-reactive (18).

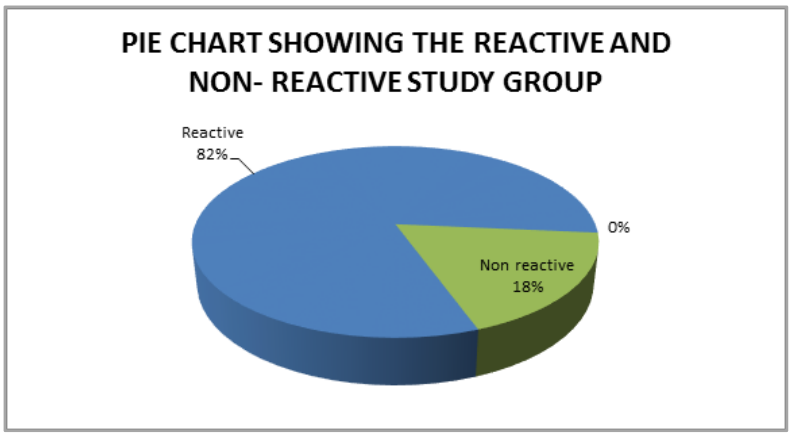


Fig. 2: PIE CHART SHOWING THE REACTIVE AND NON- REACTIVE STUDY GROUP

Test Result	Number	%
Reactive	82	82%
Non-Reactive	18	18%
Total	**100**	**100%**

TABLE 2: CLASSIFICATION DEPENDING ON TEST RESULTS

Out of hundred cases 82 were Reactive and 18 were Non-Reactive.

Group	Gestational age (Weeks)	Reactive (82)		Non-Reactive (18)	
		No.	%	No.	%
I	40-41	64	78.0	14	77.8
II	41-42	14	17.0	2	11.1
III	42 + 2 days	4	5.0	2	11.1

Total	**---**	**82**	**100.0**	**18.0**	**100.0**

TABLE 3: CLASSIFICATION DEPENDING ON GESTATIONAL AGE

The hundred cases were grouped into three groups depending on the gestational age.

Group	Weight in grams	Number	Percentage
I	2001-2500	21	21%
II	2501-3000	50	50%
III	3001-3500	23	23%
IV	3501-4000	6	6%

TABLE 4: CLASSIFICATION ACCORDING TO FETAL WEIGHT IN GRAMS

Mode of delivery	Reactive (82)	Non-Reactive (18)
	No.	No.
Vaginal delivery	47	2
Forceps	9	NIL
Caesarean section	26	16
C.S. (fetal distress)	13	10
Failed induction	2	NIL
Meconium, Cx dilation < 3cms	5	3
Prolonged labour	2	NIL
Cord factor	2	3
Oligohydramnios	2	NIL

TABEL 5: CHART SHOWING THE MODE OF DELIVERY (100 CASES)

Test Result	CST Cases	CST +ve	Mode of delivery			Apgar at 1′ & 5′ < 7	Apgar at 5′ <7
			Vaginal	LSCS	Forceps		
Non-Reactive	7	2	-	2	-	2	1

Table 6: CST AND MODE OF DELIVERY IN NON REACTIVE TEST (18)

Out of 18 Non-Reactive cases, 7 cases tested with CST. 2 were CST +ve ended with emergency LSCS. Out of 5 CST –ve cases labour was induced. One delivered vaginally and remaining were developed fetal distress and ended up with emergency caesarean section.

Particulars	Pheelan et al.,[3]	Study Group		Total
		Reactive	Non-Reactive	
	No.	No.	No.	
Number	239	82	18	100

Casearean Section	42	26	16	42
Caesarean (FD)	13	13	10	23
Meconium	99	5	3	8
Apgar <7 at 1min	47	7	2	9
Apgar < at 5 min	6	0	1	1
Post maturity	40	23	9	32
Nuchal cord	49	2	3	5
Perinatal mortality	2	0	1	1
Test delivery interval	2.7+ 2.3	3	1	2
Birth Wt > 4000 gms	52	0	0	0

TABLE 7: COMPARATIVE STUDY BETWEEN FOREIGN AUTHOR'S AND STUDYGROUP

The incidence of caesarean section fetal distress and caesarean section is high in our study group. This is because the author has followed a Bio-physical profile, where as our study is purely based on Non Stress Test results only.

