Chattagram Maa-O-Shishu Hospital Medical College Journal
Volume 24, Issue 1, January 2025

Original Article

Role of Intrapartum Cardiotocography to Predict the Fetal Outcome in High-Risk Patients : A Prospective Study

Farah Naz Mabud[1*]
Most Sabina Yeasmeen[1]
Adiba Malik[1]
Shahanaj Sharmin[1]
Shamima Akhter[2]
Farjana Ahmed Surovi[1]
Jannatul Ferdoues[1]
Nargis Sultana[3]

[1]Department of Obstetrics & Gynaecology
Chattagram Maa-O-Shishu Hospital Medical College
Chattogram, Bangladesh.

[2]Department of Obstetrics & Gynaecology
Upozilla Health Complex, Fatikchari
Chattogram, Bangladesh.

[3]Department of Obstetrics & Gynaecology
Chandanaish Upozila Health Complex
Chattogram, Bangladesh.

*Correspondence to:
Dr. Farah Naz Mabud
Associate Professor
Department of Obstetrics & Gynaecology
Chattagram Maa-O-Shishu Hospital Medical College
Chattogram, Bangladesh.
Mobile : +88 01678 22 11 44
Email : farah.naz.mabud@gmail.com

Date of Submission : 21.11.2024
Date of Acceptance : 20.12.2024

www.banglajol.info/index.php/CMOSHMCJ

Abstract

Background: *Labour is a very short period of life of a fetus but poses physiological stress to all the fetus. Fetal distress is a progressive condition that, if not corrected, can increase the chance of fetal death. So routine and continuous monitoring of fetal heart rate by doing Cardiotocography in labour in high risk pregnancies has become an established obstetric practice. The aim of the study is to evaluate the predictive value of the admission CTG in detecting fetal hypoxia at the time of admission during labour and to correlate its result with fetal outcome in high risk pregnancies.*

Materials and methods: *This prospective observational study was held in ChattogramMaa O Shishu Hospital Medical College from March 2022 to August 2022. A total of 65 gravid women with high risk pregnancies of >37 weeks gestation with cephalic presentation in the first stage of labour were taken. Result was assessed in the form of APGAR SCORE at 5 min, NICU admission, perinatal mortality and mode of delivery. Statistical analysis was done by using SPSS 20. Chi square test was used and p< 0.05 is considered statistically significant.*

Results: *A total of 65 high risk obstetric patients were recruited. The admission CTG were reactive in 45 patients (69.23%) and non-reactive in 20 patients (30.77%). APGAR SCORE <7 at 5 minutes was higher in nonreactive group (60%) as compared to reactive group (60% v/s 17.78%). Occurrence of fetal distress, NICU admission and perinatal mortality was also higher in nonreactive group to reactive group (NICU admission 35% v/s 6.67% and perinatal mortality 15% v/s 0%). Incidence of vaginal delivery vaginal delivery was more common when the test was reactive (64.44% v/s 10%). Sensitivity, specificity, positive predictive value and negative predictive value of Admission CTG for these high risk cases were 68%, 76%, 54% and 85% respectively.*

Conclusion: *Admission CTG is a simple and easy test and an effective screening test to identify groups of women with greater risk of intrapartum fetal hypoxia and to predict fetal outcome and thus prevents unnecessary delay in intervention.*

Key words: Admission Cardiotocography; Fetaldistress; Fetalhypoxia; Fetal outcome.

INTRODUCTION

Labour poses physiological stress to all fetuses during the transition from intrauterine to the extra uterine environment.[1] Fetal distress is a progressive condition, which if not corrected, will result in decompensation of physiological response and cause damage the brain or death of fetus.[2]Although, the vast majority of fetuses cope well during labour, the journey through the birth canal is stressful

and the fetus may mount as a 'stress response'. Thus, surveillance of the fetus during labour is important to ensure the delivery of a healthy baby in good condition with a minimum of intervention.[3] Such an approach is introduced to prevent neurological injury, including cerebral palsy.[4] Fetal monitoring during labour identifies the fetuses at risk of hypoxic damage, so that appropriate intervention could be instituted to optimize perinatal outcome.[5] For this purpose, Electronic Fetal Monitoring (EFM) has widely been adopted.[6] Although with intermittent auscultation the baseline Fetal Heart Rate (FHR) can be measured, other features of the fetal heart such as baseline variability, accelerations and decelerations are difficult to quantify.[7] Therefore, the use of antepartum and intrapartum cardiotocography (CTG) has increased over the last 15 years.

