PREDICTIVE VALUE OF ADMISSION CARDIOTOCOCGRAM TEST IN PERINATAL OUTCOME

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ABSTRACT

BACKGROUND
The present study was undertaken to test the reliability of admission test to identify compromised foetuses and to correlate the test results with different parameters of adverse foetal outcome and mode of delivery.

MATERIALS AND METHODS
An admission Foetal Heart Rate (FHR) tracings was obtained by cardiotocogram on 100 antenatal mothers, both high and low risk in early labour for 20 minutes and then categorised based on RCOG criteria for interpretation of admission test. Perinatal outcome and mode of delivery were analysed with the help of Kruskal-Wallis chi square test.

RESULTS
1. Preeclampsia was the most common high risk factor in our study.
2. Mean gestational age at delivery in high risk group was 37 weeks compared to 39 weeks in low risk group.
3. The percentage of LSCS is more in non-reactive tracings, but this value is not statistically significant as p value is 0.0524 in high risk group and 0.0636 in low risk group.
4. In high risk category in non-reactive group, 6 out of 9 i.e. 66.7% had low Apgar score making the p value 0.0001, which is statistically significant.
5. The duration of hospital stay was also more in babies with non-reactive tracings, a mean of 7 days as compared to 5 days in reactive group in high risk patients. This value is statistically significant as the p value is 0.04.
6. The specificity of admission test in predicting perinatal mortality in high risk pregnancies is quite high; it is 95% and the negative predictive value is 93%. The sensitivity of the test is 70% and positive predictive value is found to be 78%.

CONCLUSION
By analysing our study carefully and comparing it with similar studies in literature we can conclude any non-reactive tracings should be extended for 40 minutes along with foetal stimulation to reduce the false positive rates. Admission test increases the rate of LSCS in both high and low risk groups. Non-reactive tracings in both high and low risk groups are associated with more foetal distress, low Apgar, prolonged NICU care and increased perinatal mortality.

KEYWORDS
Admission Test (AT), Non-Stress Test, Reactive Trace, Non-Reactive Trace, Foetal Heart Rate (FHR).


BACKGROUND
The purpose of obstetric care is to optimise maternal and foetal safety. The clinical decisions are always a balance between the risk to the foetus if undelivered and the risk to the mother and foetus if the pregnancy continues. In an attempt to stratify the risk, a variety of screening tests are performed during prenatal and intrapartum periods to identify high risk population. These include detailed patient history, physical examination, laboratory tests - non-stress test, contraction stress test, sonographic assessment of foetal biophysical profile, Vibroacoustic stimulation, amniotic fluid assessment, Doppler velocimetry. There is no single test that is ideal for all high risk foetuses.

Financial or Other, Competing Interest: None.
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DOI: 10.14260/Jemds/2017/394

The “Admission” Cardiotocogram
Dynamic screening test for the state of oxygenation of the foetus on admission of mother to labour room, to detect compromised foetuses. It assesses the placental reserve by checking the response of FHR during the phase of temporary occlusion of uteroplacental blood supply. The incidence of emergency caesarean section for foetal distress is higher in the first hour of labour than in any subsequent single hour. This is because the onset of contraction reveals the foetus that is unable to cope with the relative hypoxia of labour. Such foetuses may then be delivered or subjected to additional tests of foetal surveillance like continuous CTG (Cardiotocography) throughout labour in order to prevent adverse outcomes.

Advantages of Admission CTG over Auscultation
A crucial advantage of the admission CTG is the ability to assess all parameters of foetal heart rate including baseline variability. Presence of accelerations, normal baseline heart rate, variability more than 5 bpm and absence of any decelerations are features of a normal reassuring CTG.6 Although, auscultation may provide the baseline foetal heart rate and indicate presence of accelerations/decelerations -
baseline variability is not audible to the unaided ear and quantification/description of type of decelerations may be difficult.

The admission CTG being a visual test can make patients as well as clinicians feel reassured that the foetus is not at risk of hypoxia at the time of admission and is unlikely to develop hypoxia in the next few hours.

For this reason, performing electronic foetal monitoring in for the first hour of labour even in low risk pregnancies (“Admission test”) has become popular in some maternity units, unfortunately no studies of sufficient size have been conducted to enable an evolution of the usefulness of this approach.

