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Original Research Article

EVALUATION OF ADMISSION TEST (CARDIOTOCOGRAPHY) IN HIGH RISK VERSES NORMAL PREGNANACY

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ABSTRACT

Background: Antepartum fetal monitoring is crucial, as almost two-thirds of fetal fatalities transpire prior to the onset of labor. Cardiotocography (CTG) simultaneously records fetal heart rate and uterine contractions, aiding in the identification of at-risk pregnancies. Admission cardiotocography has become significant in evaluating fetal health, especially in high-risk pregnancies. To study the efficacy of admission cardiotocography in high-risk compared to normal pregnancies, focusing on its effectiveness in averting unfavorable perinatal outcomes and evaluating its reliability, accuracy, sensitivity, and specificity.

Materials and Methods: This hospital-based observational study was conducted at Government General Hospital, Nizamabad from 2024 to 2025. A total of 200 women with singleton pregnancies beyond 37 weeks were included—100 high-risk and 100 normal pregnancies. CTG was performed using the Philips Series 50A machine, 1–2 hours postprandially. Data on maternal history, obstetric risk factors, mode of delivery, neonatal outcome, and NICU admissions were analyzed. Exclusion criteria included multiple gestations and lack of consent.

Results: In high-risk pregnancies, 48% exhibited reactive CTG, whereas 52% were non-reactive. In the control group, 79% exhibited reactivity, while 21% shown non-reactivity. Non-reactive CTG patterns were predominantly linked to preeclampsia, oligohydramnios, and post-term pregnancies. Cesarean section was necessitated in 54% of high-risk cases, as contrast to 24% of normal instances. Neonates exhibiting reactive cardiotocography (CTG) typically shown positive outcomes (Apgar >6), whereas 12 neonates in the high-risk category with non-reactive CTG recorded Apgar scores ranging from 2 to 6. NICU admissions were markedly elevated in high-risk pregnancies (40 instances) compared to normal pregnancies (4 occurrences). The sensitivity and specificity of CTG were 52% and 79%, respectively, with a false positive rate of 21% and a false negative rate of 48%.

Conclusion: Entry CTG is an essential instrument for identifying fetal distress, especially in high-risk gestations. Nonetheless, its restricted sensitivity and comparatively elevated false positive rate indicate that it should not be utilized independently. Integrating CTG with additional modalities like Doppler velocimetry and biophysical profiling may augment prediction accuracy and boost clinical results.

Keywords: Admission test, Cardiotocography, High-risk pregnancy, Fetal monitoring, Perinatal outcome.

INTRODUCTION

Antepartum fetal monitoring is necessitated by the reality that over two-thirds of fetal fatalities transpire prior to the commencement of labor. Applying the principles of intrapartum fetal heart rate monitoring to the antepartum phase could significantly contribute to the prevention of such fatalities.[1-3] A considerable percentage of antepartum fatalities are linked to risk factors for uteroplacental insufficiency, underscoring the imperative for prompt and efficient monitoring. The creation of dependable assessments for evaluating fetal well-being prenatally facilitates prompt intervention, thus diminishing the likelihood of hypoxic injury or fetal death.[4-6]

Antepartum fetal monitoring encompasses both non-invasive and invasive techniques. Non-invasive methodologies include subjective techniques like daily fetal kick counts and the Cardiff count, as well as objective evaluations such as biochemical hormonal assays, non-stress testing (NST), and ultrasonography with Doppler velocimetry. Invasive procedures, however infrequently utilized due to inherent dangers, encompass amniocentesis, fetal electronic monitoring with scalp electrodes or vibroacoustic stimulation, and fetal blood sampling.[7-9] Among them, antepartum fetal heart rate monitoring has become the principal method for assessing fetal condition, with the non-stress test being the most frequently employed technique in high-risk pregnancies. Its popularity is ascribed to numerous practical benefits—it is non-invasive, rapid, cost-effective, easily interpretable, devoid of contraindications, and appropriate for outpatient environments.[10-12] Consequently, NST has gained widespread acceptance as the primary technique for antenatal fetal monitoring, effectively supplanting previous laboratory-based approaches, particularly when utilized alongside ultrasonography and Doppler examinations. It is especially beneficial in pregnancies complicated by post-term gestation, diminished fetal movements, hypertensive diseases, growth limitation, and antepartum haemorrhage.[13-15] Cardiotocography (CTG) enhances prenatal monitoring by simultaneously recording the fetal heartbeat and uterine contractions, usually during the third trimester. Two distinct transducers are utilized in an electronic fetal monitor (EFM): one for detecting the fetal heart rate via ultrasound and another for measuring uterine contractions using a tocodynamometer. External methods are non-invasive, but internal measurements, which require the insertion of a pressure catheter into the uterine canal and the attachment of a scalp electrode to the fetus, offer enhanced precision but are constrained by their invasive characteristics and inherent hazards.[16-18]

This study seeks to assess the significance of admission cardiotocography in high-risk and normal pregnancies. It aims to evaluate the role of admission CTG in mitigating unfavorable perinatal outcomes and to ascertain its reliability, accuracy, sensitivity, and specificity in detecting at-risk fetuses.

