

A Study of Cardiotocography during Active Labour to Assess the Perinatal Outcome in High Risk Pregnancy

Trupti J. Dhakare^{1*} and Kiran P. Patole²

¹P. G. Student, Department of Obstetrics and Gynaecology, Dr. Vasant Rao Pawar Medical College, Hospital and Research Centre, Nashik 422003, India; trupti217@yahoo.com

²Professor and Head, Department of Obstetrics and Gynaecology, Dr. Vasant Rao Pawar Medical College, Hospital and Research Centre, Nashik 422003, India

Abstract

Introduction: Cardiotocography is a test performed during active labour. It was used to assess the fetal wellbeing. **Aim:** To evaluate the CTG in high risk pregnancies and assess the perinatal outcome. **Materials and Methods:** Prospective observational study was conducted on 105 high risk pregnant patients fulfilling the eligibility criteria & written informed consent. Complete clinical & obstetrics examination was done. CTG monitoring was done during active labour. The results of CTG were studied according to NICE guidelines. Perinatal outcome were studied by Apgar score, NICU admission. **Results:** Out of 105 patients 56.2% were primigravida. Post datism was the most common risk factor present in 35.2% females followed by PIH (31.4%), oligohydramnios (18.1%), Anaemia (17.1%), Prev. LSCS (16.2%) and IUGR (16.2%). Normal CTG pattern was observed in 62.9% while suspicious and abnormal pattern was observed in 13.3% and 23.8% pregnancies respectively. Over one third of females with suspicious and abnormal CTG pattern had Thick Meconium Stained Liquor (MSL) during pregnancy. ($p < 0.05$) The association of abnormal pattern in CTG and caesarean section was found to be statistically significant ($p < 0.001$). The Sensitivity and Specificity of CTG for predicting neonatal morbidity was 81.25% and 82.2%, while it's PPV and NPV was 66.6% and 90.9%. **Conclusion:** CTG appears to be a simple non-invasive test that can serve as a screening tool in assessing fetuses of high risk obstetric patients in hospitals/centers with a heavy workload and limited resources.

Keywords: Apgar Score, Cardiotocography, Foetal Distress, Perinatal Outcome

1. Introduction

One of the main concerns of obstetricians is the early recognition of fetal distress during labour in order to avoid an adverse outcome¹. Intrapartum fetal asphyxia with significant metabolic acidosis at delivery was shown to occur in approximately 20-25 infants per 1000 births². Fetal monitoring during labor identifies the fetuses at risk of hypoxic damage, so that appropriate intervention could be instituted to optimize perinatal outcome. Such an approach is introduced to prevent neurological injury, including cerebral palsy³. For this purpose, Electronic Fetal Monitoring (EFM) has widely been adopted. Although with intermittent auscultation the baseline Fetal Heart Rate (FHR) can be measured, other features

of the fetal heart such as baseline variability, accelerations and decelerations are difficult to quantify⁴. The use of an intrapartum cardiotocography (CTG) has increased over the last 15 years. As a consequence there is a considerable decrease in the overall perinatal mortality & morbidity. Some authors have attributed this decreasing trend to the use of CTG. Today CTG is a first line investigation for antepartum and intrapartum foetal assessment⁵.

Ingemarsson *et al.*⁶ described an alternative method of monitoring FHR during labour in high risk patients whose fetuses were compromised on admission or were likely to become compromised in labour.

The CTG is a short test usually of 20 minute, which records the FHR immediately after admission to the labour ward⁷. This can also be done during the active

*Author for Correspondence

phase of labour. The basis of CTG is that the uterine contraction during labour causes a stress on the placental circulation. This compromise in circulation is picked up by the fetal brain with the help of various stimuli such as chemoreceptors, baroreceptors, and direct effect of metabolic changes within the brain itself. The brain sends signals to the fetal heart to alter its rate on a moment to moment basis. These changes or alterations in the FHR are thus recorded on the CTG⁸.

Hence this study is conducted to assess the outcome in high risk patients using CTG during the labour to prevent morbidity or mortality from uteroplacental and fetoplacental insufficiency due to maternal risk factors, placental disorders or fetal diseases.

2. Aims and Objective

- To study CTG findings during active phase of labour in high risk patients.
- To correlate CTG findings with perinatal outcome.

