

Role of Intrapartum CTG in Reliable Prediction of Fetal Outcome: A Tertiary Care Hospital Based Study

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Abstract:

Background: Fetal mortality, morbidity and neurological sequelae of fetal hypoxia can be reduced to a significant extent by effective monitoring in Intrapartum period. The study aims to evaluate the role of intrapartum cardiotocography (CTG) in accurately predicting the fetal outcome.

Methods: This prospective observational study was conducted at the department of obstetrics and gynecology in the department of Obstetrics and Gynaecology, Patna Medical College and hospital, Patna, Bihar, India.) A total of 106 patients in labour participated in this study during the period of December 2022 to December 2023 who had delivered their child either by lower uterine caesarian section (LUCS) or normal vaginal delivery (NVD) during the study period.

Result: In this study, most patients were between 20 – 25 years of age(68.86%) . With respect to Parity, 44 out of 106 were primigravida (41%), 53 were multigravidas (50%). Out of the total patients enrolled, CTG was reactive in 74 cases (69.8%) and Non-reactive in 32 patients(30.18%). In this study, the non-reactive CTG accurately predicted poor Apgar in 65.51% cases. Of intrapartum CTG, findings were falsely positive in 11.7% cases and 34.5% were false negative.

Conclusions: CTG is one of the reliable methods of monitoring the fetus. Non-reactive CTG record with a high probability indicates the likelihood of the presence of perinatal asphyxia. However reactive CTG is not an accurate marker of fetal well being. If fetal distress is suspected, optimal and adequate interventions or further investigations should be undertaken as necessitated.

Keywords: Intrapartum CTG, Fetal outcome, Apgar and CTG, Perinatal asphyxia, Fetal distress.

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Introduction

CTG is a graphic presentation of the fetal heart and uterine contraction to detect the fetal hypoxia. [1] The fetal heart rate is recorded via an ultrasound transducer located on the mother's abdomen. CTG is widely used as a process of assessing fetal well-being, mainly in pregnancies with an increased risk of complications due comorbidities like diabetes, high blood pressure [2] etc. Admission CTG is however, nowadays becoming a routinely done screening procedure.

Intrapartum fetal observation not only provides the idea about the fetal condition but also recognizes fetuses at risk of hypoxic damage so that perinatal outcomes can be enhanced by proper and timely interference.[3]

Admission test by CTG is used to indicate both the state of oxygenation of the fetus on the admission of the mother non-invasively and to check the fetal reserve during the short phases of

uteroplacental flow blockage due to uterine contractions.

Perinatal asphyxia is a deficiency of blood flow or gas interchange to or from the fetus before during or just after the birth process. [4,13] Asphyxia accounts for an estimated 900,000 deaths each year and is one of the primary causes of early neonatal mortality universally [5]. Perinatal birth asphyxia is a significant cause of acquired brain injury occurring in the neonatal period.

A consistent and reliable marker or test to assess the possibility of perinatal asphyxia remains elusive.[6]

Virginia Apgar, an anesthesiologist at Columbia university developed the APGAR score in 1952 [7]. APGAR score defines the state of the newborn infant instantly after birth and when properly applied, is a tool for standardized

assessment [8]. APGAR is a rapid test implemented on a baby at 1, 5, and 10 minutes after birth. This test checks a baby's heart rate, muscle tone, and other signs to see if extra emergency care is needed. The 1-minute score determines how well the baby tolerated the stress of the birthing process and the 5 minute score indicates how the baby's coping outside the womb. [9]

A score of 7 to 10 after five minutes is 'reassuring' and a score of 0 to 3 is concerning. It indicates a need for increased intervention, usually in assistance for breathing. [10] Several reasons for low APGAR scores exist, such as perinatal asphyxia, congenital infections, maternal infections, chorioamnionitis, preterm birth, congenital anomalies etc. [11]

Despite the lack of specificity, one of the most widely adopted modalities for the antepartum and intrapartum surveillance is cardiotocography (CTG) and has become a standard in obstetrics nowadays. [13,14]

Therefore this study aims to investigate the efficacy of intrapartum CTG in predicting the neonatal outcomes.