Admission Test (AT) first described by Ingemarsson et al. Is a short trip (20 minute) of CTG done during labour. It is a dynamic screening test for the state of oxygenation of the fetus on admission of the have been picked up by serial ultrasound or Doppler scans. But in non-industrialized countries with inadequate antenatal care, it has a role in obstetric units with a heavy workload with limited resources in 'triaging' fetuses by providing a 'snap-shot' view of fetal well-being at the time of admission mother into labour room.[8] in industrialized countries with good antenatal care, such fetuses may be in labour. Thus, taking a short recording of fetal heart rate on admission helps us to determine the ability of the fetus to withstand the stress of labour.[9] The objective of this study was to evaluate the predictive value of the admission test in detecting detailed asphyxia at the time of admission in labour and to correlate the results of the admission test with perinatal outcomes in high-risk obstetric cases.

MATERIALS AND METHODS

This prospective study was conducted during the period of March 2022 to August 2022 in the Department of Obstetrics and Gynaecology of Chattagram Maa-O-Shishu Hospital Medical College from March 2022 to August 2022. A total of 65 cases who had gestational age >37 weeks with cephalic presentation and had been classified as high risks presenting in active labour during the first stage were taken into this study according to the inclusion and exclusion criteria and were subjected to cardiotocography. Cardiotocography monitoring was performed and interpretations made based on fetal heart rate, baseline variability, number of accelerations and deceleration and CTG was designated as reactive or non-reactive. On this basis the fetal outcome was predicted by APGAR SCORE, NICU admission and perinatal mortality and prediction of CTG traces with perinatal outcome was done.

Inclusion criteria

Women who had gestational age >37 weeks in first stage of labour with high-risk factors like Diabetes Mellitus, previous history of stillbirth, Pregnancy-Induced Hypertension (PIH)/ Pre-eclampsia, post-dated pregnancy, premature rupture of membranes (PROM) oligohydramnios, intrauterine growth restriction (IUGR) Rh-negative pregnancy and women with decreased fetal movements.

Exclusion criteria

Women who were excluded from the study were those who had a period of gestation <37 weeks, USG confirmed lethal congenital anomaly of the fetus, acute hypoxic states (such as abruption of placenta, cord prolapse) multiple pregnancies, malpresentation needing immediate cesarean section and patients who were identified for elective LSCS.

MATERIALS AND METHODS

Approval from the institutional ethical committee was obtained. Written informed consent was taken from the women who participated in the study. A detailed clinical history of the patient was taken. Period of gestation was ascertained by last menstrual period and the duration of previous menstrual cycle or by first trimester ultrasound if not sure of date. The Cardiotocography was done for 20 min and the rate of baseline variability, accelerations, decelerations were assessed according to RCOG criteria of CTG (10). Patients with a normal (Reassuring), admission test were monitored by intermittent auscultation for one minute, every 30 minutes in the first stage of labor and every 5 minutes in the second stage of labour.Here if any case of suspicious then CTG done for 40 min and decision was taken whether reactive or nonreactive. If CTG was nonreactive, then IV fluid, left lateral position given to the patients and repeat CTG taken for another 40 minutes. If repeat CTG remains nonreactive, then operative or instrumental intervention was taken as soon as possible to decrease perinatal mortality and morbidity. In patients with ominous tracing, delivery was hastened by instrumental or operative intervention depending upon the stage of labor.

Fetus and neonatal outcome was considered to be in distress if one of the following are present.

1. Ominous FHR changes led to cesarean section or forceps/ Ventouse delivery.
2. Presence of moderate thick meconium- stained liquor.
3. APGAR SCORE at 5 min <74)Admission into neonatal intensive care unit (NICU).5) Intrapartum/neonatal mortality.

RESULTS

Sixty five patients were recruited .Most women were prim gravida in the 21-25 years of age (Table II) Mean gestational age 37.89weeks and mean age 24.45 years.

