

Correlation of Cardiotocography with Intraoperative Findings in Caesarean Section for Non-Reassuring Fetal Status and Neonatal Outcomes in Rural Tertiary Care Center: A Cross-Sectional Observational Study

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Abstract: Background: Cardiotocography (CTG) has been a pivotal tool in obstetric monitoring since its introduction in the 1970s, enabling continuous assessment of fetal heart rate (FHR) and uterine contractions. While CTG aims to detect fetal hypoxemia and asphyxia early, its interpretation can sometimes lead to an increased rate of caesarean sections for non-reassuring fetal status (NRFS). This trend raises concerns about the balance between necessary medical interventions and the risk of unnecessary surgical deliveries, especially in resource-limited rural tertiary care settings. Aim: The primary aim of this study was to evaluate the correlation between CTG findings and intraoperative observations in pregnant women undergoing emergency C-sections for NRFS at a rural tertiary care centre. Additionally, the study sought to assess the associated neonatal outcomes to determine the accuracy and impact of CTG-based decision-making on both maternal and neonatal health. Methods: A cross-sectional observational study was conducted at RL Jalappa Hospital and Research Centre, affiliated with Sri Devaraj Urs Medical College, Tamaka, Kolar, over a duration of one year. The study included 42 pregnant women with singleton pregnancies between 32 to 40 weeks of gestation who underwent emergency C-sections due to NRFS as indicated by CTG. Participants with multifetal pregnancies, non-cephalic presentations, gestational age below 32 weeks, and significant medical disorders during pregnancy were excluded. Data were collected using structured case record forms and analysed using SPSS Software version 26. Descriptive statistics, chi-square tests, t-tests, and ANOVA were employed to analyse the data, with a significance level set at $p < 0.05$. Results: The mean age of participants was 24.14 years (SD = 4.604), and the average neonatal weight was 2.86 kg (SD = 0.440 kg). A majority of the women were primigravida (42 cases, 76.2%). Gestational age at delivery was predominantly between 38 to 40 weeks (30 cases, 71.4%). Intraoperative findings revealed that 38.1% of cases had "liquor thick meconium stained," indicating significant fetal distress. Apgar scores at 1 minute were predominantly 1'7/10 (85.7%), improving to 5'9/10 at 5 minutes in 83.3% of neonates. Neonatal outcomes showed that successfully managed without NICU admission at 64.3% (N=27), required observation (Obs) at 19.0% (N=8), and experienced respiratory distress (RD) at 14.3% (N=6). Conclusion: The study demonstrated a significant correlation between CTG findings and intraoperative observations, with a majority of neonates achieving favorable Apgar scores. However, the presence of respiratory distress and stillbirths in a subset of cases highlights the necessity for precise CTG interpretation and timely medical interventions. These findings suggest that while CTG is effective in identifying fetal distress, enhancing training and implementing standardized guidelines could reduce unnecessary C-sections and improve neonatal outcomes, particularly in rural tertiary care settings.

Keywords: Cardiotocography, Non-reassuring fetal status, Caesarean section, Neonatal outcomes, Rural tertiary care

1. Introduction

Cardiotocography (CTG) has been a cornerstone in obstetric monitoring since its introduction in the 1970s. This technology allows for the continuous recording of fetal heart rate (FHR) and uterine contractions, providing critical insights into fetal well-being during pregnancy and labor [1]. The primary objective of CTG is to detect any signs of fetal hypoxemia and asphyxia, which, if identified early, can prompt timely medical interventions to improve neonatal outcomes [2]. Over the decades, CTG has evolved, becoming an indispensable tool in both antepartum and intrapartum care, thereby significantly enhancing the ability of obstetricians to monitor and respond to fetal distress [3].

The utilization of CTG has been associated with a notable increase in the rate of cesarean sections (C-sections), particularly those performed for non-reassuring fetal status (NRFS). NRFS is typically characterized by abnormal FHR patterns, which may indicate fetal hypoxia or distress [4]. While the primary intention behind CTG monitoring is to safeguard fetal health, the interpretation of CTG traces

remains subject to variability among practitioners, potentially leading to an over-reliance on C-sections as a precautionary measure [5]. This trend raises concerns about the balance between necessary medical intervention and the risk of unnecessary surgical deliveries, which carry their own set of maternal and neonatal risks [6].

