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ROLE OF CARDIOTOCOGRAPHY IN LABOR PATIENTS: A PROSPECTIVE OBSERVATIONAL STUDY

Obstetrics & Gynaecology

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ABSTRACT

Background: Cardiotocography (CTG) is widely used for intrapartum fetal surveillance. Proper interpretation can reduce perinatal morbidity and prevent unnecessary interventions. However, over-interpretation may lead to increased cesarean delivery rates. **Objective:** To evaluate the effectiveness of CTG in predicting fetal distress and neonatal outcomes among laboring women at a tertiary care centre in Bhilwara. **Methods:** This prospective observational study included 300 laboring women at Ajmera Hospital from January– September 2025. CTG tracings were categorized according to FIGO criteria: normal, suspicious, and pathological. Maternal outcomes (mode of delivery) and neonatal outcomes (Apgar score, NICU admission) were correlated with CTG findings. **Results:** Among 300 patients, CTG was normal in 54%, suspicious in 28%, and pathological in 18%. Cesarean section rates were 18.5% in the normal CTG group, 38% in suspicious CTG, and 72% in pathological CTG. Pathological CTG had a sensitivity of 82% and specificity of 76% in predicting neonatal distress. NICU admission was significantly higher in the pathological group (34%) compared to suspicious (12%) and normal (4%). **Conclusion:** CTG is a valuable tool for intrapartum fetal surveillance. Pathological CTG correlates strongly with adverse neonatal outcomes. However, interpretation should be cautious to prevent unnecessary operative interventions.

KEYWORDS

Cardiotocography, CTG, Labor Monitoring, Fetal Distress, Intrapartum Surveillance

1. INTRODUCTION

Cardiotocography (CTG) is a non-invasive technique used for real-time assessment of fetal heart rate and uterine contractions during labor. Its primary purpose is early detection of fetal hypoxia, enabling timely intervention. Worldwide, CTG is used routinely despite ongoing debates about false-positive interpretations leading to higher cesarean section rates.

In developing countries like India, CTG plays a crucial role in obstetric decision-making, especially in resource-limited settings where fetal blood sampling and advanced monitoring are unavailable. This study evaluates CTG's role in predicting fetal distress and neonatal outcomes among laboring women at Ajmera Hospital, Bhilwara.

2. Objectives

1. To evaluate CTG patterns among laboring patients.
2. To correlate CTG categories with mode of delivery.
3. To determine association between CTG findings and neonatal outcomes.
4. To assess sensitivity, specificity, and predictive values of CTG in detecting fetal distress.

3. MATERIALS AND METHODS

3.1 Study Design

This prospective observational study included 300 laboring women at Ajmera Hospital from January– September 2025. CTG tracings were categorized according to FIGO criteria: normal, suspicious, and pathological. Maternal outcomes (mode of delivery) and neonatal outcomes (Apgar score, NICU admission) were correlated with CTG findings.

3.2 Study Setting

Department of Obstetrics & Gynecology, Ajmera Hospital, Bhilwara, Rajasthan.

3.3 Sample Size

300 pregnant women in labor.

3.4 Inclusion Criteria

- Singleton pregnancies
- Gestational age ≥ 37 weeks
- Cephalic presentation
- Women in active labor

3.5 Exclusion Criteria

- Multiple gestation
- Intrauterine fetal demise
- Congenital anomalies
- Elective cesarean section

3.6 Methodology

CTG was recorded for all participants upon admission and intermittently until delivery. Tracings were classified according to FIGO 2015 guidelines:

- Normal
- Suspicious
- Pathological

Maternal data, labor course, mode of delivery, Apgar score, meconium staining, and NICU admissions were documented.

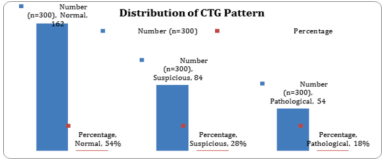
3.7 Statistical Analysis

Data were analyzed using SPSS version 21. Chi-square test used for categorical variables ($p < 0.05$ significant). Sensitivity, specificity, PPV, and NPV were calculated for pathological CTG predicting fetal distress.

4. RESULTS

4.1 Distribution of CTG Patterns

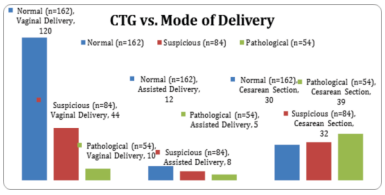
CTG Category	Number (n=300)	Percentage
Normal	162	54%
Suspicious	84	28%
Pathological	54	18%



Graph 1: Distribution of CTG Patterns

4.2 CTG vs. Mode of Delivery

CTG Category	Vaginal Delivery	Assisted Delivery	Cesarean Section
Normal (n=162)	120 (74%)	12 (7.5%)	30 (18.5%)
Suspicious (n=84)	44 (52%)	8 (10%)	32 (38%)
Pathological (n=54)	10 (18%)	5 (10%)	39 (72%)



Graph 2: Mode of Delivery by CTG Category

Observation: Cesarean sections increased significantly with worsening CTG category ($p < 0.001$).

4.3 Neonatal Outcomes

Apgar Score at 1 Minute

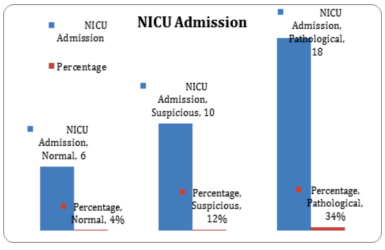
CTG Category	<7	≥7
Normal	4	158
Suspicious	10	74
Pathological	20	34

NICU Admission

CTG Category	NICU Admission	Percentage
Normal	6	4%
Suspicious	10	12%
Pathological	18	34%

Meconium-Stained Liquor

CTG Category	Cases
Normal	12
Suspicious	22
Pathological	28



Graph 3: NICU Admission

4.4 Diagnostic Accuracy of Pathological CTG

Parameter	Value
Sensitivity	82%
Specificity	76%
Positive Predictive Value (PPV)	63%
Negative Predictive Value (NPV)	89%

5. DISCUSSION

This study demonstrates that CTG is a useful screening tool in intrapartum monitoring, showing significant correlation with adverse outcomes. In our study, 18% tracings were pathological, consistent with reported global rates of 15–20%.

The cesarean section rate rose sharply from 18.5% in normal CTG to 72% in pathological CTG groups. This aligns with studies by Ayres-de-Campos et al. and Indian multicentric data showing that pathological CTG often prompts emergency cesarean due to suspected fetal distress.

NICU admission rates and low Apgar scores increased significantly in the suspicious and pathological groups, indicating true fetal compromise. However, the PPV (63%) suggests some false positives, a known limitation of CTG. This supports the established idea that CTG alone should not dictate intervention; it must be combined with clinical assessment, fetal scalp stimulation, or ST analysis when available.

Compared with global data, our findings reinforce CTG's strengths—high sensitivity and NPV—making it an excellent tool for ruling out fetal distress.

6. CONCLUSION

Cardiotocography plays a crucial role in intrapartum fetal surveillance. Pathological CTG patterns strongly correlate with increased cesarean delivery, meconium staining, low Apgar scores, and NICU admissions. CTG is a valuable tool, but its interpretation must be cautious to avoid unnecessary operative interventions.

Recommendations

- Routine CTG monitoring for all laboring patients
- Training programs for accurate CTG interpretation
- Use of adjunct tests where available to reduce false positives

7. Limitations

- Single-center study
- Sample size relatively small
- Lack of long-term neonatal follow-up
- No fetal blood sampling for correlation

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