NST Results	No. of Patients	Perinatal mortality No.
Reactive	82	00
Non-Reactive	18	01

TABLE 8 : Perinatal mortality in 100 cases

As shown in the above table perinatal mortality in the reactive group was nil. Whereas it is about 01in the Non-Reactive group.

Particulars	Imam Bano et al., India.[4]		Study Group		Total
	Reactive	Non-Reactive	Reactive	Non-Reactive	
Number	96	4	82	18	100
Casearean Section	23	3	26	16	42
Caesarean (FD)	2	3	13	10	23
Meconium	18	4	5	3	8
Apgar <7 at 1min	1	3	7	2	9
Apgar < at 5 min	0	1	0	1	1
Post maturity	NS	NS	23	9	32
Nuchal cord	NS	NS	2	3	5
Perinatal mortality	0	2	0	1	1

TABLE 9: A comparative study between Indian author's study and study group

DISCUSSION: NST provides reliable predictive information about the fetal condition. The result suggests that reactive FHR pattern reflects good fetal outcome. There was no intrauterine death within a week of reactive NST, which indicates adequate placental reserve for one week.

The presence of deceleration in a reactive NST also had a poor outcome similar to the non-reactive group of postdate patients. These data suggests that the non-stress test, when reactive without evidence of FHR decelerations, is a reliable indicator of fetal wellbeing in the post date pregnancy. However, a reactive Non Stress Test with evidence of FHR decelerations is associated with a significant increase in perinatal morbidity.

As observed by Miyazaki and Miyazaki.[5], Pheelan.[3] and Lewis and Freeman.[2] et al- when FHR is associated with deceleration the outcome is not favourable.

Out of 100 study cases 82 were reactive and 18 were non-reactive. In the reactive group 57 cases were not associated with deceleration. Here the incidence of caesarean section for fetal distress was 50% in comparison with deceleration pattern present was 66.7%. In the reactive group the Apgar score < 7 at 5min was nil.

Out of the 18 non-reactive patients 2 delivered vaginally and the rest was taken up for caesarean section. The Apgar score less than 7 at 5 min in this group was 1. The perinatal mortality rate is 01.

CONCLUSION: At our Institution, the reactive NST has proved a reliable indicator of fetal wellbeing. However when viewed at the reports it shows that reactivity alone is insufficient to assure fetal wellbeing. The presence of FHR decelerations in the NST was associated with a less favourable outcome for the fetus.

Out of 100 studied post-dated patients 82 were reactive and 18 were non-reactive. In 82 patients 68.2% were delivered vaginally in the reactive group and 11.1% delivered vaginally in the non-reactive group. The incidence of caesarean section in the reactive group is 31.8% where as in the non-reactive group it is about 88.9%. The caesarean section for fetal distress is 15.9% in the reactive group and 62.4% in the non-reactive group. The incidence of cord factor was 2.4% in the reactive group where as 18.8% in the non-reactive group. In all the cases meconium was observed in the O.T. before rupture of the membranes.

The incidence of caesarean section 24.7% when decelerations were absent in a reactive NST. No perinatal death has been occurred in the reactive group.

Whereas it is 48% when decelerations were present. The overall fetal mortality in the study group was (01/100) cases. This is because the study was based only on NST results.

Antepartum fetal monitoring has proved to be beneficial in assessing the fetal wellbeing. The non-stress test is a simple noninvasive, time saving and repeatable test. When employed in time the perinatal morbidity and mortality can be reduced. FHR decelerations can also be associated with decreased amniotic fluid in which the umbilical cord is vulnerable to compression.

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Date of Submission: 24/03/2015.
Date of Peer Review: 25/03/2015.
Date of Acceptance: 26/03/2015.
Date of Publishing: 30/03/2015.