Several studies have highlighted the discrepancy between CTG findings and actual intraoperative and neonatal outcomes. For instance, some cases of C-sections performed due to NRFS do not reveal significant intraoperative abnormalities, suggesting that the decision to proceed with surgery may sometimes be influenced by factors beyond objective clinical indicators [7]. This misalignment underscores the need for a more nuanced understanding of the relationship between CTG interpretations and the underlying physiological conditions observed during surgery and their subsequent impact on neonatal health [8].

In rural tertiary care centers, the reliance on CTG may be particularly pronounced due to limited access to advanced diagnostic tools and specialized personnel. These centers

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often serve a large population with varying levels of healthcare literacy, which can further complicate the accurate interpretation and application of CTG data [9]. Consequently, the potential for both overuse and underuse of C - sections based on CTG findings is heightened, necessitating context - specific studies to evaluate and optimize clinical practices in these settings [10].

Neonatal outcomes are a critical measure of the effectiveness of obstetric interventions. While timely C - sections can prevent adverse outcomes such as birth asphyxia and hypoxic - ischemic encephalopathy, unnecessary surgeries expose neonates to risks like respiratory distress syndrome and surgical complications [11]. Therefore, establishing a clear correlation between CTG findings, intraoperative observations, and neonatal outcomes is essential for refining clinical guidelines and improving maternal and child health [12].

The National Institute for Health and Care Excellence (NICE) has provided comprehensive guidelines on the interpretation of CTG traces, categorizing them into normal, suspicious, and pathological patterns [13]. Adhering to these guidelines is crucial for standardizing care and minimizing subjective biases in decision - making. However, adherence to these guidelines varies, and there is a need for empirical evidence to support their implementation in diverse healthcare settings, including rural tertiary care centers [14].

Moreover, the training and experience of healthcare providers play a significant role in the accurate interpretation of CTG. Studies have shown that continuous professional development and standardized training programs can enhance the reliability of CTG interpretations, thereby reducing the incidence of unnecessary C - sections [15]. In resource - limited settings, investing in such training initiatives could lead to more judicious use of C - sections, optimizing both maternal and neonatal outcomes [16].

The economic implications of rising C - section rates cannot be overlooked. Unnecessary surgical deliveries contribute to increased healthcare costs, longer hospital stays, and greater demand for surgical facilities and personnel [17]. In rural areas, where healthcare resources are often stretched thin, optimizing the use of C - sections based on accurate CTG interpretations can lead to more efficient resource allocation and improved overall healthcare delivery [18].

Furthermore, patient - centered outcomes, including maternal satisfaction and long - term health, are influenced by the mode of delivery. Vaginal births generally entail shorter recovery periods and fewer complications compared to C - sections, which can have lasting effects on a woman's health and well - being [1]. By correlating CTG findings with intraoperative and neonatal outcomes, healthcare providers can make more informed decisions that align with the best interests of both mother and child [2].

Despite the widespread use of CTG, there remains a significant lacuna in knowledge regarding its correlation with intraoperative findings and neonatal outcomes, particularly in rural tertiary care settings. Most existing studies have been conducted in urban or well - resourced hospitals, leaving a

gap in understanding how CTG interpretations translate into clinical decisions and outcomes in different healthcare environments. Addressing this gap through targeted research is essential for developing tailored guidelines that consider the unique challenges and resources of rural healthcare facilities.

In addition, cultural and socioeconomic factors influence healthcare - seeking behavior and acceptance of medical interventions, including C - sections. In rural communities, where traditional beliefs and limited access to healthcare information prevail, the decision to proceed with a C - section based on CTG findings may be affected by factors beyond clinical indications. Understanding these dynamics is crucial for developing comprehensive strategies that ensure the appropriate use of CTG and C - sections, thereby enhancing neonatal outcomes without compromising maternal health [17, 18].

