

An Observational Study to Evaluate the Antepartum Cardiotocography and Fetal Outcome in High-Risk Pregnancy

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Conflict of interest: Nil

Abstract

Aim: The aim of the present study was to observe the antepartum cardiotocography and fetal outcome in high-risk pregnancy.

Material & methods: It was a prospective cross-sectional study carried out in the department of Obstetrics and Gynaecology, Jannayak Karpoori Thakur Medical, College and Hospital, Madhepura Bihar, India for one year. Thereafter, they were scrutinized according to eligibility criteria and 50 patients were finalized. Sixty consecutive CTG tracings were collected from patients who were advised to perform CTG after admission. Statistical analysis was carried out by chi-square test. Level of significance was set at p value <0.05.

Results: The highest percentage was 22 (44%) of age group 26-30 years. Shows that majority patients 39 (78%) were housewife. That educational status, 3 (6%) had illiterate, 10 (20%) had primary level of education, 22 (44%) had secondary, 14 (28%) had higher secondary and 1 (2%) had graduate level. Method of delivery, 17 (34%) were spontaneous and 33 (66%) were caesarean section. The fetal heart condition 37 (74%) had normal CTG and 13 (26%) had abnormal CTG. The differentiation was statistically significant (p<0.05). The liquor 31 (62%) were normal colour, 13 (26%) were light meconium and 6 (12%) were deep meconium stained. The pregnancy status of the study subjects 3 (6%) had chronic hypertension 2 (4%) had gestational HTN, 16 (32%) had preeclampsia, 8 (16%) had eclampsia, 8 (16%) had diabetes, 1 (2%) had heart disease, 6 (12%) had anaemia 3 (6%) had BOH, 3 (6%) had IUGR and 1 (2%) had other disease. The birth weight 18 (36%) were <2.5 kg and 32 (64%) were >2.5 kg. The APGAR score 13 (26%) had <7 and 37 (74%) had >7 at one minute. 16 patients were spontaneous delivery and 21 patients were caesarean section in normal CTG. On the other hand 12 patients were caesarean section and 1 patient had spontaneous delivery in abnormal CTG. The difference was statistically significant between normal CTG and abnormal CTG.

Conclusion: This study shows lower APGAR score and low birth weight were associated with abnormal CTG. CTG can be continued as a good screening test of fetal surveillance but it is not the sole criteria to influence the management of high-risk pregnancies. Abnormal CTG should be supplemented with other test before intervention

Keywords: Antepartum Cardiotocography (CTG), High Risk, Pregnancy, Fetal outcome

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Introduction

Journey of the fetus through the birth canal is a stressful response which can be manifested by the fetus as a “stress response” in the form of fetal heart rate abnormality.[1] Fetal surveillance during labour is important to ensure delivery of a healthy baby. Intrapartum foetal asphyxia with significant metabolic acidosis at delivery has shown to occur in approximately 20- 25 infants per 1000 births. Foetal

monitoring during labour identifies the foetuses at risk of hypoxic damage, so that appropriate intervention could be instituted to optimize neurological injury, including cerebral palsy. Electronic fetal heart rate monitoring (EFM) involves the use of a cardiotocograph (CTG).[2] It is obtained via an ultrasound transducer placed on the mother’s abdomen. The machine used to perform

monitoring is called a “cardiotocograph.” It records the fetal heart rate (FHR) to determine the fetal well-being in order to detect signs of intrapartum hypoxia so that appropriate management can be given timely. Hence CTG plays important role in labour monitoring and identification of fetal distress. Therefore, there is a considerable decrease in the overall perinatal mortality and morbidity. CTG has been a durable cornerstone of antenatal testing.[3]

In high-risk pregnancies antepartum fetal heart rate assessment can be used to predict fetal compromise. However, the false-positive rate can be as high as 60% for various reasons. Higher sensitivity might be achieved either by longer recording (fetal deep sleep phase) or by adding ultrasound Doppler.[4] Antepartum cardiotocographs (CTGs) were obtained at weekly intervals from 34 weeks onwards and twice weekly from 40 weeks onwards in normal pregnancies." A Hewlett-Packard cardiotocograph with narrow ultrasound beam was used for simultaneous recording of fetal heart rate and uterine activity.