MATERIALS AND METHODS

This study was performed at Government General Hospital, Nizamabad from 2024 to 2025 to assess the significance of the admission test (cardiotocography) in both high-risk and normal pregnancies with singleton gestation exceeding 37 weeks. A comprehensive history was collected from all participants, encompassing the date of the last menstrual period, pertinent past obstetric history, the number of prior antenatal visits, and notable factors from previous pregnancies. Prior to doing the test, data concerning meal time and medication usage was gathered, as these factors could affect fetal activity. The majority of tests were conducted one to two hours postprandially. The technique was elucidated to each participant, and informed consent was acquired, as patient collaboration was crucial. Cardiotocography was conducted with the Philips Series 50A CTG apparatus.

Inclusion Criteria

- Normal and high-risk pregnant women with singleton pregnancy beyond 37 weeks of gestation.

Exclusion Criteria

- Women with multiple gestations.
- Women who did not provide informed consent.

High-Risk Group

- The high-risk group included pregnancies complicated by:
- Hypertensive disorders of pregnancy (gestational hypertension/preeclampsia).
- Gestational diabetes mellitus.
- Rh-negative pregnancy.
- Bad obstetric history.
- Intrauterine growth restriction (IUGR).
- Oligohydramnios.
- Maternal anemia (<8 gm%).
- Post-dated pregnancy.
- Premature rupture of membranes (PROM).

Low-Risk Group

- The low-risk group consisted of women with normal, uncomplicated pregnancies.

Limitations

- In this study, cardiotocography could not be supplemented with ancillary tests such as Doppler velocimetry or biophysical profiling due to institutional constraints.

RESULTS

A total of 200 cases were studied, including 100 high-risk pregnancies and 100 normal pregnancies. Among the high-risk group, 48 cases showed a reactive CTG pattern while 52 cases demonstrated a non-reactive pattern. In the normal group, 79 cases were reactive and 21 cases were non-reactive. These

findings indicate that the admission test (CTG) plays an important role in detecting impending fetal risk not only in high-risk pregnancies but also in apparently normal pregnancies, where intrapartum fetal distress may still occur.

Primagravidae made up 48% of the women in the high-risk group and 44% of the women in the usual group, making them the majority in both groups. Multigravidae were least represented in both groupings, while Gravida II was the next significant group.

Table 1: Parity distribution of cases

Parity	High risk cases	Normal cases.
Primi	48	44
Gravida II	24	40
Gravida III	20	14
Multigravida	8	2

Table 2: Age wise distribution of Cases

Age	High risk pregnancy	Normal pregnancy
15-20	8	16
21-25	58	54
26-30	22	20
>30	12	10

In both categories, the majority of instances (58% in high-risk pregnancies and 54% in normal pregnancies) occurred in patients aged 21 to 25. The smallest category was women over 30 who were pregnant.

Table 3: Percentage of High Risk cases in the study

High risk cases	Number of cases	% of cases
PH/ Preeclampsia	24	12
GDM	16	8
BOH	4	2
Anemia	12	6
Rh negative pregnancy	4	2
Oligohydramnious	12	6
IUGR	4	2
Postdated pregnancy	8	4
PROM	6	3
Hypothyroid	10	5

The most prevalent high-risk factor was preeclampsia (12%), which was followed by oligohydramnios (6%), anemia (6%), and gestational diabetes mellitus (8%). Less frequently occurring conditions were IUGR, BOH, and Rh negative.

Table 4: Relation to Risk Factors

Risk Factors	Reactive CTG	Non Reactive CTG
PH/ Preeclampsia	10	14
GDM	10	6
BOH	2	2
Anemia	8	4
Rh negative pregnancy	2	2
Oligohydramnious	4	8
IUGR	2	2
Postdated pregnancy	2	6
PROM	2	4
Hypothyroid	6	4

The most common conditions linked to non-reactive CTG patterns were oligohydramnios (8 instances), late postdated pregnancies (6 cases), and preeclampsia (14 occurrences). Conversely, reactive CTG patterns were more common in situations of anemia and gestational diabetes.

Table 5: Pattern of Non Reactive CTG

Non Reactive CTG	High risk cases	Normal cases
Fetal bradycardia	4	0
Early deceleration	14	8
Late decelaration	16	0
Variable deceleration	8	2
Fetal heart rate variablility	10	2

The most common abnormal CTG results among high-risk individuals were early decelerations (14 cases) and late decelerations (16 cases). Two normal instances and ten high-risk cases showed a loss of

beat-to-beat variability. Bradycardia or late decelerations were absent in all normal pregnancies.

Table 6: Mode of delivery

	High risk pregnancies	Normal pregnancy
Spontaneous vaginal delivery	28	74
Induction of labour	18	2
Caesarean section	54	24

Caesarean section was the primary delivery method for high-risk pregnancies (54%), whereas spontaneous vaginal delivery was the most prevalent in normal pregnancies (74%). Induction of labor was necessitated more often in high-risk situations than in normal pregnancies.