Technological advancements also offer opportunities to improve the accuracy and reliability of CTG monitoring. Innovations such as computerized analysis and artificial intelligence can assist in the interpretation of CTG traces, reducing human error and increasing consistency. Implementing such technologies in rural tertiary care centers could enhance the precision of CTG - based decision - making, ultimately leading to better clinical outcomes.

The primary aim of this study was to evaluate the correlation between cardiotocography (CTG) findings and intraoperative observations in pregnant women undergoing emergency caesarean sections for non - reassuring fetal status (NRFS) at a rural tertiary care centre. Specifically, the study sought to determine how accurately CTG, as guided by NICE guidelines, reflects the actual intraoperative conditions encountered during caesarean deliveries. Additionally, the research aimed to assess the subsequent neonatal outcomes associated with NRFS - based caesarean sections, including Apgar scores, the need for neonatal intensive care, and instances of respiratory distress. By analysing these correlations, the study intended to identify potential discrepancies between CTG interpretations and clinical findings, thereby informing strategies to optimize decision - making processes, reduce unnecessary cesarean interventions, and improve both maternal and neonatal health outcomes in resource - limited rural healthcare settings.

2. Methodology

1) Study Design

This research employed a cross - sectional observational study design to investigate the correlation between cardiotocography (CTG) findings, intraoperative observations, and neonatal outcomes in caesarean sections performed for non - reassuring fetal status (NRFS). The observational nature of the study allowed for the collection of data without manipulating any variables, ensuring that the findings reflected real - world clinical practices and outcomes.

2) Study Setting

The study was conducted at RL Jalappa Hospital and Research Centre, affiliated with Sri Devaraj Urs Medical

College, located in Tamaka, Kolar. This rural tertiary care center serves a diverse population with limited access to advanced medical facilities. The Obstetrics and Gynaecology department at RL Jalappa Hospital is equipped with essential diagnostic and surgical facilities, making it an appropriate setting for examining CTG utilization and its outcomes in a resource - limited environment.

3) Study Duration

The study spanned a period of twelve months, commencing in January 2023 and concluding in December 2023. This duration allowed for the comprehensive collection of sufficient data to achieve the study's objectives and ensured that seasonal variations in obstetric cases did not bias the results.

4) Participants

Inclusion Criteria:

- Participants
- Pregnant women with a singleton pregnancy.
- Gestational age between 37 and 42 weeks.
- Underwent emergency caesarean section due to non - reassuring cardiotocography (NRCTG) findings.
- Provided informed consent to participate in the study.

Exclusion Criteria:

- Participants Excluded
- Multifetal pregnancies.
- Non - cephalic fetal presentations.
- Gestational age below 37 weeks.
- Presence of significant medical disorders during pregnancy (e. g., preeclampsia, gestational diabetes).
- Cases where CTG monitoring was not available or incomplete.

5) Study Sampling

A purposive sampling technique was utilized to select participants who met the inclusion criteria. This approach ensured that the study focused on individuals who were directly relevant to the research objectives, thereby enhancing the validity and applicability of the findings within the context of rural tertiary care settings.

6) Study Sample Size

The sample size for this study was meticulously calculated to ensure that the research findings would achieve statistical significance and reliability. Based on existing literature, the prevalence of non - reassuring cardiotocography (NRCTG) was estimated to be approximately 63.4%. To determine the appropriate number of participants, the standard formula for estimating sample size in prevalence studies was employed, incorporating an allowable margin of error of 15%. This calculation considered both the proportion of expected cases (63.4%) and the complementary proportion (36.6%) to account for variability within the population. Applying these parameters, the resultant sample size was determined to be 42 participants. This number was deemed sufficient to provide a robust analysis of the correlation between CTG findings, intraoperative observations, and neonatal outcomes within the specified rural tertiary care setting. By enrolling 42 eligible pregnant women undergoing emergency cesarean sections for NRCTG, the study aimed to balance the need for comprehensive data collection with the practical considerations of the study environment and timeframe.

