



## ROLE OF CARDIOTOCOGRAPHY AT ADMISSION IN PREDICTING PERINATAL OUTCOME IN LOW- RISK PREGNANCY: A PROSPECTIVE OBSERVATIONAL STUDY

Dr Gautami Thambiraj

Junior Resident.

Dr Asmita Patil

Associate Professor, Head of Unit.

**ABSTRACT** **Background:** Admission cardiotocography (CTG) is a 20-minute monitoring tool used to assess foetal well-being at the onset of labour. Its utility in predicting perinatal outcomes in low-risk pregnancies remains debated.<sup>1</sup> **Objectives:** To evaluate the role of admission CTG in predicting maternal and perinatal outcomes in low-risk term pregnancies. **Methods:** A prospective observational study was conducted on 100 term, low-risk pregnant women in active labour at Dr R. N. Cooper Hospital, Mumbai. Participants underwent 20-minute admission CTG and were categorized into normal, suspicious, or pathological groups per FIGO guidelines<sup>2</sup>. Maternal demographics, sonographic findings, mode of delivery, APGAR scores, NICU admission, and neonatal resuscitation requirements were recorded and analysed using Chi-square test ( $p < 0.05$  considered significant). **Results:** Of 100 women, 68% had normal, 12% suspicious, and 20% pathological CTG. Pathological CTG was significantly associated with maternal age  $> 30$  years ( $p = 0.045$ ), multigravida ( $p = 0.035$ ), abnormal liquor ( $p = 0.028$ ), caesarean section ( $p < 0.001$ ), low APGAR scores at 1 and 5 minutes ( $p < 0.001$ ), NICU admission ( $p < 0.001$ ), and neonatal resuscitation ( $p < 0.001$ ). Third-trimester sonographic abnormalities also correlated with pathological CTG ( $p = 0.042$ ).<sup>3</sup> **Conclusion:** Admission CTG may guide early intervention, its routine use in low-risk pregnancies should be approached with caution due to potential over-intervention.<sup>4</sup>

**KEYWORDS :** cardiotocography, fetal monitoring, cesarean section, fetal hypoxia

## INTRODUCTION

Fetal heart rate monitoring is one of the important components of antenatal care.<sup>1</sup> Intermittent auscultation of fetal heart rate was a traditional method of fetal monitoring during labor.<sup>2</sup> In order to reduce fetal morbidity and mortality, electronic fetal monitoring with CTG has been used for the last 2–3 decades.<sup>2</sup> CTG is a form of electronic fetal monitoring in which there is simultaneous recording of fetal heart rate and uterine contractions. This recording is done by placing fetal and toco transducers on the mother's abdomen for 20 minutes.<sup>3</sup>

Mostly, fetal hypoxia is detectable on CTG but many of the CTG signs of hypoxia have been seen in neonates without hypoxia, leading to over management in these cases.<sup>5</sup> In the current situation, almost all women are monitored with cardiotocography, which probably significantly increases the number of caesarean sections for “fetal indications.”<sup>6</sup>

In spite of these limitations, most experts believe that continuous CTG monitoring should be considered in all situations where there is a high risk of fetal hypoxia/acidosis, whether due to maternal health conditions (such as vaginal hemorrhage and maternal pyrexia), abnormal fetal growth during pregnancy, epidural analgesia, meconium-stained liquor, or the possibility of excessive uterine activity, as occurs with induced or augmented labour.<sup>7</sup> Continuous CTG is also recommended when abnormalities are detected during intermittent fetal auscultation.<sup>7</sup> An alternative approach is to provide intermittent CTG monitoring alternating with fetal heart rate (FHR) auscultation.<sup>8</sup>

The routine use of admission CTG for low-risk women on entrance to the labor ward has been associated with an increase in caesarean section rates and no improvement in perinatal outcomes,<sup>9</sup> but studies were also underpowered to show such differences. In spite of the lack of evidence regarding benefit, this procedure has also become standard of care in many countries.<sup>9</sup>

Table – 1

Parameter	Normal CTG (n=68)	Suspicious CTG (n=11)	Pathological CTG (n=20)	p-value
Age (Years)				0.045*
<25	35 (51.5%)	5 (41.7%)	2 (10%)	
26-30	25 (36.8%)	4 (33.3%)	10 (50%)	
31-35	6 (8.8%)	2 (16.7%)	9 (40%)	
36-40	2 (2.9%)	1 (8.3%)	2 (10%)	
Parity				0.035*
Primigravida	48 (70.6%)	6 (50%)	6 (30%)	
Multigravida	20 (29.4%)	5 (50%)	14 (70%)	
Gestational Age				0.035*
Early Term (37-38 wks)	18 (26.5%)	2 (16.7%)	2 (10%)	
Full Term (39-40 wks)	40 (58.8%)	6 (50%)	14 (70%)	
Late Term (41 wks)	8 (11.8%)	3 (25%)	4 (20%)	
Post Term (>42 wks)	2 (2.9%)	1 (8.3%)	0 (0%)	
USG Anomaly Scan				0.152
Normal	68 (100%)	11 (91.7%)	19 (95%)	

