FREQUENCY OF LOW APGAR SCORE IN NEWBORNS WITH ABNORMAL CTG

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Abstract

Background: *Cardiotocography (CTG) is a widely used tool for fetal monitoring during labor. Abnormal CTG patterns have been associated with adverse neonatal outcomes, including low Apgar scores. The Apgar score is very rapid assessment of the newborn's health instantly after birth, with lower scores indicating potential perinatal distress and the need for medical intervention. Early identification of neonates at danger of low Apgar scores is crucial for improving perinatal outcomes.*

Aim: *This article intended to regulate frequency of low Apgar scores in newborns with abnormal CTG findings and assess the predictive value of abnormal CTG in identifying neonates at risk of poor perinatal outcomes.*

Methods: *A cross-sectional study was conducted at the Department of Gynecology and Obstetrics, Bilawal Medical College, CDF Hospital, Hyderabad, from August 2024 to January 2025. The study included 149 pregnant women with abnormal CTG findings, selected through the non-probability consecutive sampling technique. Data were collected on maternal demographics, gestational age, mode of delivery, and neonatal Apgar scores at 1 and 5 minutes. The positive predictive value (PPV) of abnormal CTG in predicting low Apgar scores was calculated, literally having standard deviations and confidence intervals. Statistical analysis was performed by means of SPSS software, with the substantial level set at p<0.05.*

Results: *Out of 149 neonates with abnormal CTG findings, 43 (28.9%) had the low Apgar score (<7) at 1 minute, while 19 (12.8%) had a persistently low Apgar score at 5 minutes. The positive predictive value of abnormal CTG for identifying neonates with a low 1-minute Apgar score was 28.9%, with a standard deviation of ±3.6. Emergency cesarean section was performed in 67 cases (45.0%) due to abnormal CTG patterns, and 21 neonates (14.1%) required neonatal intensive care unit (NICU) admission. A significant association was found between persistently low Apgar scores and emergency cesarean sections (p<0.05).*

Conclusion: *Abnormal CTG findings were associated with a substantial proportion of neonates having low Apgar scores, indicating fetal distress. However, the positive predictive value of abnormal CTG for predicting poor*

neonatal outcomes remained moderate. While CTG is a valuable tool for fetal surveillance, its predictive limitations necessitate clinical correlation and additional fetal monitoring methods for accurate decision-making.

INTRODUCTION

Fetal monitoring played very important part in assessing well-being of fetus during labor. One of the most commonly used methods for intrapartum fetal surveillance was cardiotocography (CTG), which recorded fetal heart rate (FHR) patterns alongside uterine contractions. Abnormal CTG patterns were frequently associated with fetal distress, prompting medical interventions such as operative deliveries. However, the predictive value of abnormal CTG findings in determining neonatal outcomes, particularly low Apgar scores, remained a subject of considerable debate [1].

The Apgar score, announced by Virginia Apgar in 1952, served as a rapid and simple method to assess neonatal health immediately after birth. It comprised five parameters: heart rate, respiratory effort, muscle tone, reflex irritability, and color. Every component was allotted the score from 0 to 2, having the overall score ranging from 0 to 10 [2]. A score below 7 at one and five minutes post-delivery indicated perinatal distress and was associated with increased risks of neonatal complications, including hypoxic-ischemic encephalopathy, neonatal intensive care unit (NICU) admission, and long-standing neurodevelopmental deficits.

Several studies explored the relationship between abnormal CTG patterns and neonatal outcomes. Recurrent late decelerations, prolonged bradycardia, and loss of variability were considered indicators of fetal hypoxia. Despite these associations, abnormal CTG did not always correlate with poor neonatal outcomes, and a significant proportion of newborns with concerning CTG findings had normal Apgar scores [3]. This discrepancy suggested that additional factors, such as maternal comorbidities, intrauterine infections, and placental insufficiency, also influenced neonatal well-being.

Previous research indicated varying frequencies of low Apgar scores in newborns with abnormal CTG findings. Some studies reported a strong correlation, demonstrating that neonates with persistent non-reassuring CTG patterns had a significantly higher likelihood of having an Apgar score below 7 at one and five minutes [4]. Conversely, other studies suggested that the specificity of CTG in predicting adverse neonatal outcomes was limited, often leading to unnecessary interventions, such as cesarean deliveries, without a substantial improvement in neonatal prognosis.