7) Study Groups

As this was an observational study without intervention, the participants were not divided into distinct groups. Instead, all included pregnant women undergoing emergency cesarean sections for NRCTG were assessed collectively to evaluate the correlation between CTG findings, intraoperative observations, and neonatal outcomes.

8) Study Parameters

The primary parameters of the study included:

- **Cardiotocography (CTG) Findings:** Classified as normal, suspicious, or pathological based on NICE guidelines.
- **Intraoperative Findings:** Documented observations during the caesarean section, including uterine condition, fetal distress indicators, and any surgical complications.
- **Neonatal Outcomes:** Assessed using Apgar scores at 1 and 5 minutes, admission to the Neonatal Intensive Care Unit (NICU), need for neonatal resuscitation and perinatal mortality rates.

9) Study Procedure

Upon admission, eligible pregnant women who required emergency cesarean sections for NRCTG were identified. Continuous CTG monitoring was conducted during labor, and recordings were meticulously documented in the labor room. Following the decision for caesarean delivery, intraoperative findings were systematically recorded from operative notes. Neonatal outcomes were evaluated immediately post - delivery and during the hospital stay, with Apgar scores assigned at 1 and 5 minutes. Data regarding NICU admissions, neonatal resuscitation, and perinatal mortality were also collected to provide a comprehensive assessment of outcomes.

10) Study Data Collection

Data were gathered using a structured case record form designed to capture all relevant information systematically. The form included sections for patient demographics, obstetric history, CTG findings, intraoperative observations, and neonatal outcomes. Trained research assistants ensured that data were collected consistently and accurately. All collected data were entered into Microsoft Excel 2016 for preliminary organization before being transferred to SPSS Software version 26 for detailed analysis.

11) Data Analysis

Data analysis was performed using SPSS Software version 26. Qualitative variables were summarized using frequencies and percentages, while quantitative variables were described using means and standard deviations.

12) Ethical Considerations

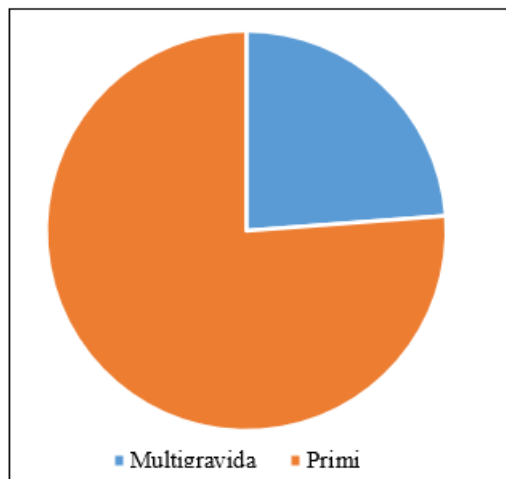
Ethical approval for the study was obtained from the Institutional Ethics Committee of Sri Devaraj Urs Academy of Higher Education & Research. Informed consent was secured from all participants, ensuring that they were fully aware of the study's purpose, procedures, and their rights, including the right to withdraw at any time without affecting their medical care. Confidentiality was strictly maintained by anonymizing all patient data and securely storing records. The study adhered to the ethical principles outlined in the

Declaration of Helsinki, ensuring respect for participants, beneficence, and justice throughout the research process.

3. Result and Analysis

Table 1: Parity & Gravida wise distribution

Parity & Gravida	Frequency	Percent
Primigravida	32	76.2
Multigravida	10	23.8
Total	42	100

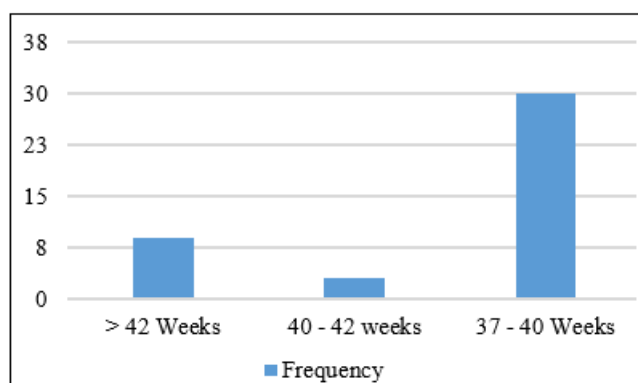


Parity and Gravidity

The data on parity and gravidity indicates that among the 42 participants, 76.2% (32 individuals) were primigravida, meaning they were experiencing their first pregnancy, while 23.8% (10 individuals) were multigravida, indicating they had been pregnant more than once. This distribution highlights that the majority of the study population consisted of first - time pregnant individuals. [Table 1 & Figure 1]