Abnormal USG 3rd Trimester Scan	0 (0%)	1 (8.3%)	1 (5%)	0.042*
Normal	68 (95.6%)	8 (66.7%)	17 (85%)	
Abnormal Liquor Characteristics	3 (4.4%)	4 (33.3%)	3 (15%)	0.028*
Clear	60 (88.2%)	6 (50%)	4 (20%)	
Thin Meconium	6 (8.8%)	4 (33.3%)	10 (50%)	
Thick Meconium	2 (2.9%)	2 (16.7%)	5 (25%)	
Blood Stained	0 (0%)	0 (0%)	1 (5%)	
Mode of Delivery				<0.001*
Vaginal Delivery	65 (95.6%)	5 (41.7%)	8 (40%)	
Cesarean Section	3 (4.4%)	7 (58.3%)	12 (60%)	
1 Min APGAR Score <7				<0.001*
Yes	1 (1.5%)	5 (41.7%)	9 (45%)	
No	67 (98.5%)	7 (58.3%)	11 (55%)	
5 Min APGAR Score <7				<0.001*
Yes	0 (0%)	3 (25%)	7 (35%)	
No	68 (100%)	9 (75%)	13 (65%)	
NICU Admission				<0.001*
Yes	1 (1.5%)	4 (33.3%)	10 (50%)	
No	67 (98.5%)	8 (66.7%)	10 (50%)	

## MATERIALS AND METHODS

A study was conducted in the labor room of the Obstetrics and Gynecology department of Dr R N Cooper Hospital, Mumbai. The pregnant woman presenting in labor and fulfilling the inclusion criteria were included in the study after securing an informed, written consent.

A general history and obstetric history of the pregnancy along with past medical history was collected in the 'Case record form' followed by clinical examination. A baseline admission CTG of 20 minutes was performed in left lateral position and the study population were divided into Normal, Suspicious and Pathological as per the FIGO Guidelines<sup>2</sup>. All patients with Normal, Suspicious or Pathological CTG were then monitored till delivery to determine primarily the fetal distress and other fetal outcome including the 1 minute APGAR score, 5 minutes APGAR score & need for neonatal resuscitation and secondarily the maternal outcome that warranted the mode of delivery.

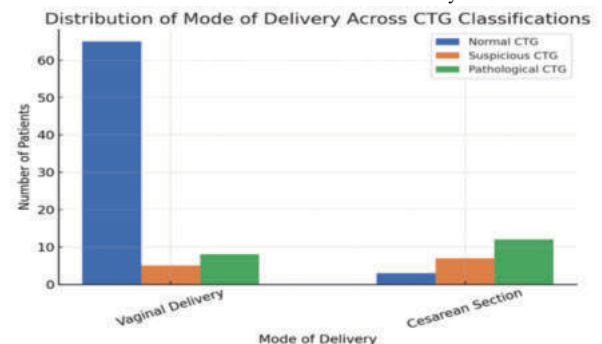


Figure 1

The aim was predicting perinatal and maternal outcome in term antenatal women in low-risk pregnancy. Primary objective was to evaluate the Maternal and fetal outcome with admission cardiotocography in low-risk pregnancy. The secondary objectives included correlation and reporting association of fetal distress & perinatal mortality with CTG tracings, report the incidence of Neonatal resuscitation in term babies with abnormal CTG tracings, to report the incidence of normal vaginal deliveries and to evaluate and report the incidence of emergency caesarean section.

All the data collected from patient were compiled in a Microsoft office Excel sheet in a master chart and analyzed. Results are displayed in Tabular and Graphical format.

## RESULT & DISCUSSION

Of the 100 women included, 68% had normal CTG, 12% suspicious, and 20% pathological CTG. (Table 1)

### Demographic Characteristics:

- A significant association was found between maternal age and CTG findings ( $p=0.045$ ). Women aged 31-35 years were more likely to show pathological tracings. This is consistent with the findings of Kumar et al.,<sup>10</sup> who reported that advancing maternal age was linked with an increased likelihood of abnormal CTG findings and adverse neonatal outcomes.
- Multigravidas had a higher incidence of pathological CTG compared to primigravida (70% vs. 30%,  $p=0.035$ ). This aligns with the study by Banu et al.,<sup>11</sup> which noted that multiparous women had an increased likelihood of abnormal CTG and subsequent caesarean delivery due to obstetric factors like previous uterine scarring and foetal compromise.