Table I RCOG guidelines for use of electronic fetal monitoring[10]

Feature	Baseline (bpm)	Variability (bpm)	Decelerations	Accelerations
Normal	100-160	>5	None	Present
Suspicious	100-109 161-180	<5 for >=40>=90 min	Early decelerations, variabledeceleration, Single prolonged deceleration for upto 3 min	
Pathological	≤100 >180 Sinusoidal pattern >10 min	<5 for >90 mins	Atypical variable decelerations, Latedecelerations, Single prolonged deceleration for more than 3 min	The absence of Accelerations with otherwise normal trace is of uncertain significance

Table II Sociodemographic profile

Age Years	Total Number	Total Percentage
17-20	10	15.38%
21-25	33	50.77%
26-30	15	23.07%
31-35	7	10.78%
Parity		
Primi	39	60%
Multi	26	40%
G age		
37-40	63	96.92%
>40 weeks	2	3.08%

Figure : CTG : chart shows that out of 65 patients recruited, reactive pattern was found in 41 cases.Initially 12 cases to be suspicious and 12 reactive cases was found. Out of 12 patients in suspicious group, after repeat CTG and necessary intervention 8 patients were taken to the nonreactive group and the rest 4 patients were with reactive group.

(n=65)
Reactive CTG- 45(69.23%)
Non-Reactive CTG 20(30.76%)

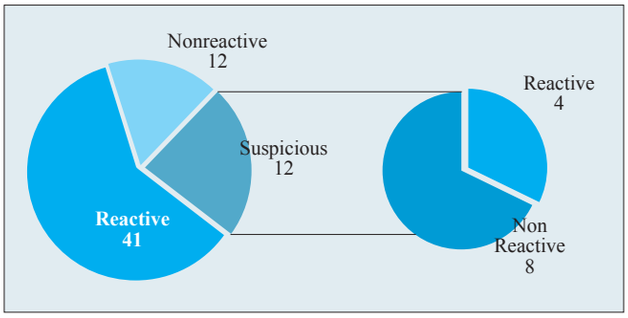

Figure 1 Distribution of studied cases according to reactivity of CTG

About 21.54% patients were postdated pregnancy followed by PIH 20% and PROM 13.84%. A few patients had multiple risk factors (Table III).

Table III Risk factors in study population

Risk Factor	Number	Percentage
GDM	6	9.2%
Postdated	14	21.54%
PIH	13	20%
Oligohydramnios	8	12.27%
Rh Negative mother	2	3.07%
PROM	9	13.84%
IUGR	3	4.73%
Anaemia	4	6.15%
Less Fetal Movement	6	9.2%

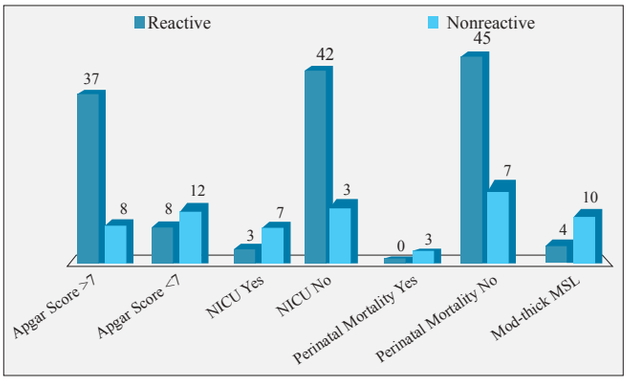

Figure 2 Perinatal Outcome in Reactive and Non-Reactive CTG

Table IV Reactivity of Admission CTG according to mode of delivery

Admission CTG	Vaginal delivery	Instrumental delivery	LSCS
Reactive (45)	29 (64.44%)	4 (8.88%)	12 (26.67%)
Non-Reactive (20)	2 (10%)	1 (5%)	17 (85%)

Table IV depicts the correlation between CTG reactivity and mode of delivery either LSCS, instrumental or vaginal delivery. 85% of non-reactive cases and 26.67% of reactive cases had undergone LSCS. 10% of nonreactive and 64.44% of reactive cases had undergone vaginal delivery. Instrumental delivery was done in 8.88% of reactive and 5% of non-reactive cases. So this study suggests that there is significant difference in the mode of delivery with increasing chance of cesarean section in cases belong to non-reactive traces ($p<0.001$)

Table V Validity tests of Admission CTG and comparison to other studies

Study	Sensitivity	Specificity	PPV	NPV
Rashed et al	77.7%	93.15%	80.7%	91.89%
Hafiz et al	60%	94.8%	56.8%	88.6%
Gupta et al		77.2%	65.9%	84.5%
Present Study	68%	76%	54%	85%