Table 2: Gestational age wise distribution

Gestational Age (in weeks)	Frequency	Percent
> 42 Weeks	9	21.4
40 - 42 weeks	3	7.1
37 - 40 Weeks	30	71.4
Total	42	100

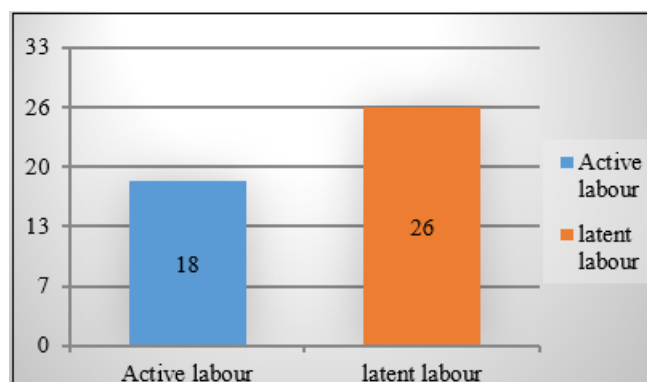


Gestational Age

The data on gestational age shows that out of 42 participants, the majority (71.4%, or 30 individuals) were in the 37–40 weeks gestational age range, which is considered full - term. A smaller proportion (21.4%, or 9 individuals) had a gestational age beyond 42 weeks, while 7.1% (3 individuals) were in the 40–42 weeks range. This indicates that most pregnancies in the study were within the normal full - term period. [Table 2 & Figure 2]

Table 3: Labour status

Labour Status	Frequency	Percent
Active labour	18	41
latent labour	26	59
Total	42	100