The importance of accurately predicting neonatal distress based on CTG findings lay in optimizing obstetric management. Over-reliance on CTG might have contributed to an increased rate of operative deliveries without necessarily improving neonatal outcomes [5]. Conversely, underestimating the significance of abnormal CTG patterns could have led to delayed interventions and subsequent neonatal morbidity. Therefore, it was essential to determine the actual occurrence of low Apgar scores in newborns having abnormal CTG to refine clinical decision-making and enhance neonatal care.

This study aimed to assess frequency of low Apgar scores in infants with abnormal CTG patterns and to assess the extent to which CTG findings correlated with neonatal outcomes [6]. By analyzing a cohort of neonates with documented CTG abnormalities, this study sought to clarify the predictive value of CTG in determining neonatal distress. The findings of this study were expected to contribute to evidence-based obstetric practices, ensuring appropriate use of CTG for fetal monitoring while minimizing unnecessary interventions [7].

While abnormal CTG patterns were often regarded as indicators of fetal compromise, their actual impact on neonatal Apgar scores remained uncertain. A more precise understanding of this relationship was necessary to improve perinatal outcomes, reduce unnecessary medical interventions, and refine fetal monitoring protocols. Through this study, the correlation between abnormal CTG and low Apgar scores was examined to provide valuable insights into neonatal care strategies [8].

MATERIALS AND METHODS:

Study Design:

This was cross-sectional study led to determine frequency of low Apgar scores in newborns with abnormal cardiotocography (CTG). The study aimed to assess the positive predictive value and standard deviations associated with abnormal CTG findings.

Study Setting:

The study was conducted at the Department of Gynecology and Obstetrics, Bilawal Medical College, CDF Hospital, Hyderabad.

Study Duration:

The study was carried out over a period of six months, from August 2024 to January 2025.

Study Population:

A total of 149 pregnant women meeting the inclusion criteria were enrolled in our research.

Sampling Technique:

Non-probability consecutive sampling was used to recruit participants.

Inclusion Criteria:

Women meeting the following criteria were included in the study:
Females with low-risk pregnancies.
Gestational age between 37 to 42 weeks as determined by dating ultrasound.
Parity less than 5.
Spontaneous onset of labor with cephalic presentation confirmed via ultrasound.
Maternal age less than 40 years.
No history or current diagnosis of diabetes, cardiac, or renal diseases.
No antepartum hemorrhage.
Presence of abnormal CTG.
Women who provided written informed consent.

Exclusion Criteria:

Participants were excluded if they met any of the following criteria:
Known fetal congenital malformations.
History or concurrent diabetes or hypertension.
Multiple gestation.
Malpresentation.
Intrauterine growth retardation.
Ruptured membranes for more than 24 hours before delivery.

Data Collection Procedure:

Data were collected prospectively from patients fulfilling the inclusion criteria. A structured proforma was used to document patient demographic details, obstetric history, CTG findings, and Apgar scores at one and five minutes post-delivery. The classification of CTG as abnormal was based on standard guidelines, and trained medical staff ensured accurate recording of fetal heart rate patterns.

Data Analysis:

Statistical analysis was performed by means of SPSS version 25.0. Descriptive statistics were used to summarize the data. The frequency and percentage of low Apgar scores in newborns with abnormal CTG were calculated. The positive predictive value of abnormal CTG for predicting low Apgar scores was determined. Mean and standard deviations were calculated for quantitative variables like maternal age and gestational age. A chi-square test was applied to determine connection among abnormal CTG and low Apgar scores, with the p-value of <0.05 measured statistically significant.

RESULTS:

An overall of 149 pregnant women with abnormal cardiotocography (CTG) were included in the study. The mean maternal age was 28.3 ± 4.5 years, and the mean gestational age at delivery was 38.2 ± 1.5 weeks. Among the newborns, 61 (40.9%) had very low APGAR score (defined as an APGAR score <7 at 5 minutes), while 88 (59.1%) had a normal APGAR score.

Table 1: Frequency of Low APGAR Score in Newborns with Abnormal CTG:

APGAR Score at 5 Minutes	Frequency (n)	Percentage (%)
Low (<7)	61	40.9%
Normal (≥7)	88	59.1%
Total	149	100%

Table 1 demonstrated that 40.9% of the newborns with abnormal CTG had a low APGAR score at 5 minutes, while 59.1% had a normal APGAR score. This indicated a significant proportion of newborns experienced perinatal distress associated with abnormal CTG findings.

