



ORIGINAL RESEARCH PAPER

Gynaecology

A STUDY ON RELATIONSHIP BETWEEN ABNORMAL CARDIOTOCOGRAPHY AND ITS PERINATAL OUTCOME

KEY WORDS:

Cardiotocography, Mode of delivery, Apgar score, Gestational age, Meconium stained liquor, NICU admission, perinatal outcome

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ABSTRACT

Background: Cardiotocography (CTG) is most diffused, non invasive pre-natal diagnostic technique to monitor fetal health during labour. It is easy to operate, available in a hospital setting and there is no better independent non invasive monitoring modality established so far for a widespread clinical use. CTG was introduced with the aim of reducing perinatal mortality and morbidity. It is helpful in identifying conditions that causes fetal distress during labour so that timely interventions can be taken to achieve most favourable perinatal outcome.

Aims: This study aimed to compare perinatal outcome of normal and abnormal cardiotocograms and to correlate the abnormal cardiotocographic pattern with its pregnancy outcome.

Methods: This study was a cross-sectional retrospective study undertaken among 500 women admitted for delivery to Department of Obstetrics and Gynecology in a Tertiary Care Hospital from August 2012 – August 2013 with inclusion and exclusion criteria.

Results: The mean maternal age was 22.8 years. 37.6% of the women were aged less than 20 years. The gestational age of the women was 38 weeks in 59.4%. Primigravida constituted 80% as the study was conducted in a Tertiary care centre. 28.2% of the women with abnormal CTG findings had meconium stained liquor during labour when compared to 6% of women with normal CTG findings. CTG patterns showed abnormal findings in 20% of women with loops of the cord around the baby's neck as compared to 4.2% in the normal group. In women with normal CTG, vaginal delivery occurred in 67% and LSCS rate was 33% as compared to 48% vaginal delivery and 52% LSCS rate in women with abnormal CTG. NICU admission were 1.2% with normal CTG results as compared to 30.9% with abnormal CTG patterns. Perinatal death was encountered in 5.5% of the newborns born to women with abnormal CTG patterns.

Conclusions: Abnormal CTG influence the fetal outcome. However, still adjunctive methods are required to improve the efficacy of fetal monitoring to avoid unnecessary surgical interventions. Normal CTG predicts fetal well being.

INTRODUCTION:

Pregnancy and childbirth is a normal physiological process but has great pathological potential. Most of the pregnancies progress normally but some pregnancies are more complex. Modern obstetric practice also demands for care of the mother and her fetus. The antenatal and intra-partum conditions place the mother, or the developing fetus or both at a higher risk for complications¹. Some instances can lead to adverse outcome resulting in immediate and late neonatal and maternal problems. Intrapartum asphyxia is a major risk for neonatal morbidity and mortality. In the past intermittent auscultation of fetal heart sounds and nature of amniotic fluid were used as means of monitoring the fetus during labour. Now electronic fetal monitoring (cardiotocography) record shows the changes in the fetal heart rate and their temporal relationship to uterine contractions². Cardiotocography has been able to detect fetal distress with more reliability³. Reactive cardiotocography trace reassures both the mother and health care provider of good fetal health⁴. Widespread use of electronic fetal monitoring is associated with substantial falls in perinatal mortality being 0.7/1000 compared with 1.8/1000 in auscultation group⁵. Abnormal cardiotocography is more common in meconium aspiration syndrome⁶. Incidence of abnormal fetal heart rate pattern were 2.3 times as common in babies who developed cerebral palsy and 6.7 times as common in perinatal death⁷. Moreover, there is interobserver variation in interpretation of abnormal cardiotocography readings and recommendations for interventions⁸. The study done in 2000 at Lady Dufferin Hospital Karachi, showed that the Apgar score less than 7 at 1 minute in 64.15% cases, and it was more than 7 at 1 minute in 35.84%. It remained less than 7 at 5 minute in 18.86% only, while in 81.13% it improved or stayed constant in pathological CTG group⁴. This study will help to detect fetal distress in the early stage and can avoid adverse fetal outcome. However despite its association with

increased caesarean section rate cardiotocography remains a major method of monitoring high-risk pregnancy⁹. The objectives of the study is to compare perinatal outcome of normal and abnormal cardiotocograms and to correlate the abnormal cardiotocographic pattern with its pregnancy outcome.