DISCUSSION

Admission CTG is a dynamic screening test for the state of oxygenation of the fetus done on admission of the mother into the labour room at her first stage of labour. It assesses the placental reserve by checking the response of the fetal heart during the phase of temporary occlusion of the uteroplacental blood supply under physiological stress of repeated uterine contractions. It thereby assesses the ability of the fetus to withstand the process of labour.[11] The admission CTG has two potential roles. It can be used as a screening test in early labour to detect compromised fetuses on admission and to select the women in need of continuous EFM during labour.[1] It is a non-invasive recordable method of fetal monitoring and is a highly logical solution to the undeniable human factors/human lapses of manual fetal monitoring of labour(8).The use of EFM is controversial. For example, Imply et al. believe that neonatal outcome is not significantly improved by the use of Admission CTG as compared to intermittent FHR auscultation during labour.[12] Thacker et al. also feel that the use of EFM is of limited effectiveness and carries an increased risk of interventions.[13] According to them, increased information at admission will not necessarily lead to better clinical outcomes. This may be true in developed countries when the majority of the population is provided with comprehensive antenatal care and receives personal attention during labour. Although a Cochrane review recommends that continuous electronic fetal monitoring be limited to high risk pregnancies-this may not be possible in developing countries where antenatal care is inadequate with a large number of high risk pregnancies being delivered in a crowded settings and inadequate health care provider to patient ratios.

In our study the majority of patients belong to the age group 21-25 years 50.77% followed by 26-30 years which correlate with the studies by Hafizur Rahman et al. and Hrishikesh Joshi et al in which 42.5%and 55% patients were in 21-25 years of age. Nulliparous patients were found 60% while 40% were multiparous, comparable with the study by Hrishikesh Joshi et al. where 67% were nulliparous and 33% were multiparous. According to 20 min admission CTG tracing done in our subjects, 69.23% were reactive and 30.77% were nonreactive which was comparable to the study by Manish Gupta et al. where reactive CTG were 63.2% and nonreactive were 36.8%. In this study Postdated pregnancy 21.54%, PIH 20%,PROM 13.84%, oligohydramnios, GDM and Less fetal movement 9.2%, anemia 6.15%, IUGR 4.73% and Rh negative mother 3.07%.[14,15]

In our study incidence of fetal distress and chances of cesarean delivery were higher in nonreactive CTG. In our study, APGAR SCORE <7, moderate to thick meconium stained liquor, NICU admission and perinatal mortality were 17.78%, 8.89%, 6.67%and 0% respectively in reactive CTG whereas in nonreactive CTG 40%had APGAR SCORE <7, 50% had moderate to thick meconium stained liquor, 35%NICU admission and 15% perinatal mortality. This was similar with the study conducted by Manish Gupta et al. where APGAR SCORE <7, moderate to thick meconium stained liquor, NICU admission and perinatal mortality were 33.1%, 34.6%, 22.8% and 0% respectively whereas in nonreactive CTG 66.2% MSL, 58.1% APGAR <7, 75.7% NICU admission and 12.25 perinatal mortality. In a prospective study by Panda et al.[16] Reassuring CTG group had 4.45% MSL, 3.48% APGAR <7 and 93% NICU admission.Nonreassuring CTG group had 85.71% MSL, 28.57% APGAR SCORE<7 and 74.57% NICU admission.

In our study 85% nonreactive cases and 20.5% of reactive cases had undergone LSCS which is comparable to the study conducted by Gupta et al.[15] Increased rate of cesarean section may be attributed to the fact that the type of population studied by us belonged to high risk group .High risk group definitely not only had more chances of of having increase rate of both maternal and fetal complications if allowed to go to into vaginal delivery.Though there is a definite increase in the rate of operative intervention,but relative fall in perinatal mortality rate gives immense satisfaction in timely saving the lives of many babies.

In our study negative predictive value 85% is higher than positive predictive value 54% which is similar to Rashed et al where NPV is 91.89% and PPV 80.7% which means that a negative test instill more confidence in the clinicians mind as compared to a positive test result. One of the drawbacks of electronic fetal monitoring is its increased false positive rates. Hence, whenever CTG is interpreted, clinical situation should be considered and and timely appropriate action should be taken to prevent birth asphyxia. The risk of fetal hypoxia and acidosis is extremely small when the CTG is normal. False negative may sometimes occur (Poor outcome despite of a normal CTG) and these may be due to adverse factors other than hypoxia such as intrauterine infection, maternalpyrexia, fetal congenital and metabolic problems that may influence fetal outcome.