In this study, effectiveness and the role of admission stress test has been evaluated for assessing the perinatal outcome of foetuses in both high and low risk pregnancies.

MATERIALS AND METHODS
This prospective study was undertaken in (Meenakshi Mission Hospital and Research Centre from Dec. 2011 to Dec. 2012); 50 high risk patients and 50 low risk patients were studied.

Inclusion Criteria
1. Patients of all age groups who give informed consent.
2. Singleton, non-anomalous pregnancies of 32 weeks or more weeks of gestation delivering at MMHRC.

RCOG Criteria for Interpretation of Admission Test

<table>
<thead>
<tr>
<th>Feature</th>
<th>Baseline (bpm)</th>
<th>Variability (bpm)</th>
<th>Decelerations</th>
<th>Accelerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reassuring</td>
<td>110 – 160</td>
<td>≥ 5</td>
<td>None</td>
<td>&gt; 2</td>
</tr>
<tr>
<td>Non-Reassuring</td>
<td>100 – 109</td>
<td>&lt; 5 for &gt; 40 to &lt; 90 minutes</td>
<td>Early deceleration Variable deceleration Single prolonged deceleration up to 3 minutes</td>
<td>The absence of accelerations with an otherwise normal CTG are of uncertain significance</td>
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<td></td>
<td>161 – 180</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abnormal</td>
<td>&lt; 100</td>
<td>&lt; 5 for ≥ 90 minutes</td>
<td>Atypical variable decelerations Late decelerations Single prolonged Single prolonged deceleration &gt; 3 minutes</td>
<td>The absence of accelerations with an otherwise normal CTG are of uncertain significance</td>
</tr>
<tr>
<td></td>
<td>&gt; 180</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Sinusoidal pattern ≥ 10 minutes</td>
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</table>

Table 1

<table>
<thead>
<tr>
<th>Category</th>
<th>Definition</th>
</tr>
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<tbody>
<tr>
<td>Normal</td>
<td>All four features fall into the reassuring category</td>
</tr>
<tr>
<td>Suspicious</td>
<td>A CTG whose features fall into one of the non-reassuring categories and the remainder of the features are reassuring</td>
</tr>
<tr>
<td>Pathological</td>
<td>A CTG whose features fall into two or more non-reassuring categories or one or more abnormal categories</td>
</tr>
</tbody>
</table>

Table 2

Extended up to 40 minutes for the non-reactive traces.

Outcome
The patients were then followed up for the mode of delivery and perinatal outcome. At the time of delivery following data variables were collected - perinatal mortality, foetal distress during labour, 5 mins Apgar score of > 5, Meconium Stained Amniotic Fluid (MSAF), duration of NICU care.

Statistical Tools
Using Epidemiological Information Package (EPI 2002) software, range, frequencies, percentages, means and
standard deviations were calculated. Kruskal-Wallis chi-square test was used to test the significance of difference between quantitative variables and Yate’s chi square test for qualitative variables. A ‘p’ value less than 0.05 is taken to denote significant relationship.

Result Analysis
The mean age for high risk pregnancy and low risk pregnancy were 26.5 years and 25.9 years respectively. Most of the patients attending our hospital were from class 3 socioeconomic status.

The mean gestational age in High Risk (HR) group was 37 weeks at delivery, whereas in Low Risk (LR) group the mean gestational age was 39 weeks. This is statistically significant as the p value is 0.0001.

Lower gestational age at delivery in high risk group was due to preterm PROM, severe preeclampsia, IUGR, warranted early delivery in this group. Also, percentage of non-reactive admission test was more in high risk group leading to early delivery of baby. Maximum number of patients in our study had more than one high risk factor. Preeclampsia is the most common risk constituting 42% of the total cases high risk factor in our study.

Comparing the admission test results, the total percentage of non-reactive test in our study was 22%. The percentage of non-reactive admission test (18%) in high risk group was more than reactive (4%), but it is not statistically significant as p value is 0.05.

Comparing, the rate of LSCS in reactive and non-reactive traces the rate of LSCS in non-reactive high risk group was 88.9% and in reactive case it was 53.7%. While the rate of LSCS in low risk group in non-reactive cases was 100% and 22.9% in reactive traces.

In high risk non-reactive group, non-reactive admission test with unfavourable cervix was the most common indication for LSCS constituting 43.3% of cases followed by foetal distress 13.3% meconium stained liquor 13.3%, failed induction 10% and non-progression of labour.