METHODS:

A cross sectional retrospective study was undertaken among 500 women admitted for delivery to Department of Obstetrics and Gynecology in a Tertiary care Hospital between August 2012 and August 2013. An informed bilingual consent was obtained from all the patients included in the study. A continuous CTG monitoring was done in all pregnant women with established labour by observing the monitor and sample traces were taken that are needed for the study. The CTG patterns obtained were then followed up with special reference to Gestational age, mode of delivery, meconium stained liquor, Apgar score and admission to NICU- perinatal morbidity and mortality. The cardiotocographic machine of BPL- model FM 9853 was used. The inclusion and exclusion criteria were as follows:-

Inclusion Criteria:

1. All pregnant women with term pregnancy with established labour irrespective of gravidity and parity.
2. Singleton pregnancy
3. Cases with previous history of Instrumental vaginal Delivery.
4. Previous caesarean section considered for trial of vaginal delivery.

Exclusion Criteria:

1. Patients not considered for trial of vaginal delivery
2. Pregnant women with premature rupture of membranes, multiple pregnancy.

3. Pregnancy associated complications like pregnancy induced hypertension, gestational diabetes, antepartum haemorrhage, malpresentations and malpositions.
4. Women with associated medical disorders of pregnancy (heart disease, liver disorders, renal disease)
5. Preterm deliveries
6. Patients who opted for epidural labour analgesia.

At the time of delivery, following data variables were collected.

1. The pattern of CTG tracings whether Normal / Abnormal/ Suspicious were noted.
2. Based on the FHR abnormalities in CTG during labour, cases were followed up for the mode of delivery - Normal vaginal/ Instrumental/ emergency cesarean section.
3. In the event of rupture of membranes (spontaneous or artificial), the colour of liquor during labor was looked for normalcy or meconium staining.
4. The one minute and five minute Apgar score was determined by an independent observer – a pediatrician.

The data thus obtained was entered in a predesigned proforma. The data was compiled and analyzed using Statistical Package for Social Services (SPSS vs 18). Frequencies and proportions were used for presenting the categorical variables. Chi Square test was used as significance test for categorical variables. Means and other measures of central tendency were used for Quantitative variables.

RESULTS:

Hypothesis:

H₀= the attributes that Cardiotocographic findings and mode of delivery are independent

H₁≠ the attributes that Cardiotocographic findings and mode of delivery are not independent

Table 1: Mode of delivery and CTG findings

Cardiotocographic findings	Mode of delivery			Total
	Vaginal delivery	Instrumental delivery	LSCS	
Normal	202	20	112	334
Abnormal	50	3	57	110
Suspicious	28	3	25	56
Total	306	26	194	500

There exists an association between mode of delivery and cardiotocographic findings since the chi-square statistic is 13.121 greater than table value chi-square (9.49) at degrees of freedom is equal to 4 and the level of significance is 0.05. The p-value is 0.010698. The result was significant at p<0.05.

Result:

The null hypothesis may be rejected and the alternative hypothesis of the two attributes that findings of CTG and Mode of delivery are not independent, can be accepted and it was statistically significant at p<0.05. The p-value is 0.010698.

Table 2: Distribution of the study group according to age group

Age group	Frequency	Percentage
16-20 years	188	37.6
21-25 years	177	35.4
26-30 years	127	25.4
31-35 years	7	1.4
36-40 years	1	0.2
Total	500	100
Mean ± SD	22.8 ± 3.8	

The table 2 shows the frequency and percentage of women according to their age group. It reveals that 37.6% of women in the study group were in less than 20 years and the mean age of the maternal women was 22.8 years with standard deviation of 3.8

Table 3: Distribution of Obstetrics Score and Cardiotocographic findings

Details	Frequency n=500	Percentage
Booked	379	75.8
Un booked	121	24.2
Gravida		
Primi	396	79.2
Multi	104	20.8
Parity		
Primi	414	82.8
Multi	86	17.2
Gestational age		
36 weeks	8	1.6
37 weeks	158	31.6
38 weeks	297	59.4
39 weeks	29	5.8
40 weeks	7	1.4
41 weeks	1	0.2
Cardiotocographic findings		
Normal	334	66.8
Abnormal	110	22.0
Suspicious	56	11.2

The table 3 shows the obstetric score and CTG findings. 75.6% of cases in this study were booked cases and 24.2% were unbooked cases. The primigravida and multigravida ratio was 4:1 approximately. Similarly, the parity of the study group ratio was about at 4:1. 59.4% of the women in this study had 38 weeks of gestation, 31.6% had 37 weeks of gestation and 5.8% had 39 weeks of gestation. The CTG findings stated that 66.8% had normal pattern, 22% had abnormal patterns and 1.2% had suspicious CTG patterns.