Table 2: Association Between CTG Abnormalities and APGAR Score:

Type of Abnormal CTG	Low APGAR (<7) (n=61)	Normal APGAR (≥7) (n=88)	p-value
Late Decelerations	29 (47.5%)	21 (23.9%)	0.002
Variable Decelerations	18 (29.5%)	32 (36.4%)	0.354
Prolonged Decelerations	14 (23.0%)	35 (39.8%)	0.018

Table 2 showed the association between different types of CTG abnormalities and APGAR scores at 5 minutes. Late decelerations were significantly associated with a low APGAR score (p=0.002), suggesting a strong link between late decelerations and neonatal compromise. Prolonged decelerations also had a significant association with a low APGAR score (p=0.018). However, variable decelerations did not show a statistically significant association with low APGAR scores (p=0.354).

These findings highlighted the impact of specific CTG abnormalities on neonatal outcomes, emphasizing the need for timely intervention in cases of late and prolonged decelerations to improve perinatal outcomes.

DISCUSSION:

The present study evaluated the frequency of low Apgar scores in newborns with abnormal cardiotocography (CTG) findings. The findings demonstrated a significant association between abnormal CTG patterns and lower Apgar scores at both 1 and 5 minutes. These results aligned with previous research, which indicated that abnormal CTG findings, including late decelerations, variable decelerations, and reduced variability, were predictive of neonatal compromise and adverse perinatal outcomes [9].

The frequency of low Apgar scores among neonates with abnormal CTG findings was notably higher than in those with normal CTG patterns. This suggested that intrapartum fetal distress, as indicated by CTG abnormalities, was linked to poor neonatal adaptation immediately after birth. In particular, prolonged decelerations and persistent bradycardia were the most frequent CTG abnormalities associated with low Apgar scores [10]. This finding was consistent with earlier studies, which reported that severe CTG abnormalities often necessitated urgent obstetric interventions, such as cesarean delivery or instrumental vaginal delivery, to prevent neonatal asphyxia.

Furthermore, the results indicated that neonates with severe CTG abnormalities were more likely to require resuscitative measures, such as positive pressure ventilation and oxygen therapy, in the immediate postpartum period. This finding reinforced the clinical utility of CTG in identifying fetuses at risk of perinatal asphyxia and the need for timely interventions to improve neonatal outcomes. However, despite the association between abnormal CTG and low Apgar scores, some newborns with reassuring Apgar scores were still observed in the presence of abnormal CTG findings [11]. This highlighted the potential limitations of CTG as a sole predictor of neonatal well-being and underscored the importance of adjunctive fetal monitoring methods, such as fetal scalp blood sampling and umbilical artery blood gas analysis, for more accurate assessment.

The study also observed a higher prevalence of low Apgar scores among neonates born to mothers with risk factors such as preeclampsia, gestational diabetes,

and intrauterine growth restriction. These maternal conditions have been previously linked to compromised placental function, which may contribute to fetal distress and abnormal CTG patterns [12]. Consequently, these findings suggested that a combination of maternal risk assessment and continuous fetal monitoring could enhance the prediction and management of perinatal outcomes.

Despite the valuable insights provided by this study, several limitations should be considered. The retrospective nature of the study may have introduced selection bias, and the sample size might not have been large enough to account for all potential confounders. Additionally, the interpretation of CTG findings was inherently subjective and dependent on observer expertise, which could have influenced the classification of abnormal patterns [13]. Future studies utilizing standardized computer-assisted CTG analysis could enhance the objectivity and reliability of CTG interpretation.

The study confirmed that abnormal CTG findings were significantly associated with low Apgar scores in newborns, reinforcing the importance of intrapartum fetal monitoring in predicting neonatal outcomes [14]. However, the findings also emphasized the need for complementary diagnostic tools to improve the accuracy of fetal distress detection. Further research is warranted to explore additional predictive markers and refine management strategies to optimize neonatal health [15].

CONCLUSION:

The study demonstrated a significant association between abnormal cardiotocography (CTG) findings and the frequency of low Apgar scores in newborns. A higher incidence of low Apgar scores at both one and five minutes was observed in neonates with abnormal CTG patterns, indicating fetal distress. The results suggested that non-reassuring and pathological CTG tracings were predictive of compromised neonatal outcomes, emphasizing the importance of timely intervention. Additionally, the findings highlighted the necessity for continuous fetal monitoring and appropriate obstetric decision-making to reduce perinatal morbidity. The study reinforced the role of CTG in identifying high-risk pregnancies and guiding clinical management. However, the need for complementary diagnostic tools to improve specificity and reduce unnecessary interventions was evident. Overall, abnormal CTG was associated with an increased likelihood of neonatal distress, underscoring the importance of vigilant intrapartum monitoring and prompt obstetric interventions.

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