It is evident that from the results of the present study that admission CTG in intrapartum patients can serve as a tool in high risk obstetric patients to detect fetal distress already present or likely to develop. It is useful in early triage for categorization of mothers based on tracings obtained and early intervention to be made for better outcomes.Hence the admission test can be used as a useful tool to analyze CTG tracings of women in early labour to give quality care and to predict the mode of delivery and fetal outcome.

LIMITATIONS

The study conducted was a single center study with small sample size and short duration of study.

CONCLUSION

The admission CTG in intrapartum patients is a simple non-invasive test that can serve as a screening tool in high risk obstetrics patients to detect fetal distress already present or likely to develop and prevent unnecessary delay in intervention. This is particularly relevant in obstetric wards of non-industrialized with a heavy workload with a large number of high risk cases and limited resources to help in 'triaging' fetuses.

RECOMMENDATION

Further studies should be carried out involving a large number of participants in multiple centers to get the national scenario. We recommend abnormal CTG with fetal scalp pH study which is more specific of fetal distress.

DISCLOSURE

All the authors declared no competing interest.

REFERENCES

1. Abed G N, Umashankar K M, Dharmavijay M N, Mahe Darakshan M S. Admission Cardiotocography: its role in predicting foetaloutcome in high- risk obstetric patient. Indian Journalof Basic and Applied Medical Research. 2013;3(1):156-164.
2. Parer JT, Livingstone EG. What is fetal distress.Am J obstet Gynecol.1990;162:1421-1425.
3. Whittle MJ,MartinWL.Turnbull's obstetrics. London: Churchill Livingstone;2001. monitoring in labor. In: Chamberlain G, steer P, editors. [Google Scholar]
4. Chandraharan E, Sabaratnam A. Electronic foetal heart rate monitoring in current and future practice. J Obstet Cynecol India.2008;58(2):121-130.
5. Thackar SB, Struup DF. Continuous electronic heart rate monitoring for foetal assessment during labor.Cochran Database Syst Rev.,2001;2:CD000063.
6. Gibb D, Arulkumaran S.Oxford: Boston: Butterworth-Heinemann; 1997. The admission test: Clinical scenarios Foetal monitoring in practice. p. 67-72.
11. Lekis S, Loghis C, Parayoto N. Use of antepartum and intrapartum cardiography. Clin ExpObstet Gynaecol. 1997;24:79-81.
10. Ingemarsson I, Arulkumaran S, Ingemarsson E, Tambyraja RL, Ratnam SS. Admission test: A screening test for fetal distress in labor. Obstet Gynecol. 1986 Dec;68(6):800-6.
9. Hafizur Rahman, Prachi Renjhen, 2 Sudip Dutta and Sumit Kar Admission cardiotocography: Its role in predicting fetal outcome in high-risk obstetric patients.
10. RCOG Evidence based Clinical Guideline number 8. The use of electronic fetal monitoring.The use and interpretation of cardiotocography in intrapartum fetal surveillance. London: RCOG. press, 2001;52.
11. Blix E, Reinar LM, Klovning A, Oian P. Prognostic value of labour admission test and its effectiveness compared with auscultation only: A systematic review. Br J ObstetGynaecol. 2005; 112:1595-1604.
12. Imply L Reynolds M, MacQuillan K, Gates S, Murphy J, Shell O. Admission cardiotocography: A randomised controlled trial. Lancet. 2003;361:465-470.
13. Thacker SB, Stroup DF. Revisiting the use of the electronic foetal monitor Lancet. 2003;361:445-446.
14. J Hrishikesh, PMSuruchi,, S Akanksha. Role of admission test by Cardiotocography (CTG) as a predictor of perinatal outcome: A prospective study. International Journal of Clinical Obstetrics and Gynaecology. 2019; 3(2): 128-131.
15. Gupta M,Gupta P. Role of cardiotocography in high risk pregnancy and its correlation with increased cesarean section. Int J ReprodContraceptObstet Gynecol. 2017 Jan;6(1): 168-171.
16. Panda S, Das A. NowrozHM,SinghAS.Role of Admission Test s in Predicting Perinatal Outcome: A Prospective Study. JPreg Child Health.2015;2:171.
17. Rashed M, Srivastava AK. Labour admission test: A screening test for foetal distress in labour. Int J Reprod Contracept Obstet Gynecol. 2017;6(2):452-456.