Table 4: Comparison of CTG findings with Mode of delivery

Cardiotocographic findings	Mode of delivery			Total n (%)
	Vaginal delivery (%)	Instrumental delivery (%)	LSCS (%)	
Normal	202 (60.5)	20(6.0)	112(33.5)	334(100)
Abnormal	50 (45.5)	3(2.7)	57(51.8)	110(100)
Suspicious	28(50.0)	3(5.4)	25(44.6)	56(100)
Total	306(56.0)	26(5.2)	194(38.8)	500(100)

The table 4 shows the comparison of CTG findings with mode of delivery. In women with normal CTG patterns, 60.5% had normal vaginal delivery; 6% had instrumental vaginal delivery and 33.5% had to undergo LSCS. It reveals that 51.8% of the women with abnormal CTG results had LSCS; 45.5% had normal vaginal delivery and 2.7% had instrumental vaginal delivery. In those with suspicious CTG patterns, 50% had vaginal delivery; 5.4% had instrumental vaginal delivery and 44.6% underwent LSCS.

Table 5: Comparison of Cardiotocographic findings with Meconium stained liquor

Cardiotocographic findings	Meconium stained liquor		Total n (%)
	Absent n (%)	Present n (%)	
Normal	314 (94.0)	20(6.0)	334(100)
Abnormal	79(71.8)	31(28.2)	110(100)
Suspicious	55(98.2)	1(1.8)	56(100)
Total	448(89.6)	52(10.4)	500(100)

The table 5 shows the comparison of cardiotocographic findings with Meconium stained liquor. It stated that 28.2% with abnormal CTG patterns had meconium stained liquor during the labour when compared to 6% of the women with normal CTG and 1.8% with suspicious trace patterns.

The table 6 shows that comparison of cardiotocographic findings with loops of cord. It reveals that abnormal patterns in 20% of

women with loops of cord around baby's neck as compared to 4.2% of normal CTG pattern group.

Table 6: Comparison of Cardiocotographic findings with loops of cord

Cardiocotographic findings	Cord factor		Total n (%)
	Absent n (%)	Present n (%)	
Normal	320 (95.8)	14(4.2)	334(100)
Abnormal	88(80.0)	22(20.0)	110(100)
Suspicious	56(100)	0	56(100)
Total	464(92.8)	36(7.2)	500(100)

Table 7: Comparison of Cardiocotographic findings with NICU Admission

Cardiocotographic findings	NICU Admission			Total n(%)
	Good n (%)	Admitted to NICU n (%)	Perinatal death n (%)	
Normal	330(98.8)	4(1.2)	0	334(100)
Abnormal	70(63.6)	34(30.9)	6(5.5)	110(100)
Suspicious	56(100)	0	0	56(100)
Total	456(91.2)	38(7.6)	36(7.2)	500(100)

The table 7 shows the comparison of cardiocotographic findings with NICU admission. It stated that NICU admission were 30.9% with abnormal CTG patterns as compared to 1.2% with normal CTG results. Peinatal death was encountered in 5.5% of the newborns born to women with abnormal CTG patterns.

Table 8: Comparison of Cardiocotographic Mean findings with weight of the baby

	CTG findings			F Value	p value, Sig.
	Normal	Abnormal	Susp		
	Mean ± SD	Mean ± SD	Mean ± SD		
Weight of the baby	2.8 ± 0.2	2.7 ± 0.02	2.7 ± 0.2	1.646	0.323

The table 8 shows the comparison of cardiocotographic mean findings with weight of the baby. It states that babies with weight less than 2.7 kg appear to have abnormal CTG patterns.