Table 7: Neonatal outcome in high risk pregnancies

Apgar	Reactive	Non reactive
>6	48	40
2-6	0	12
<2	0	0
Still birth	-	-

In the high-risk cohort, newborns exhibiting reactive CTG consistently attained Apgar scores exceeding 6, while 12 neonates with non-reactive CTG recorded Apgar values ranging from 2 to 6, indicating a compromised neonatal prognosis.

Table 8: Neonatal outcome in normal pregnancies

Apgar	Reactive	Non reactive
>6	79	19
2-6	0	2
<2	-	-
Still birth	-	-

The majority of neonates in the normal pregnancy cohort exhibited positive outcomes, irrespective of the CTG pattern. Only two individuals with non-reactive CTG had mild depression at delivery (Apgar scores of 2–6).

Table 9: Perinatal mortality and morbidity in relation to CTG

	High risk cases	Normal cases
NICU admission	40	4

The link between high-risk status, non-reactive CTG, and severe perinatal outcomes was highlighted by the significantly greater number of NICU admissions (4 cases) compared to normal pregnancies (20 cases).

DISCUSSION

This study aimed to analyze the efficacy of admission cardiotocography (CTG) in evaluating fetal well-being in high-risk and normal pregnancies. Our findings indicate that admission CTG offers critical insights into fetal state upon admission, revealing considerable disparities between high-risk and low-risk groups.[22,23]

In the present study, 52% of high-risk pregnancies exhibited a non-reactive CTG, whereas only 21% of normal pregnancies did. This underscores the increased susceptibility of high-risk pregnancies to fetal jeopardy. Previous studies have revealed analogous findings, indicating that high-risk pregnancies routinely exhibit elevated rates of aberrant CTG patterns, especially in circumstances such as preeclampsia, intrauterine growth restriction (IUGR), oligohydramnios, and post-term pregnancies. Our data further validate previous findings that non-reactive CTG patterns are commonly linked to uteroplacental insufficiency, highlighting the efficacy of CTG in identifying early fetal distress.[24,25]

The method of delivery was markedly affected by CTG results. Over fifty percent (54%) of high-risk pregnancies necessitated cesarean delivery, whereas the majority of normal pregnancies (74%) resulted in spontaneous delivery. The increased frequency of surgical procedures in high-risk pregnancies is due to non-reassuring CTG tracings, which frequently require immediate action to prevent fetal distress. These findings correspond with recent meta-analyses indicating that aberrant CTG results are highly predictive of the necessity for surgical delivery.[26,27]

Neonatal outcomes further validate the significance of CTG. In our investigation, infants exhibiting reactive CTG consistently demonstrated favorable Apgar scores (>6). Conversely, 12 neonates from the high-risk cohort exhibiting non-reactive CTG experienced significant neonatal depression (Apgar scores of 2–6). Furthermore, NICU admissions were significantly elevated in the high-risk group (40%) vs to the normal group (4%), hence supporting the correlation between non-reactive CTG and

unfavorable newborn outcomes. These findings underscore that CTG can function as an early detection instrument for identifying fetuses at risk of postnatal morbidity.[28,29]

Nonetheless, despite its clinical significance, CTG possesses several limitations. Our investigation revealed that the sensitivity and specificity of CTG were 52% and 79%, respectively. The 21% false-positive rate led to superfluous procedures, chiefly cesarean sections, but the 48% false-negative rate suggests that certain at-risk fetuses may go undetected by CTG alone. This aligns with prior publications emphasizing the intrinsic limitations of CTG as a screening instrument, attributable to intra- and inter-observer variability and its incapacity to differentiate between hypoxia and other benign causes of fetal heart rate fluctuations.[30,31]

Consequently, CTG should not be employed as the sole method for fetal monitoring. Integrating CTG with additional modalities, including Doppler velocimetry, biophysical profile, or fetal scalp stimulation, could enhance diagnostic precision and diminish unwarranted procedures. Moreover, recent research indicates that computerized analysis of CTG tracings may mitigate observer bias and improve consistency in clinical decision-making.[32-34]

CONCLUSION

The sensitivity and specificity of the CTG in our study is 52% and 79% respectively. The over all incidence of caesarian section is 39%, which included cases with non reactive CTG, reactive CTG with BOH, GDM, failed induction and CPD. In our study, NICU admissions were 22%, of these only 7% neonates had low apgar, the remaining inspite of having a reactive CTG, were admitted in NICU in view of factors like precocious neonate, infant of diabetic mother and delayed cry. The false positive rate is 21% which is a high number, resulted in over treatment leading to more rate of caesarian sections. But the fact should be noted that in 79% cases, by an active intervention, we had a good fetal outcome. Whereas the false negative rate is 48% which is not a small number, in these cases fetal risk is missed or rather under diagnosed and may result in poor outcome.

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