Admission CTG is short continuous electronic FHR monitoring for 20 minutes along with simultaneous recording of uterine activity on admission to labour room ward. The intrapartum stress is well tolerated by a normal fetus but a compromised fetus can't sustain hypoxia. Thus, perinatal risk of intrapartum hypoxia and subsequent hypoxic ischaemic encephalopathy is common in high-risk pregnancy. Birth asphyxia during birth process is leading cause of perinatal mortality.[5] CTG is the most commonly used test for antepartum and intrapartum fetal surveillance in the majority hospitals of developed countries. There are very few studies on fetal outcome of antepartum CTG in high-risk pregnancies. So, this study has been designed antepartum cardiotocography and fetal outcome in high-risk pregnancy. Hence the aim of study was to

observe the antepartum cardiotocography and fetal outcome in high-risk pregnancy.

Material and Methods

It was a prospective cross-sectional study carried out in the department of Obstetrics and Gynaecology, Jannayak Karpoori Thakur Medical, College and Hospital, Madhepura, Bihar, India for one year. Thereafter, they were scrutinized according to eligibility criteria and 50 patients were finalized. Sixty consecutive CTG tracings were collected from patients who were advised to perform CTG after admission.

- Patients with high-risk pregnancy (PIH, eclampsia, diabetes, IUGR, Thyroid disorder, heart disease, anaemia, BOH, Oligohyramnios, Post-dated pregnancy, Diminished fetal movements, Premature rupture of membrane >6 hrs.).
- Gestational age (33 to 42 weeks).

Exclusion criteria

- Patients with normal pregnancy.
- Multi fetal pregnancy.
- Gestational age

Methodology

Data were collected by interview, brief history, general physical examination, and sonographic finding using a structured questionnaire containing all the variables of interest.

Statistical Analysis

All the collected data were compiled and analyzed by statistical package for social science (SPSS-16) software. Test of significance was done by P value/ Chi square test. ‘P’ values

Results

Table 1: Baseline characteristics

Variables	Frequency	Percentage (%)
Age group (years)		
≤20	4	8
21-25	16	32
26-30	22	44
31-35	8	16
Occupational status		
House wife	39	78
Service holder	6	12
Student	5	10
Educational status		
Illiterate	3	6
Class I-V	10	20
Class VI-SSC	22	44
Higher secondary	14	28
Graduate	1	2
Method of delivery		
Spontaneous	17	34
Caesarean section	33	66

The highest percentage was 22 (44%) of age group 26-30 years. Shows that majority patients 39 (78%) were housewife. That educational status, 3 (6%) had illiterate, 10 (20%) had primary level of education,

22 (44%) had secondary, 14 (28%) had higher secondary and 1 (2%) had graduate level. Method of delivery, 17 (34%) were spontaneous and 33 (66%) were caesarean section.

Table 2: Distribution of fetal heart condition and liquor colour in study subjects

CTG	Frequency	Percentage (%)	p value
Normal CTG	37	74	0.001
Abnormal CTG	13	26	
Liquor	Frequency	Percentage (5%)	
Normal colour	31	62	
Light meconium	13	26	
Deep meconium	6	12	

The fetal heart condition 37 (74%) had normal CTG and 13 (26%) had abnormal CTG. The differentiation was statistically significant (p<0.05).

The liquor 31 (62%) were normal colour, 13 (26%) were light meconium and 6 (12%) were deep meconium stained.

Table 3: Pregnancy status of the study subjects

Pregnancy status	Frequency	Percentage (%)
Chronic hypertension	3	6
Gestational HTN	2	4
Preeclampsia	16	32
Eclampsia	8	16
Diabetes	8	16
Heart disease	1	2
Anaemia	6	12
BOH	3	6
IUGR	2	4
Others	1	2
Total	50	100

The pregnancy status of the study subjects 3 (6%) had chronic hypertension 2 (4%) had gestational HTN, 16 (32%) had preeclampsia, 8 (16%) had

eclampsia, 8 (16%) had diabetes, 1 (2%) had heart disease, 6 (12%) had anaemia 3 (6%) had BOH, 3 (6%) had IUGR and 1 (2%) had other disease.

