Antepartum Cardiotocography and Feto-maternal Outcome Among Admitted Patients in Bangabandhu Sheikh Mujib Medical University (BSMMU) Dhaka, Bangladesh

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ABSTRACT

Background: *Admission Cardiotocography (CTG) a noninvasive procedure, is used to indicate the state of oxygenation of the fetus on admission into the labor ward. This study is performed to assess the association of admission CTG findings with feto-maternal outcome at a tertiary health facility in Bangladesh.*

Materials and methods: *A prospective, observational study of 50 pregnant women who were admitted into the labor ward with singleton live pregnancies in Bangabandhu Sheikh Mujib Medical University. Information on the demographic characteristics, obstetrics and medical history, admission CTG tracing and neonatal outcome was obtained using a structured data collection form. Data were analyzed using the SPSS software version 20.0 with the level of significance set at p< 0.05.*

Results: *The admission CTG findings were normal in 72% and abnormal in 28% of the women. The occurrence of low birth weight, asphyxiated neonates and Special Care Neonatal Unit (SCANU) admission was significantly more frequent among those with abnormal admission CTG results compared with normal results (p<0.001 for each). The incidence of cesarean delivery was more common when the CTG findings were abnormal, whereas all women with normal CTG result had a vaginal delivery (p<0.001).*

Conclusion: *Admission CTG was effective in identifying fetuses with a higher incidence of perinatal asphyxia. Neonatal outcome such as low birth weight, APGAR score and SCANU admission was significantly associated with pathological CTG findings. In the absence of facilities for further investigations, prompt intervention for delivery should be ensured if admission CTG is pathological.*

Key words: APGAR score; Cardiotocography; Neonatal outcome.

Introduction

Cardiotocography (CTG) is a graphical ('Graph') recording of fetal heart activity ('Cardio') and uterine contraction ('Toco'), both at the same time scale and continuously during uterine quiescence and contraction.[1] Over the centuries, different methods of fetal monitoring have been used both for low and high-risk patients. These methods include noninvasive as well as invasive techniques, of which CTG is the most common non-invasive and cost-effective technique.[2] CTG patterns are widely classified as normal, suspicious and pathological. These terms are further categorized into four variables: fetal baseline heart rate, accelerations, decelerations and variability.[3]

In labor fetal heart rate is usually checked through intermittent auscultation by a pinards fetoscope. However, due to increased fetal morbidities and litigations, continuous CTG has gained global importance. Abnormal fetal heart patterns in a CTG trace usually indicate fetal hypoxia which may lead to adverse perinatal outcomes like seizures and NICU admissions.[4] Lately, CTG has become the first line of investigation for a patient who presents to the labor suite. After evaluating her for risk factors, either continuous or intermittent auscultation is offered during uterine contractions where uteroplacental insufficiency is recorded in the form of abnormal fetal heart patterns.[5] Developing countries account for most of the global burden of perinatal deaths, but at the present time the use of antenatal CTG in under resourced settings is limited.[6,7] An evaluation of antenatal CTG in Nigeria found that women who received a non-reactive non-stress test were significantly more likely to deliver by caesarean section, experienced high perinatal mortality

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and had small-for-gestational-age infants; the authors of that study concluded that the non-reactive non-stress test was a valuable tool for early detection of fetal compromise.[8] This study was designed to compare the pregnancy outcomes and early neonatal outcomes among the normal and abnormal CTG groups and to find out the association between abnormal findings of CTG with that of pregnancy outcomes and early neonatal outcomes.

Materials and methods
A prospective, observational study was conducted at the Department of Obstetrics and Gynaecology in Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh from June 2022 to December 2022. The Ethical Committee of BSMMU approved the study protocol. Informed consent was obtained from the participating women after a clear explanation of the nature and purpose of the study.

A total of 50 women with low- and high-risk pregnancies who presented in labor with singleton live fetuses at a gestational age between 32-34 weeks were included in this study. Women with multiple pregnancy, fetus with malpresentation or ultrasound diagnosis of congenital anomalies, those who presented in emergency conditions such as abruptio placentae or cord prolapse and fetal distress were excluded from the study.

Information on the demographic characteristics, obstetrics and medical history, admission CTG tracing and neonatal outcome was obtained using a structured data collection form.Fetal heart tracing was recorded using the CTG at the time of admission to the labor ward for 20 min in a semilateral position and evaluated. The fetal heart rate tracing was categorized as reactive/normal, suspicious or pathological according to the National Institute of Clinical Excellence.[9]

Obstetrics interventions were carried out as deemed fit by the most senior obstetrician in the labor ward. The fetal outcome was reported in terms of birth weight, APGAR scores at 1 and 5 min of birth, admission to Special Care Neonatal Unit (SCANU) and early neonatal mortality. The birth weight was termed "low" if <2.5 kg and "normal" if ≥2.5kg, whereas the APGAR score was interpreted as asphyxia if it <7 and ≥7 was reassuring.[10]Another outcome variable considered was the outcome of labor (Spontaneous vaginal delivery or cesarean delivery).

Data were entered and analyzed using the SPSS version 20.0 (IBM Corp. Armonk, NY, USA). Categorical variables were presented in the form of frequency and percentage. Quantitative data were presented in the form of mean and standard deviation. Bivariate analysis was used to detect the association between neonatal outcome and the categorized CTG tracing and a value of $p< 0.05$ was considered significant.