Methods

This cross-sectional observational study was carried out in the Department of obstetrics and gynaecology, Patna Medical College and hospital during the period of December 2022 to Dec 2023. Selection of the participants was done by convenient sample selection method. Informed written consent was obtained from willing participants after explaining the procedure and risks associated. Ethical approval was also obtained from the ethical review committee of the study hospital. All patients were in labour and they were admitted to hospital for delivery purposes.

At admission, all the pregnant participants underwent general and obstetric examination as well as intrapartum CTG.

Patients' progress of labour were checked at regular interval. Effacement of the internal OS, dilatation of external OS and the bag of membrane was checked by vaginal examination with caution periodically. All necessary history and data collected through questionnaire that was prepared previously, and medical information was also collected and analyzed. After data collection was done, available data analyzed through SPSS software.

Inclusion Criteria

- 1) Age <35 years
- 2) Cephalic presentation
- 3) Singleton pregnancy
- 4) ≥ 37 weeks
- 5) Willing to participate.

Exclusion Criteria

- 1) Age ≥ 35 years
- 2) Multifetal gestation
- 3) Congenital anomalies / Syndromic fetus
- 4) Placenta previa/ Abruptio placentae
- 5) Non-Cephalic presentation

Apgar score: Satisfactory Apgar defined as ≥ 7 at 1 minutes and 5 minutes.

Results

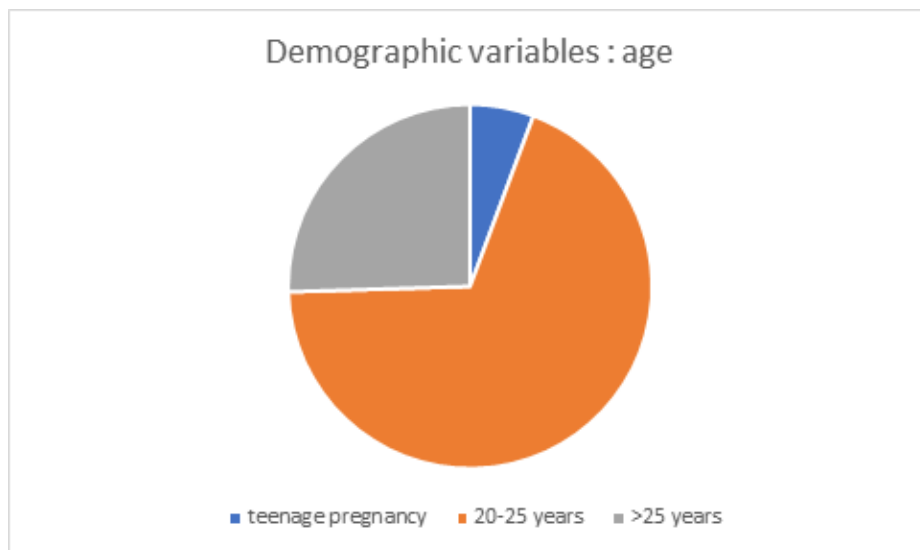
A total of 106 patients undergoing delivery at the department of obstetrics and gynecology labour room were admitted for the study.

Out of these, 6 were teenage pregnancy (5.6%), 73 patients were between 20 - 25 years of age (68.86%) and 27 patients were more than 25 years (25.47%).

With respect to Parity, 44 out of 106 were primigravida (41%), 53 were multigravidas (50%) and 9 patients were grand multiparas (8.4%).