LSCS for Intrapartum Foetal Distress
In low risk patients in non-reactive category there were two patients, both were delivered by LSCS and one had thick meconium stained liquor, other patient had intrapartum foetal distress.

Out of 100 patients, clinical foetal distress was seen in 8 out of 89 reactive traces (8.9%) and 2 out of 12 of non-reactive traces (10%). In high risk group, 3 out of 41 reactive traces had clinical foetal distress, (7%) one out of 8 non-reactive had intrapartum foetal distress (12%).

In low risk group 4 out of 48 reactive traces had intrapartum distress (8.3%), one of two patients had intrapartum foetal distress (50%). Thus, clinically detected foetal distress was more common in non-reactive traces in both high and low risk cases compared to low risk group.

Perinatal Outcome
Out of 100 patients, 24 had meconium staining of liquor. In high risk group, out of 9 non-reactive tracings 5 had meconium stained liquor (55%).

In low risk group, out of 2 non-reactive tracing two had meconium staining of liquor (50%). Thus, the incidence of meconium staining is more in non-reactive tracings compared to reactive group.

In HR category in non-reactive group, 6 out of 50 i.e. 66.7% had low Apgar score making the p value 0.0001, which is statistically significant. In low risk category, out of the 2 cases 1 had low Apgar. All reactive cases had good Apgar score. In high risk cases in reactive traces 7.1% had low Apgar and in non-reactive cases 25% had low Apgar.

Analysing NICU care among the high risk patients, 76% of babies received NICU care, whereas in low risk patients only 18% received NICU care making it statistically significant as the p value is 0.0001. The duration of hospital stay was also more in non-reactive admission test babies, a mean of 7 days as compared to 5 days in reactive group in high risk patients. This value is statistically significant as the p value is 0.04.

In low risk group also, out of 50 babies 9 were admitted in NICU i.e. 8 from reactive category and one from non-reactive category. But since there were only 2 non-reactive tracings, this value is not statistically significant.

Perinatal Mortality
In 50 low risk cases 48 had reactive traces, out of which 47 (97.9%) were discharged alive and healthy; 2 patients had non-reactive AT, both the babies expired. P value was 0.0024. In high risk group out of 50 cases, 41 had reactive traces and 38 (92.2%) were discharged alive and healthy; 9 had non-reactive traces, 7 babies expired in neonatal period. Perinatal mortality in high risk case is 77.8%.

DISCUSSION
Comparing the AT results in high risk group, out of 50 patients 41 patients had a reactive AT tracings and 9 had NR AT tracings. In low risk group, 48 patients had reactive tracings and two patients had NRAT tracings. Percentage of non-reactive tracings in high risk group is 18% and that of reactive group is 4% only. The total percentage of NRAT in our study is 22%. This is almost similar to other studies found in the literature. Nochimson D [1] in his study had 23.8% (187/786) non-reactive tracings. Shivani Khandelwal in her study had 24% non-reactive tracings.

Analysing the Mode of Delivery
Comparing the rate of LSCS in reactive and non-reactive traces, the rate of LSCS in non-reactive HR group is 90.9% and in reactive case it is 53.7%. While the rate of LSCS in LR Group in non-reactive cases is 100% and 22.9% in reactive traces. KIDD noted found LSCS rate to be 29% in a series of 77 patients. Bhid[5] studied NRAT in 143 cases and found the false positive rates for LSCS to be as high as 74.36%.

Phelan J .[6] studied 3000 AT tracings done in 1452 high risk patients and observed that 14% tests were non-reactive and in these women there were significant increase in LSCS rates for foetal distress and perinatal mortality rates.

In low risk patients in non-reactive category there are two patients, both are delivered by LSCS and had thick meconium stained liquor. Other patient had Intrapartum foetal distress.

LSCS for Intrapartum Foetal Distress
Out of 100 patients, clinical foetal distress was seen in 8 out of 89 reactive traces (8.9%) and 2 out of 12 of non-reactive traces (10%). In high risk group, 3 out of 41 reactive tracings and two patients had NRAT tracings. Percentage of non-reactive tracings in high risk group is 18% and that of reactive group is 4% only. The total percentage of NRAT in our study is 22%. This is almost similar to other studies found in the literature. Nochimson D [1] in his study had 23.8% (187/786) non-reactive tracings. Shivani Khandelwal in her study had 24% non-reactive tracings.
had clinical foetal distress (7%). One out of 8 non-reactive had intrapartum foetal distress (12%).