3. Materials and Methods

3.1 Study Type and Area

This study was conducted during 2012 to 2014. It is a prospective observational study conducted in department of Obstetrics & Gynaecology labour ward, at tertiary health care centre.

3.2 Sampling Technique and Sample Size

105 pregnant females coming to department of obstetrics & gynaecology, fulfilling the eligibility criteria were included in the study after obtaining written, informed consent.

3.3 Inclusion Criteria

For present study high risk pregnancy is defined as presence of any one or more of the following risk factors:

- Previous LSCS
- PIH and chronic hypertension
- Postdatism.
- IUGR, oligohydramnios.
- Gestational diabetes. Rh- isoimmunization (ICT positive)
- Severe anaemia
- PROM more than 12 hours.

3.4 Exclusion Criteria

- Sedative usage in the mother 24 hours before testing.

- Malpresentations
- Major congenital anomaly of the fetus detected by the antenatal ultrasound scan.
- multiple pregnancies
- Cephalopelvic disproportion

On admission history, complete clinical & obstetrics examination was done. CTG monitoring was done for minimum 20 minutes during active labour. The results were studied according to NICE guidelines & CTG was categorized as 'Normal', 'Suspicious' & 'Abnormal'⁹.

- Patients CTG categorized as normal were monitored with intermittent auscultation for 1 minute, every 30 minutes in stage I & every 5 minutes in stage II. Any abnormal auscultation pattern in fetal heart sounds were subjected to continuous monitoring.
- Patients with suspicious CTG findings were subjected to continuous monitoring. If any abnormal CTG finding were seen the patients were managed accordingly.
- Patients with abnormal CTG findings were taken as fetal distress & delivery was hastened by instrumentation or operative method depending on cervical dilatation & station of fetal head.

The progress of labour was plotted on partograph. Perinatal outcome was studied by Apgar score (at 1&5 minutes), NICU admission requirement.

4. Results

Total 105 patients were enrolled in the study. Most of the females were between 20-30 years of age (81%), while only 4.8% were above 30 years of age. About 56.2% were primigravida while 28.6%, 11.4% and 3.8% were 2nd, 3rd and 4th gravida.

Table 1. Subject distribution based on risk factors

Risk factors	N	%
Post datism	37	35.2%
PIH	33	31.4%
Oligohydramnios	19	18.1%
Anaemia	18	17.1%
Prev. LSCS	17	16.2%
IUGR	17	16.2%
RHD	4	3.8%
Rh Negative	4	3.8%
DM	1	1.0%
Polyhydramnios	1	1.0%

Table 2. Distribution of subjects based on number of risk factors

No. Risk Factors	N	%
Single	45	42.9%
Multiple	60	57.1%
Total	105	100.0%

Post datism was the most common risk factor present in 35.2% females followed by PIH (31.4%), oligohydramnios (18.1%), Anaemia (17.1%), Prev. LSCS (16.2%) and IUGR (16.2%) (Table -1). Normal CTG pattern was observed in 62.9% while suspicious and abnormal pattern was observed in 13.3% and 23.8% pregnancies respectively (Table -3). Single risk factor was seen in 42.9% and multiple risk factor seen in 57.1% (Table -2)

Table 3. CTG Observation distribution based on Risk Factors

Risk Factors	Normal	CTG			Total
		Suspi-cious	Abnormal		
Single	N	32	8	5	45
	%	48.48%	57.14%	20.00%	42.9%
Multiple	N	34	6	20	60
	%	52.3%	42.9%	80.0%	57.1%
Total	N	66	14	25	105
	%	100.0%	100.00%	100.00%	100.0%

p-value < 0.05

Abnormal CTG pattern was found to be significantly associated with pregnancies with multiple risk factors (p< 0.05). Over one third of females with suspicious and abnormal CTG pattern had Thick Meconium Stained Liquor (MSL) during pregnancy. The association was statistically significant (p< 0.05).

Table 4. NICU Admission requirement based on CTG Observations

NICU Admission	Normal	CTG			Total
		Suspi-cious	Abnor-mal		
No	N	60	7	6	73
	%	90.9%	50.00%	24.00%	69.5%
Yes	N	6	7	19	32
	%	9.1%	50.00%	76.00%	30.5%
Total	N	66	14	25	105
	%	100.00%	100.00%	100.00%	100.0%

p-value < 0.05

Mean APGAR score in babies having normal, suspicious and abnormal pattern was 7.0, 5.7 and 5.2 at 1 minute and 7.6, 6.5 and 6.0 at 5 minutes. Mean APGAR score was significantly higher in babies with normal CTG pattern while no significant difference was observed between Suspicious and Abnormal Group.