### Gestational Age And CTG:

Pathological CTG was more frequent in full-term (39-40 weeks) and late-term pregnancies ( $p=0.038$ ). Similarly, Zubda Anwar et al.<sup>12</sup> reported that prolonged gestation beyond 40 weeks correlated with an increased incidence of abnormal CTG patterns and adverse foetal outcomes.

### Sonographic Findings:

- Third-trimester USG abnormalities (IUGR, oligohydramnios) were significantly associated with pathological CTG ( $p=0.042$ ).
- This is supported by Singh et al.,<sup>13</sup> who demonstrated that conditions such as oligohydramnios and intrauterine growth restriction (IUGR) were more common in pregnancies with abnormal CTG, necessitating closer monitoring and intervention.

### Liquor Characteristics:

- Clear liquor was found in 88.2% of normal CTG cases but only 20% in pathological cases.
- Thin and thick meconium-stained liquor were more prevalent in pathological CTG (50% and 25%, respectively;  $p=0.028$ ).
- This aligns with findings from Gordana Bogdanovic et al.,<sup>14</sup> who reported that meconium-stained amniotic fluid is an important predictor of foetal distress and is often associated with abnormal CTG patterns.

### Mode Of Delivery:

- Fig.1. A highly significant association ( $p < 0.001$ ) was found between CTG classification and mode of delivery. Vaginal delivery was predominant in normal CTG cases (95.6%), while the likelihood of caesarean section increased in cases with suspicious (58.3%) and pathological CTG findings (60%).
- A meta-analysis by Devane et al.<sup>15</sup> highlighted that abnormal CTG findings are associated with an increased risk of caesarean delivery, often due to concerns over foetal distress, even in low-risk pregnancies.

### Neonatal Outcomes:

- Neonatal outcomes were also significantly affected by CTG classification (Fig 2). The incidence of low APGAR scores at 1 minute ( $p < 0.001$ ) and 5 minutes ( $p < 0.001$ ) was markedly higher in suspicious and pathological CTG cases.
- NICU admissions ( $p < 0.001$ ) were more frequent in neonates born to mothers with pathological CTG findings (50%), compared to only 1.5% in normal CTG cases.
- The need for neonatal resuscitation ( $p < 0.001$ ) followed a similar trend, with 40% of neonates in the pathological CTG group requiring resuscitation.

- These findings align with those of Singh et al., who found that abnormal CTG traces were associated with an increased need for neonatal resuscitation and NICU admissions.<sup>13</sup>

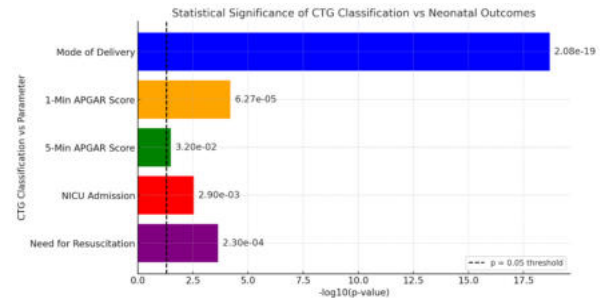


Figure 2

Table – 2

Parameter Comparison	p-value	Significance
CTG Classification vs Mode of Delivery	$2.08 \times 10^{-19}$	Significant
CTG Classification vs 1-Min APGAR Score	$6.27 \times 10^{-5}$	Significant
CTG Classification vs 5-Min APGAR Score	0.032	Significant
CTG Classification vs NICU Admission	0.0029	Significant
CTG Classification vs Need for Resuscitation	0.00023	Significant

## CONCLUSION

Admission CTG should be integrated into routine labour room screening for early detection of foetal compromise, even in low-risk pregnancies. Suspicious CTG patterns require continuous monitoring to prevent unnecessary interventions while ensuring timely obstetric management. Pathological CTG mandates immediate decision-making to reduce perinatal morbidity and mortality. Thus, admission CTG is a simple, non-invasive and effective tool for early identification of foetal distress, particularly in high-risk or resource-limited settings. In low-risk pregnancies, its utility must be balanced against the risk of increased operative deliveries. Individualized assessment incorporating maternal factors and sonographic findings may optimize its clinical use.

## Limitations And Future Recommendations

- Sample Size:** The study included only 100 participants, which limits the generalization. Future research should incorporate larger cohorts to enhance statistical power.
- Single-Centre Study:** Conducting the study in a single tertiary care hospital may limit the applicability of results to other settings

**Conflict Of Interest:** None declared.

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