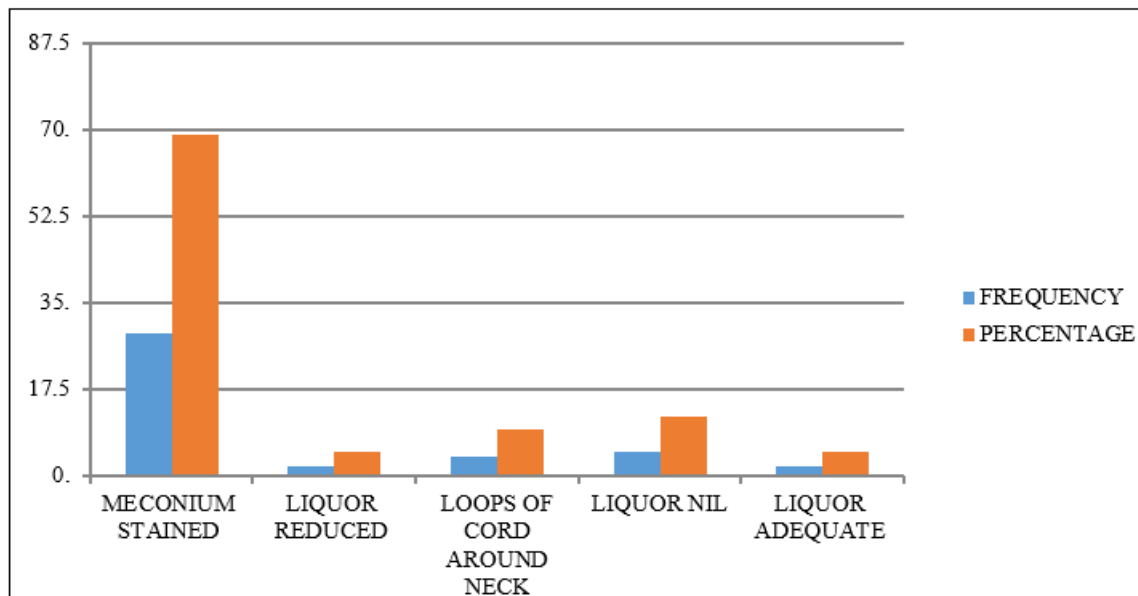


Labour Status

The data on labor status shows that out of the total participants, 26 were in latent labor, which is the early phase of labor, while 18 were in active labor, indicating the more advanced stage of labor. This suggests that a larger proportion of participants were in the early stages of labor at the time of data collection. [Table 5]

Table 4: Intraoperative findings

Intraoperative Findings	Frequency	Percent
MECONIUM STAINED	29	69
LIQUOR REDUCED	2	4.76
LOOPS OF CORD AROUND NECK	4	9.56
LIQUOR NIL	5	11.9
LIQUOR ADEQUATE	2	4.76
Total	42	100



Intraoperative Findings

Intraoperative assessments revealed that the most common finding was "Lus well formed, liquor thick meconium stained," present in 38.1% (N=16) of the cases. This indicates a significant presence of meconium in the amniotic fluid, which can be a sign of fetal distress. Other notable findings included "Liquor clear and adequate" (11.9%, N=5) and "liquor thick meconium stained" (4.8%, N=2). Several other combinations of intraoperative observations were recorded, each accounting for 2.4% to 4.8% of the participants. These findings underscore the variability in intraoperative conditions encountered during cesarean sections for NRCTG and highlight the importance of accurate CTG interpretation in anticipating and managing potential complications. [Table 6]

The improvement in Apgar scores from the first to the fifth minute reflects ongoing stabilization of the neonates after birth. However, the persistence of a small percentage with lower scores and a stillbirth case highlights the critical importance of effective monitoring and timely interventions during labor. [Table 7]

Table 6: Neonatal Outcomes

Required nicu	Frequency	Percent
No	27	64.3
yes	14	19

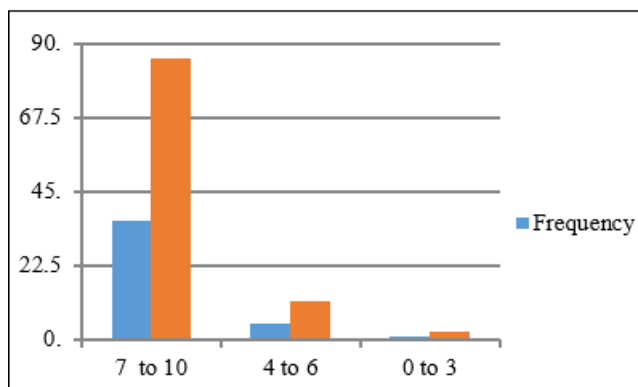
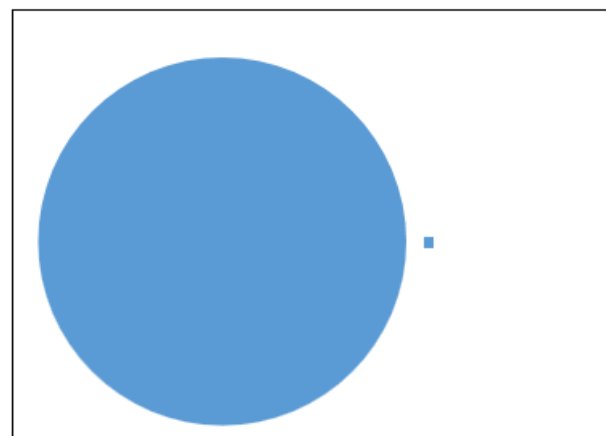


Table 5: APGAR Score at 5 minutes

APGAR Score	Frequency	Percent
7-10	36	85.7
4-6	5	11.9
0-3	1	2.4
Total	42	100

Apgar Scores at 5 Minutes

By five minutes post - delivery, 83.3% (N=35) of neonates achieved an Apgar score of 5'9/10, and 14.3% (N=6) scored 5'8/10. There was still one instance of stillbirth (2.4%, N=1).