Demographic characteristics of the study population	n = 106
Age	
<20	6 (5.6%)
20-25 years	73 (68.86%)
>25 years	27 (25.47%)
Parity	
Primi	44 (41%)
Multi	53 (50%)
Grand multi	9 (8.4%)
Birth wt.	
≤ 3 kgs	62 (58.44%)
>3 kgs	44 (41.5%)
Gestational age	
≤ 39 weeks	81 (76.4%)
>39 weeks	25 (23.6%)
CTG	

Reactive	74 (69.8%)
Nonreactive	32 (30.18%)



81 patients had a Gestational age within 37-39 weeks (76.4%) and 25 patients had Gestational age > 39 weeks.(23.6%)

All patients were examined and comorbidities were evaluated. Out of the total number, 22 had no comorbidities. 57 patients had anemia(pallor on clinical examination or Hb< 10 mg/dl). 23 patients

were hypertensive (BP ≥140/90 mm Hg at 2 separate readings 1 hour apart or documentation for hypertension in Antenatal checkups).

4 patients were known cases of Gestational Diabetes mellitus and 1 was a known case of Diabetes mellitus on medication.

Comorbidities	Number of patients (n = 106)
Anemia	57 (53.7%)
Hypertension	23 (21.6%)
GDM / DM	5 (4.7%)
None	22 (20.7%)

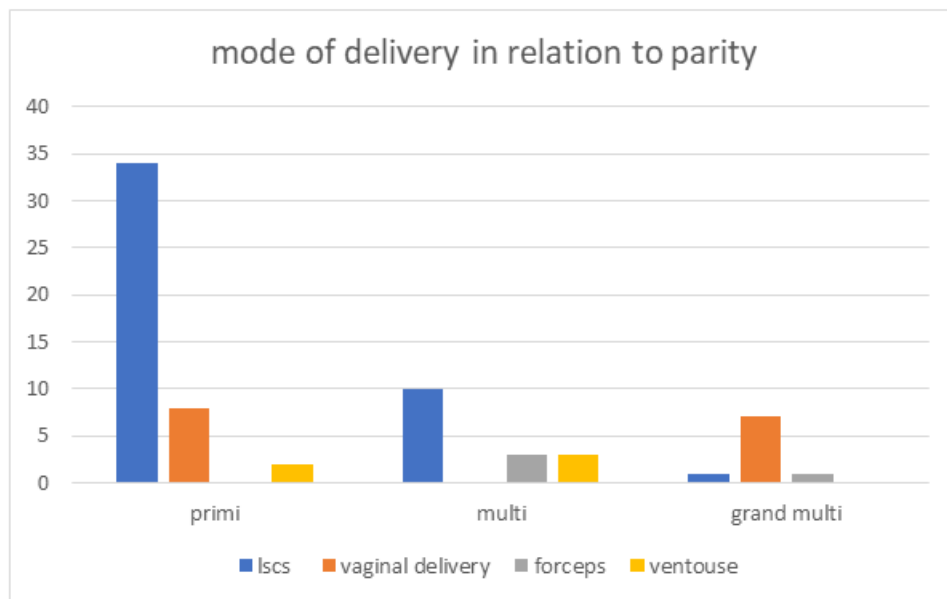
Out of the total patients enrolled, CTG was reactive in 74 cases (69.8%) and Non-reactive in 32 patients (30.18%).

In nonreactive CTG, most common abnormality seen was fetal tachycardia (baseline persistently more than 160 bpm) (43.75%). Other abnormalities were feta bradycardia (<110 bpm) (34.37%), reduced Beat to beat variability (6.25%) &decelerations (15.6%).