50% babies with suspicious and 76%with abnormal CTG pattern required NICU admission while only 9% babies with normal CTG pattern required NICU admissions. Only single mortality was observed in the study group (baby with abnormal CTG). The association of suspicious/ abnormal CTG pattern and NICU admission was statistically significant (p< 0.01) (Table -4).

The Sensitivity and Specificity of CTG for predicting neonatal morbidity was 81.25% and 82.2%, while its PPV and NPV was 66.6% and 90.9%.

5. Discussion

EFM can detect hypoxia early and unnecessary delay in intervention can be avoided. It is a noninvasive recordable method of fetal monitoring and is a highly logical solution to the undeniable human factors/human lapses of manual fetal monitoring of labor.

In the present study most of the females were between 20-30 years of age (81%), while only 4.8% were above 30 years of age. Post datism was the most common risk factor present in 35.2% females followed by PIH (31.4%), oligohydramnios (18.1%), Anaemia (17.1%), Prev. LSCS (16.2%) and IUGR (16.2%). This was compared to a study conducted by Rahman *et al.*¹⁰ where the majority of women (73.8%) were in the 21-30 years age group. 61.9% were primigravida while 38.1% females were multigravida. The most common risk factor observed was post datism (41.8%) followed by PIH (15.6%), PROM (11.3%), IUGR (6.3%) and BOH (6.3%). Oligohydramnios, Diabetes, Rh negative pregnancy risk factors were present in less than 5% of cases.

Normal CTG pattern was observed in 62.9% while suspicious and abnormal pattern was observed in 13.3% and 23.8% of high risk pregnancies respectively in our study. In the study by Sandhu *et al.*¹¹ the CTG were found to be normal in 67 %, equivocal in 23% & abnormal CTG pattern was observed in 10% of high risk pregnancies.

In comparison to another study by Rahman *et al.*¹⁰ 160 cases of high risk pregnancies were recruited. The admission CTG were 'reactive' in 77%, 'equivocal' in 14.4% and 'ominous' in 8.7% women.

In our study 35.7% females with suspicious CTG and 40 % females with abnormal CTG pattern had thick

meconium stained liquor. The association was statistically significant ($p < 0.05$). The study by Rahman *et al.*¹⁰ have 72% patients with an ominous test had moderate-thick meconium stained liquor, compared to 39% and 9% in the equivocal and reactive CTG group respectively. ($p < 0.001$)

In present study about 99% of females with normal CTG pattern had either normal or assisted vaginal deliveries while 85.7% and 92% females with suspicious and abnormal CTG pattern delivered via caesarean section. The association of abnormal pattern in CTG and caesarean section was found to be statistically significant ($p < 0.001$).

In present study Mean APGAR score was significantly lower in babies with abnormal CTG pattern. About 50% of the babies with suspicious and 75% with abnormal CTG pattern required NICU admission while only 9% babies with normal CTG pattern required NICU admissions. Only single mortality was observed in the study subjects (baby with abnormal CTG). The Sensitivity and Specificity of CTG for predicting abnormal outcome (NICU admission) was 81.25% and 82.2%, while its PPV and NPV was 66.6% and 90.9%.

In the Sharbat & Rahimi *et al.*¹² study of high-risk pregnancies with abnormal CTG, the risk of low birth weight and neonatal intensive care unit (NICU) admission increased. Overall, negative predictive value of CTG for NICU admission was 100% and 96%, respectively. Chua *et al.*¹³ reported that operative delivery ($P < 0.001$), 5-min Apgar score < 7 ($P < 0.005$), assisted ventilation ($P < 0.001$) and admission to NICU ($P < 0.001$) were significantly associated with abnormal CTG at admission.

5. Conclusion

CTG is a simple noninvasive test that can be used to detect fetal distress already present or likely to develop and prevent unnecessary delay in intervention. Thus it helps in preventing fetal morbidity and mortality. This test is simple, cost effective and can be utilized in heavy work load hospital/setups with limited resources. With the use of CTG in high risk cases timely intervention can be implied to reduce the perinatal mortality & morbidity.

6. References

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