In low risk group 4 out of 48 reactive traces had intrapartum distress (8.3%), one of two patients had intrapartum foetal distress (50%). Thus, clinically detected foetal distress was more common in non-reactive traces in both high and low risk cases compared to low risk group.

Ingermarsson [8] found that patients with reactive admission test had low rate of intruterine asphyxia (0.9%), whereas in 50% of cases with ominous traces had intruterine foetal asphyxia with a low scalp pH and neonatal depression.

Perinatal Outcome
In our study, it is found that in HR category in non-reactive group 6 out of 50 i.e. 66.7% had low Apgar score making the p value 0.0001, which is statistically significant. In low risk category, out of the 2 cases 1 had low Apgar all reactive cases had good Apgar score. Out of 100 patients, 24 had meconium staining of liquor. In high risk group, out of 9 non-reactive tracings 5 had meconium stained liquor (55%).

In low risk group, out of 2 non-reactive tracing two had meconium staining of liquor (50%). Thus, the incidence of meconium staining is more in non-reactive tracings compared to reactive group.

In a similar study by Shivani[4] in low risk group in non-reactive traces 50% had low Apgar in reactive group, 100% had good Apgar in high risk cases in reactive.

RESULTS AND ANALYSIS
Traces 7.1% had low APGAR in non-reactive cases 25% had low APGAR In their study in low risk group, 8.6% of the patients with reactive AT had meconium stained liquor, whereas 25% of the patients whose AT was non-reactive had meconium stained liquor. In the high-risk group, 9.5% of the patients had admission test reactive had meconium stained liquor whereas 37.5% of the patient had meconium stained liquor when the AT was nonreactive. So it is observed that occurrence of meconium was high in patients with nonreactive AT in both groups (p =0.05).

Assessment of Stress Test increases the rate of LSCS in both high and low risk groups. Non-reactive traces in both high and low risk groups are associated with more foetal distress, low Apgar, prolonged NICU care and increased perinatal mortality.

Assessment test may be best recommended as a screening test in all patients irrespective of whether they are high-low risk patients, as the incidence of neonatal morbidity and mortality is high in non-reactive tracings. The limitations of the study are that the present study included only 100 patients in early labour due to time constraints. A large study may be able to better evaluate the AT as screening test for predicting adverse perinatal outcome in high and low risk pregnancies.

<table>
<thead>
<tr>
<th>Our Study (%)</th>
<th>Sarno et al [%]</th>
<th>Ingermarsson et al [%]</th>
<th>Sood Military Hospital Jodhpur</th>
<th>Shivani Khandelwal et al [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity</td>
<td>70</td>
<td>83.3</td>
<td>23.5</td>
<td>41</td>
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<td></td>
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<td></td>
<td>33.3</td>
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<tr>
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<td>99.4</td>
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<td>PPV</td>
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<td>66.6</td>
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<tr>
<td>NPV</td>
<td>93</td>
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<td></td>
<td></td>
<td></td>
<td>81.8</td>
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</table>

Table 3

From our study, the specificity of AT in predicting perinatal mortality in high risk pregnancies is 95% and the negative predictive value is 93%. The sensitivity of the test is 70% and positive predictive value is 78%.

It is almost similar to other International studies; Sarno,[7] in their study in 1989, found specificity and PPV of AT for foetal distress was 84.5% and 98%. The sensitivity and PPV was found to be 83.3% and 23.8% respectively.

Ingermarsson[8] in their study (1986) found out the specificity and NPV value to be 99.4% and 98.7% respectively. This value is similar to our study. The sensitivity and PPV was 35% and 38%, respectively.

In a study in Sood Military Hospital, Jodhpur, sensitivity of AT was 94% and NPV was 72%. The specificity and NPV was 41% and 86% respectively. Another study by Shivani[9] sensitivity and NPV for perinatal mortality was 94.7% and 81.8% which was almost similar to our study.

CONCLUSION

By analyzing our study carefully and comparing it with similar studies in literature, we can conclude any non-reactive tracings should be extended for 40 minutes along with foetal stimulation to reduce the false positive rates.

REFERENCES