Neonatal outcomes were categorized into three groups: successfully managed without NICU admission at 64.3% (N=27), required observation (Obs) at 19.0% (N=8), and experienced respiratory distress (RD) at 14.3% (N=6). The majority of neonates were managed effectively without complications, indicating favourable outcomes for most cases. However, the presence of a notable percentage requiring additional observation or experiencing respiratory distress underscores the necessity for vigilant postnatal care and the potential risks associated with NRCTG - induced caesarean sections. [Table 8]

4. Discussion

The present study aimed to evaluate the correlation between cardiotocography (CTG) findings, intraoperative observations, and neonatal outcomes in emergency caesarean sections performed for non - reassuring fetal status (NRFS) at a rural tertiary care centre. The demographic and clinical characteristics of the study population, as well as the outcomes observed, provide valuable insights into the efficacy and implications of CTG monitoring in such settings.

The mean age of the participants was 24.14 years (SD = 4.604), with ages ranging from 19 to 36 years. This relatively young age distribution is consistent with the demographic profile of reproductive - age women in many rural Indian populations, where early pregnancies are common. The neonatal weights averaged 2.86 kg (SD = 0.440 kg), falling within the normal range, although the presence of weights as low as 2.02 kg suggests instances of intrauterine growth restriction (IUGR) or other perinatal complications. The predominance of primigravida women (76.2%) underscores the potential challenges faced by first - time mothers in labour, who may have less experience and higher anxiety levels, potentially influencing labour progression and CTG interpretations.

The high proportion of primigravida women in this study (76.2%) is noteworthy. Primigravida pregnancies are often associated with longer labour durations and a higher likelihood of interventions, including caesarean sections, due to the increased vigilance required in monitoring fetal well - being. This finding aligns with existing literature that suggests nulliparous women are more likely to undergo caesarean deliveries for NRFS compared to multiparous women, possibly due to the perceived higher risk of adverse outcomes in first - time pregnancies [1].

The data on gestational age shows that out of 42 participants, the majority (71.4%, or 30 individuals) were in the 37–40 weeks gestational age range, which is considered full - term. A smaller proportion (21.4%, or 9 individuals) had a gestational age beyond 42 weeks, while 7.1% (3 individuals) were in the 40–42 weeks range. This indicates that most pregnancies in the study were within the normal full - term period.

The data on labor status shows that out of the total participants, 26 were in latent labor, which is the early phase of labor, while 18 were in active labor, indicating the more advanced stage of labor. This suggests that a larger proportion of participants were in the early stages of labor at the time of data collection.

The most common intraoperative finding was "Lus well formed, liquor thick meconium stained" (38.1%), indicating significant meconium presence, which is a marker of fetal distress and hypoxia [3]. Meconium - stained amniotic fluid is associated with increased risks of meconium aspiration syndrome (MAS) and other neonatal complications [4]. The prevalence of this finding in the study underscores the critical role of CTG in identifying fetuses at risk of hypoxia. Other intraoperative findings, such as "liquor clear and adequate" (11.9%), suggest that not all caesarean sections for non -

reassuring fetal status revealed severe intraoperative abnormalities, highlighting the potential for overuse of caesarean sections based solely on CTG interpretations. This discrepancy between CTG findings and intraoperative observations aligns with previous studies indicating that CTG can sometimes lead to unnecessary surgical interventions due to its sensitivity but limited specificity [5].

Apgar scores are a crucial indicator of neonatal well - being immediately after birth. At one minute, 85.7% of neonates had an Apgar score of 1'7/10, while 11.9% scored 1'6/10, and 2.4% resulted in stillbirth. By five minutes, the majority of neonates (83.3%) achieved an Apgar score of 5'9/10, with 14.3% scoring 5'8/10 and stillbirth in 2.4% of cases. The improvement in Apgar scores from one to five minutes reflects effective immediate postnatal care and the stabilization of most infants. However, the presence of stillbirths and lower Apgar scores in a subset of neonates highlights the limitations of CTG in entirely preventing adverse outcomes. These findings are consistent with the understanding that while CTG is effective in identifying fetal distress, it is not infallible and must be complemented with other clinical assessments to optimize neonatal outcomes [6].