Table 4: Distribution of fetal birth weight and APGAR score at one minute

Birth weight	Frequency	Percentage (%)
<2.5 kg	18	36
>2.5 kg	32	64
Mean ± SD	2.54±0.46	
APGAR score		
≤7	13	26
≥7	37	74

The birth weight 18 (36%) were <2.5 kg and 32 (64%) were >2.5 kg. The APGAR score 13 (26%) had <7 and 37 (74%) had >7 at one minute.

Table 5: Relationship of CTG according to method of delivery

Mode of delivery	CTG		Total		p value
	Normal	Abnormal	No.	(%)	
	No.	No.			
Spontaneous	16	1	17	34	0.007283
Caesarean section	21	12	33	66	
Total	37	13	50	100	

16 patients were spontaneous delivery, and 21 patients were caesarean section in normal CTG. On the other hand, 12 patients were caesarean section,

and 1 patient had spontaneous delivery in abnormal CTG. The difference was statistically significant between normal CTG and abnormal CTG.

Table 6: Relationship of CTG according to birth weight

Birth weight	CTG		Total		p value
	Normal	Abnormal	No.	(%)	
	No.	No.			
<2.5 kg	10	8	18	36	0.01227
>2.5 kg	27	5	32	64	
	37	13	50	100.0	

10 patients were normal CTG and 8 were abnormal CTG in birth weight <2.5 kg. On the other hand, 27 were normal CTG and only 5 were abnormal CTG in birth weight >2.5 kg. The differentiation was statistically significant between normal CTG and abnormal CTG. ($p < 0.05$).

Discussion

Cardiotocography (CTG) is a graphical representation of fetal heart rate (FHR) and uterine activity (UA), also termed as electronic fetal monitoring, has been an indispensable part of antepartum and intrapartum fetal surveillance for four decades.[6] Cardiotocography (CTG) is a technical means of recording (-graphy) the fetal heart beat (cardio-) and the uterine contractions (-toco) during pregnancy, typically in the third trimester. The machine used to perform the monitoring is called a cardiotocography, more commonly known as an Electronic Fetal Monitor or External Fetal Monitor (EFM). CTG can be used to identify signs of fetal distress.[7]

The highest percentage was 22 (44%) of age group 26-30 years. Shows that majority patients 39 (78%) were housewife. That educational status, 3 (6%) had illiterate, 10 (20%) had primary level of education, 22 (44%) had secondary, 14 (28%) had higher secondary and 1 (2%) had graduate level. Method of delivery, 17 (34%) were spontaneous and 33 (66%) were caesarean section. The fetal heart condition 37 (74%) had normal CTG and 13 (26%) had abnormal CTG. The differentiation was statistically significant ($p < 0.05$). When the risk factors are more the overall outcomes are more among the abnormal CTG group.[9] In this study it was seen that chronic hypertension, PIH, pre-eclampsia, eclampsia, BOH, diabetes, anaemia, IUGR abnormal outcomes were more and risk factors are interrelated, one predispose to others.[10] In the study APGAR score was <7 at 1 min among the babies of abnormal CTG group than normal CTG that was similar to the study done by Dellinger et al.[11]