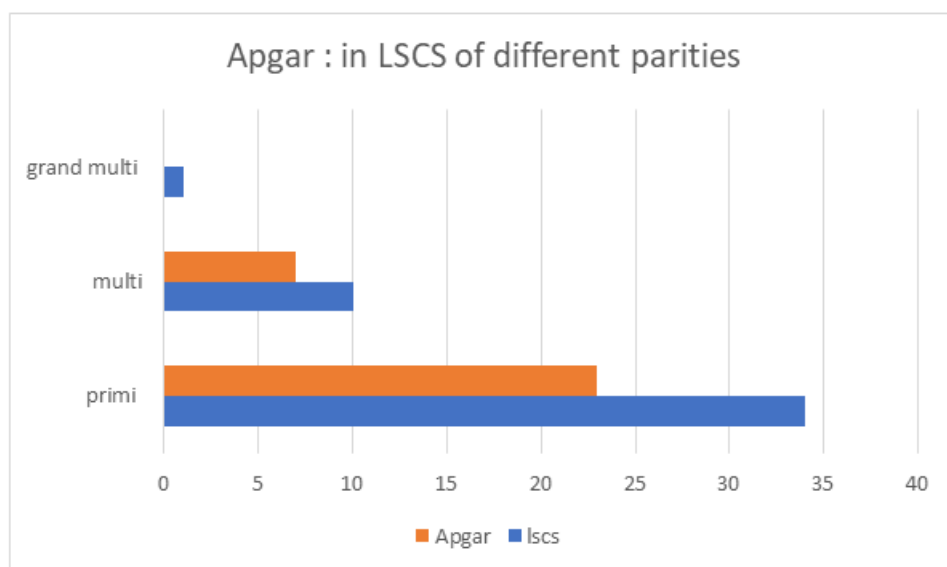
Out of these 32 cases, CTG findings were corrected in 3 cases by conservative measures like left lateral positioning, hydration, intermittent oxygen inhalation and intravenous dextrose infusion in case of low blood sugar.

Lscs was done in a total of 45 cases. Lscs was done in 29 cases out of 32 non reactive CTG findings. With reactive CTG, Lscs was done in 16 cases. Most common indication for LSCS despite a reactive CTG in our study population was severe preeclampsia – 8 patients. Other indications were arrest in 2nd stage of labour – 3 cases, Meconium stained liquor and Eclampsia– 2 cases each and 1 case of cord presentation after Spontaneous rupture of membranes.

A total of 61 patients delivered vaginally out of which Assisted vaginal delivery was done in 9 patients – forceps in 4 cases and ventouse application in 5 patients out of the total 106.



Satisfactory APGAR was seen in 29 cases post Lscs. Out of 61 vaginal deliveries, 50 had a satisfactory Apgar. On further scrutiny, in 52 normal deliveries, 44 had a satisfactory Apgar & In instrumental deliveries, 4 out of 5 ventouse deliveries & 2 out of 4 forceps deliveries had a satisfactory Apgar.



Birth weight was classified in 2 groups .

≤3 kgs – 62 babies

>3 kgs – 44 babies.

InLscs group, 16 out of 45 babies were 3kgs or

less. In vaginal delivery group (including instrumental), 46 were 3kgs or less.

In total, 79 babies had a satisfactory Apgar irrespective of mode of delivery. Out of these, 38 babies had birth weight > 3kgs.