The categorization of neonatal outcomes revealed that 64.3% of neonates were managed successfully without complications, 19.0% required observation, and 14.3% experienced respiratory distress. The majority of favourable outcomes indicate that timely caesarean interventions based on CTG findings can effectively mitigate severe neonatal complications. However, the 14.3% incidence of respiratory distress underscores the need for enhanced postnatal care and possibly more refined criteria for caesarean indications to further reduce neonatal morbidity [7]. The 19.0% of neonates requiring observation suggests a moderate level of perinatal complications that necessitate careful monitoring, which is critical in rural tertiary care settings where resources may be limited.

The findings of this study are in line with existing research that highlights both the benefits and limitations of CTG monitoring in predicting fetal distress and guiding caesarean interventions. Studies have reported varying degrees of correlation between CTG findings and actual intraoperative and neonatal outcomes, with some indicating overuse of caesarean sections due to false - positive CTG results [8]. The high rate of primigravida participants in this study echoes similar patterns observed in other research, where nulliparous women are more frequently subjected to interventions based on heightened monitoring [9]. Additionally, the prevalence of meconium - stained liquor as an intraoperative finding is consistent with the literature, reinforcing the association between CTG - detected foetal distress and meconium presence [10].

The study underscores the importance of accurate CTG interpretation and the need for standardized training among healthcare providers to minimize unnecessary caesarean sections. Given that a significant proportion of caesareans did not reveal severe intraoperative abnormalities, there is a clear impetus to refine CTG criteria and incorporate additional diagnostic tools to enhance decision - making accuracy [11]. Implementing comprehensive training programs, as

suggested by existing studies, could improve the reliability of CTG interpretations and reduce the incidence of unnecessary surgical interventions, thereby optimizing maternal and neonatal outcomes [12].

In rural tertiary care centres, where healthcare resources are often constrained, the economic impact of rising caesarean rates is a critical concern. Unnecessary caesarean sections contribute to increased healthcare costs, longer hospital stays, and greater utilization of surgical facilities and personnel [13]. By improving the accuracy of CTG interpretations through targeted training and adopting complementary diagnostic approaches, healthcare facilities can achieve more judicious use of caesarean sections, leading to better resource allocation and cost-effectiveness [14].

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This study, while providing valuable insights, is limited by its relatively small sample size of 42 participants, which may affect the generalizability of the findings. Additionally, the study was conducted in a single rural tertiary care centre, which may limit its applicability to other settings with different resource levels and patient populations. The observational design, while appropriate for the research objectives, does not allow for the establishment of causality between CTG findings and neonatal outcomes. Future studies with larger sample sizes and multicentric designs are recommended to validate and extend these findings [15].

Future research should focus on larger, multicentre studies to enhance the generalizability of the results and explore the impact of additional factors such as maternal health status, socioeconomic variables, and the availability of advanced diagnostic tools on the accuracy of CTG interpretations and neonatal outcomes. Moreover, investigating the role of emerging technologies like artificial intelligence in CTG analysis could provide avenues for improving diagnostic precision and reducing unnecessary interventions. Longitudinal studies tracking long-term neonatal outcomes would also be beneficial in understanding the full impact of caesarean deliveries based on CTG findings.

5. Conclusion

The study highlights the critical role of CTG in guiding emergency caesarean sections for Non assuring fetal status,

demonstrating a substantial correlation between CTG findings and neonatal outcomes. While the majority of neonates achieved favourable outcomes, the presence of complications such as respiratory distress and stillbirth underscores the need for continued vigilance and improvement in CTG interpretation and clinical decision-making processes. By addressing the identified gaps and implementing the recommended strategies, healthcare providers can enhance the efficacy of CTG monitoring, reduce unnecessary caesarean sections, and ultimately improve both maternal and neonatal health outcomes in rural tertiary care settings.

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