Results

Table I Baseline Characteristics of the participants (n=50)

Characteristics	Frequency (n)	Percentage (%)
Age in years		
≤20	5	10.0
21-25	18	36.0
26-30	20	40.0
31-35	7	14.0
Mean ±SD	26.40±4.61	
Occupational status		
House maker	38	76.0
Employed outside	12	24.0
Educational status		
Primary or lower	17	34.0
Secondary or higher	33	66.0
Antenatal checkup		
Regular	11	22.0
Irregular	39	78.0
Gestational age		
≤36 weeks	18	36.0
>36 weeks	32	64.0
Cardiotocography findings		
Normal	36	72.0
Abnormal	14	28.0

The mean (±SD) age was 26.40 (±4.61) years and 20 (40%) women were in the 26-30 years age group. The majority of the patients (76%) were homemakers. Regarding educational status, 34% had primary or lower education. Out of 50 participants, 6% had chronic hypertension, 14% had Pregnancy-Induced Hypertension (PIH) 24% had pre-eclampsia, 14% had diabetes, 12% had anaemia, 4% had Bad Obstetrics History (BOH) 16% had intrauterine growth restriction (IUGR). About three-quarters of the cases (72%) had normal CTG and 14 (28%) women had abnormal CTG (Table I).

Table II Maternal and neonatal outcome of the respondents (n=50)

Outcome parameters	Frequency (n)	Percentage (%)
Mode of delivery		
Spontaneous	16	32.0
Caesarean section	34	68.0
Maternal complication		
Yes	14	28.0
No	36	72.0
Birth weight		
<2.5 kg	21	42.0
≥2.5 kg	29	58.0
APGAR score at 1 minute		
≤7 (For birth asphyxia)	12	24.0
>7	38	76.0
NICU admission		
Yes	10	20.0
No	40	80.0

Table II shows that more than two-thirds of the cases (68%) needed caesarean section and the rest 32% were spontaneous vaginal delivery. Regarding neonatal outcome, 29 (58%), 12 (24%) and 10 (20%) of the newborns had low birth weight, birth asphyxia, and required admission to SCANU respectively (Table II).

Table III Association between maternal and neonatal outcomes with the cardiotocography findings (n=50)

Outcome parameters	Cardiotocography findings				p value*
	Normal (n=36)		Abnormal (n=14)		
	No.	%	No.	%	
Mode of delivery					
Spontaneous	16	44.45	0	0.00	0.001
Caesarean section	20	55.55	14	100.00	
Maternal Complication					
Yes	3	8.33	11	78.57	0.001
No	33	91.67	3	21.43	
Birth weight					
<2.5 kg	10	27.78	11	78.57	0.001
≥2.5 kg	26	72.22	3	21.43	
Apgar score					
≤7	2	5.55	10	71.42	0.001
>7	34	94.45	4	28.58	

*Chi-square test.

Table III shows a significant association of abnormal CTG with different maternal and neonatal outcomes. Cesarean delivery, maternal complication, low birth weight and low APGAR score were more frequent in patients with abnormal CTG than in patients with normal CTG at admission.

Discussion
In this study, it was seen that chronic hypertension, PIH, preeclampsia, diabetes, anaemia and IUGR abnormal outcomes were more and risk factors are interrelated, one predisposing to others.
In this study, most of the women had normal admission CTG tracing, while a fairly low proportion had suspicious and pathological tracings, a finding similar to previous studies which documented a higher proportion with normal, followed by suspicious and then pathological CTG among the participants.[11,12]
Along with more women having abnormal CTG tracing, a higher proportion of them had cesarean delivery compared with half of those with normal CTG tracing. However, all women with normal tracing had spontaneous vaginal delivery. This connotes vaginal deliveries were more common when CTG tracing was normal. In contrast, the finding of pathological tracing is a signal for operative delivery by the fastest route and several studies had reported a similar trend.[5] This study's CS rate of 68% is higher than the 15% recommended

by the World Health Organization.[13] The high rate could result from the complexity of cases attended to in this hospital, because it is a tertiary health facility and serves as a referral centre for private, primary and secondary health facilities. The reason for the high incidence of caesarean section in this study, in spite of normal test results, was due to obstetrical indications, like the history of previous caesarean section, cephalopelvic disproportion, failed induction, severe preeclampsia and severe intrauterine growth retardation.

The abnormal admission CTG tracings were significantly associated with low APGAR score at 1 min. This is in tandem with the findings in similar previous studies in other countries.[14,15] Although not statistically significant, there was an increment in the proportion of reassuring APGAR scores (>7) at 5 min across the CTG tracing categories. This reflects the prompt and active resuscitation performed on the neonate if needed after the APGAR scoring at 1 min.

In the present study, no perinatal death was observed in normal CTG and abnormal CTG groups. The study did not attempt to demonstrate an ability to decrease caesarean delivery rates, nor did it attempt to link electronic fetal monitoring with long-term neurologic function and cerebral palsy. It only tried to show the pregnancy outcome and early neonatal outcomes in the case of normal and abnormal CTG cases.

Limitations
A repeat CTG was not performed, considering that fetal distress can occur as labour progresses because of prolonged labour, cord prolapse, abruption of the placenta, etc. The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

Conclusion
The present study showed that maternal complications were more common in abnormal CTG than in normal CTG. The Apgar score and birth weight were low among the babies, with mothers having more abnormal CTG than normal CTG. The proportion of immediate resuscitation and admission of the babies at the neonatal care unit was higher among this group.

Recommendation
This was a small study and further studies involving a larger population group should be done. The foetal outcomes were evaluated on a clinical and biochemical basis. CTG should be supplemented with tests like biophysical profile and fetal scalp pH before intervention.

Disclosure
All the authors declared no conflicts of interest.

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