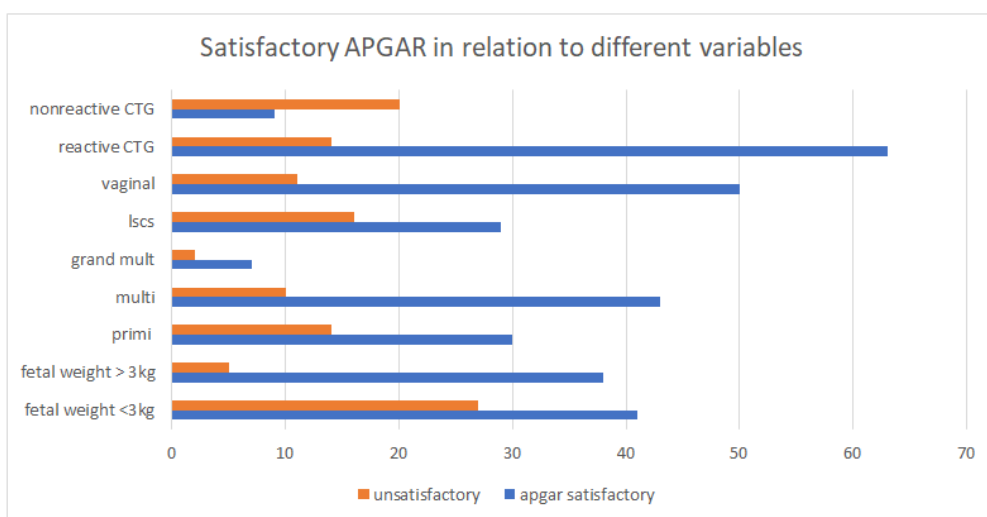
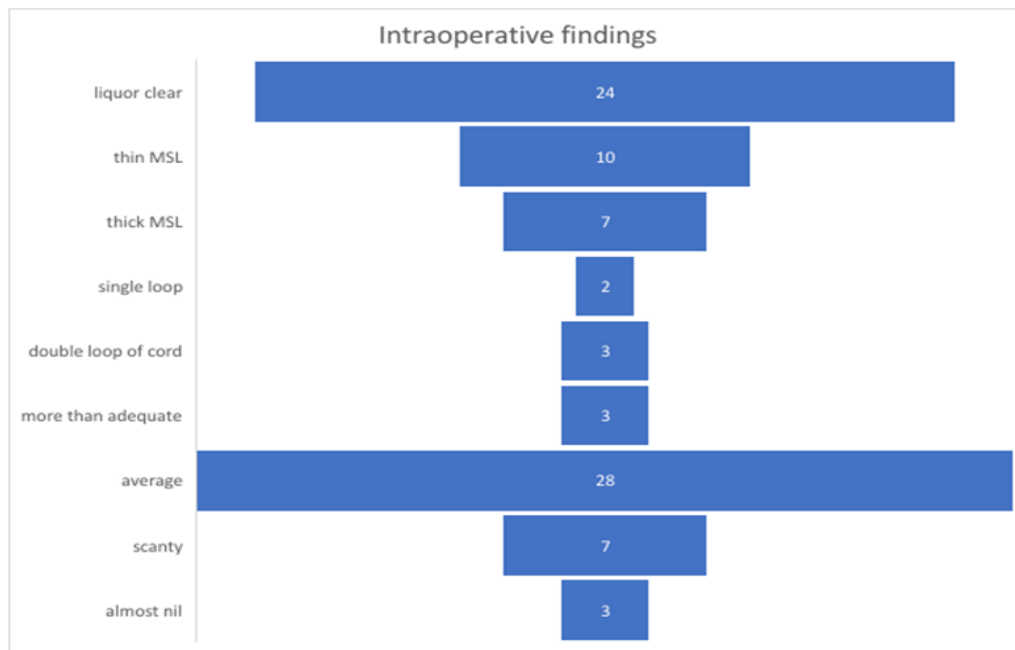
Perioperative findings	n= 45 (patients who underwent LSCS)
Liquor	
More than adequate	3 (6.6%)
Adequate	28(62.2%)
Scanty	7(15.5%)
Almost Nil	3 (6.6%)
Clarity	
Clear	24 (53.3%)

Thin Meconium	10 (22.2%)
Thickly stained	7 (15.5%)
Loop of cord	
Single	2(4.4%)
Double	3(6.6%)

Perioperative findings from LSCS group indicate that out of the 45 patients who underwent surgery, liquor was adequate in 28 patients.

More than adequate in 3 cases, scanty in 7 cases and almost nil in 3 cases. Amniotic Fluid was

clear in 24 cases, thin meconium stained in 10 cases and thickly stained in 7 cases. Single loop of cord present in 2 cases and double loop of cord in 3 out of 45 cases.



3 babies with poor Apgar were released after brief observation and routine tests. NICU admission was advised in 24 babies out of 27 with unsatisfactory APGAR.