The liquor 31 (62%) were normal colour, 13 (26%) were light meconium and 6 (12%) were deep meconium stained. The pregnancy status of the study subjects 3 (6%) had chronic hypertension 2 (4%) had gestational HTN, 16 (32%) had preeclampsia, 8 (16%) had eclampsia, 8 (16%) had diabetes, 1 (2%) had heart disease, 6 (12%) had anaemia 3 (6%) had BOH, 3 (6%) had IUGR and 1 (2%) had other disease. The birth weight 18 (36%)

were <2.5 kg and 32 (64%) were >2.5 kg. The APGAR score 13 (26%) had <7 and 37 (74%) had >7 at one minute. 16 patients were spontaneous delivery, and 21 patients were caesarean section in normal CTG. On the other hand, 12 patients were caesarean section, and 1 patient had spontaneous delivery in abnormal CTG. The difference was statistically significant between normal CTG, and abnormal CTG. 10 patients were normal CTG and 8 were abnormal CTG in birth weight <2.5 kg. On the other hand, 27 were normal CTG and only 5 were abnormal CTG in birth weight >2.5 kg. The differentiation was statistically significant between normal CTG and abnormal CTG. ($p < 0.05$). In respect to mode of delivery, there was a high incidence of caesarean section in this study. The reason for high incidence of caesarean section in this study in spite of normal test result was due to obstetrical indications, like history of previous caesarean section, cephalopelvic disproportion, failed induction, severe preeclampsia and severe intrauterine growth retardation. Here caesarean delivery for fetal distress was significantly higher in abnormal CTG group, this finding is similar to the observation of Dellinger et al. study.¹¹ In the present study no perinatal death was observed in normal CTG and abnormal CTG group. 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 attempted to show the pregnancy outcome and early neonatal outcomes in case of normal and abnormal CTG cases.

Conclusion

This study shows lower APGAR score, and low birth weight were associated with abnormal CTG. CTG can be continued as a good screening test of fetal surveillance, but it is not the sole criteria to influence the management of high-risk pregnancies. Abnormal CTG should be supplemented with other test before intervention.

References

- Joshi H, Panwar SM, Singh A. Role of admission test by cardiotocography (CTG) as a predictor of perinatal outcome: a prospective study. *Int J Clin Contrac Obstetr Gynaecol.* 2019;3(2):128-33.
- Dhakare TJ, Patole KP. A Study of Cardiotocography during Active Labour to

- Assess the Perinatal Outcome in High-Risk Pregnancy. *MVP Journal of Medical Sciences*. 2016; 3(2): 92-5.
3. Ware DJ, Devoe LD. The Nonstress test: reassessment of the "Gold standard." *1994;21(4):779-96.*
 4. Westerhuis ME, Moons KG, Van Beek E, Bijvoet SM, Drogtróp AP, Van Geijn HP, van Lith JM, Mol BW, Nijhuis JG, Oei SG, Porath MM. A randomised clinical trial on cardiotocography plus fetal blood sampling versus cardiotocography plus ST-analysis of the fetal electrocardiogram (STAN®) for intrapartum monitoring. *BMC pregnancy and childbirth*. 2007 Dec; 7:1-8.
 5. Singh S, Premi HK, Gupta R. The role of non-stress test as a method to evaluate the outcome of high-risk pregnancy: a tertiary care center experience. *International Surgery Journal*. 2020 May 26;7(6):1782-7.
 6. Krupa N, Ali M, Zahedi E, Ahmed S, Hassan FM. Antepartum fetal heart rate feature extraction and classification using empirical mode decomposition and support vector machine. *Biomedical engineering online*. 2011 Dec;10(1):6.
 7. Parer JT, King T. Foetal heart rate monitoring: *Am J obstet. Gynecol* 2000;182:982-987.
 8. Pater JT, King T, Foetal heart rate monitoring: Is it salvageable? *Am J Obs. Gynecol*. 2000; 182:982-987.
 9. Piazzè JJ, Cerekja A, Buccheri M, Computerized FHR traces in post term pregnancies. *J Perinat Med*. 2008; 36:182-183.
 10. Akter H. Antepartum cardiotocography (CTG) in high-risk pregnancy and fetal outcome in a tertiary level hospital of Dhaka city. Dissertation FCPS examination, Dhaka; c2012.
 11. Delling GEH, Boehm FH, Crancmn. Electronic Fetal rate monitoring: Early neonatal outcomes associated with normal rate, fetal stress, and fetal distress. *Am J obstet. Gynecol*. 2000; 12:214-220.