IntrapartumCTG :- prediction of poor Apgar

Intrapartum CTG	Apgar > 7 at 1 minute	Apgar >7 at 5 minutes	Apgar <7 at 1 minute	Apgar< 7 at 5 minutes
Reactive	66	69	9	8
Non reactive	6	10	34	19

Discussion

Cardiotocography is the graphical presentation of fetal heart and uterine contractions done for fetal heart and uterine contractions done for fetal well being primarily in high risk pregnancies.

It helps in early diagnosis of cases where there is high risk of developing fetal hypoxia which facilitates proper and timely management of particular case leading to better perinatal outcome and decreasing the complications like fetal distress, cerebral palsy etc.

In our study, it was observed that more than half of the participants were aged between 25-29 years(68.8%) . This was similar to the findings of another study where the mean age of the participants was 26.6 years.²¹

21.6 % of the study population had hypertension and 55.88% had anemia which is consistent with the demographic prevalence of anemia and hypertension in the regional population. Gestational Diabetes mellitus was present in present in 4.7% of the study population.

A suspicious or pathological record of CTG does not always require an immediate decision to end delivery.³ In such cases, simple procedures, such as hydration, changing the birth position, reduction of oxytocin infusion or, much less frequently, uterine relaxation (tocolysis), which may help in restoring the correct CTG recording.⁴

In this study, out of 32 non-reactive CTG cases, 3 were managed conservatively by i.v hydration, lateral positioning and correction of low blood sugar levels. These cases responded with a subsequent normal CTG tracing.

When CTG develops a persistently abnormal pattern, it is common for the delivery to be performed by Cesarean Section. The evaluation was made by Oladrian et al ⁹ in a study that showed 72% Cesarean Section rate. Results from other studies have also shown a direct correlation between an abnormal CTG and Cesarean procedure. [10,11] In our study the c-section rate in non-reactive CTG was upto 90.62%. Results from other studies have also shown a direct correlation between an abnormal CTG and Cesarean procedure. [15,16]

In this study, the non-reactive CTG accurately predicted poor Apgar in 65.51% cases. Of intrapartum CTG, findings were falsely positive in 11.7% cases and 34.5% were false negative.

Several studies also found discrepancies such as false-negative records that are sick children with normal CTG interpretation and healthy babies with false-positive CTG records. [17-20]

CTG is essential for prediction of low apgar score of babies which may be due to a variety of reasons commonly being Meconium stained liquor.

Around 37.7% cases with non reactive CTG had meconium stained liquor in our study.

NICU admission was more in babies with non assuring fetal heart rate on CTG than with reactive CTG.

Among the cases admitted to NICU only 4% of the total admissions resulted in neonatal death and the remaining survived.

CTG was also used in fetuses who were at higher risk of intrapartum fetal hypoxia. This helps in selecting cases which requires even more intense monitoring in form of fetal scalp blood gas or intervention leading to accelerate the birth of the baby.

It was seen that pregnancies complicated with severe anemia, maternal hypertension, gestational diabetes mellitus had comparatively low apgar score.

Satisfactory apgar score was higher in women with age >25 years of age.

It was seen that nulliparous females had babies with low apgar score more than multiparous women .Yeshaneh et al found that anaemia and low birth weight baby were the risk factors for the low APGAR score in their study [20]. In our study, maternal hypertension and it's associated complications were a leading risk factor in poor Apgar with reactive CTG, (62.5)%.

Conclusion

CTG is one of the reliable methods of monitoring the fetus. Non-reactive CTG record with a high probability indicates the likelihood of the presence of perinatal asphyxia. In this study, CTG was able to predict poor Apgar in majority cases (65.51%) but still had a relatively high false positive rate of 11.7% and false negative rate even higher at almost 34%. Thus, fetal distress in doubtful cases could be confirmed by ultrasound Doppler examination. pH monitoring is also advantageous in suspicious cases.

Instant and adequate decisions regarding obstetric intervention and optimal procedures should be taken if fetal distress is suspected.

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