The table 9 shows the comparison of cardiocotographic mean findings with period of gestation. The mean period of gestation in the women with normal CTG findings was 37.8 (± 0.7) weeks and in women with abnormal CTG findings it was 37.5 (± 0.5) weeks showing a statistically significant p value. This indicates that less mature infants are more likely to have abnormal CTG patterns

Table 9: Comparison of Cardiocotographic Mean findings with Period of gestation

Period of gestation	CTG findings		
	Normal n(%)	Abnormal n(%)	Suspicious n(%)
36 weeks	5 (62.5)	3 (37.5)	0
37 weeks	92(58.2)	56(35.4)	10(14.8)
38 weeks	209(70.4)	44(14.8)	44(14.8)
39 weeks	21(72.4)	7(24.1)	1(3.4)
40 weeks	6(85.7)	0	1(14.3)
41 weeks	1(100)	0	0
Mean ± SD	37.8 ± 0.7	37.5 ± 0.7	37.9 ± 0.5
F value	4.324		
P value, sig	0.000		

Table 10: Comparison of Cardiocotographic findings with Apgar score

APGAR Score	CTG findings		
	Normal n (%)	Abnormal n (%)	Suspicious n(%)
5	0	1 (0.9)	0
6	0	9(8.2)	0

7	4(1.2)	30(27.3)	0
8	192(57.5)	62(56.4)	25(44.6)
9	126(37.7)	8(7.3)	29(51.8)
10	12(3.6)	0	2(3.6)
Total	334(100)	110(100)	56(100)

The table 10 shows the comparison of cardiocotographic findings with Apgar score. It noted that 98.8% of the babies born to mothers with normal CTG findings had Apgar score of 8 and more than 8. About 36.4% of babies born to mothers with abnormal CTG patterns had Apgar score of less than 8 and 63.7% had Apgar score of 8 and more than 8; In babies born to mothers with suspicious test findings, 100% had Apgar score 8 and more than 8. Low Apgar score were commonly associated with abnormal CTG patterns.

Table 11: Comparison of Cardiographic findings with duration of stay in NICU

	CTG findings			t Value	p value, Sig.
	Normal	Abnormal	Susp		
	Mean ± SD	Mean ± SD	Mean ± SD		
Duration of stay in NICU	3.25 ± 0.9	4.8 ± 2.3	0	1.6	0.206, NS

The table 11 shows that comparison of cardiocotographic findings with duration of stay in NICU. The mean duration of stay in NICU in newborns born to mothers with normal cardiocotogram was 3.25 days, and in mothers with abnormal cardiocotogram was 4.8 days.

DISCUSSION:

In the present study, the mean maternal age was 22.8 years which is comparable to the study by Rahaman et al¹⁰. Similar study was done by Kaban et al¹¹ and Khurseed et al¹² shows a high mean maternal age which can be accounted to the regional variations in the age of marriage. In the present study, 80% of the women were primigravida which was very much higher when compared to 49.3% by Miura et al¹³ and 60% by Rahaman et al¹⁰. This difference is attributable to the fact that the present study was conducted in a Tertiary Care Hospital where more primigravidas were admitted for safe confinement compared to multigravida who usually deliver at home or in primary health centre. The present study had a mean period of gestation of 37.8 weeks and a range between 36-40 weeks which is comparable to other studies by Miru et al¹³ and Rahaman¹⁰. There was a statistically significant difference between the period of gestation and cardiocotographic findings. The present study showed higher percentage (22%) of abnormal CTG findings when compared to studies by Sandhu et al¹⁴ 10% and Rahaman et al¹⁰ 9%. This is attributable to the difference in the mode of case selection and timing of CTG tracings. In the present study, the percentage of patients having normal vaginal delivery and LSCS is comparable to studies by Khurseed et al¹² and Rahaman et al¹⁰. This study showed less percentage 51.8% in LSCS rate in Abnormal CTG patterns which is attributed to the type of case selection and the mode of study. The present study had 28.2% incidence in meconium stained liquor during labour in women with abnormal CTG patterns which is comparable to the study by Khurseed et al¹². However, study done by Rahaman et al¹⁰ shows 72% incidence in meconium stained liquor in abnormal CTG traces. This is due to the difference in case selection where all high risk patients were included in the study. In this study, 1.2% of babies were born to mothers with normal CTG and 30.9% of babies with abnormal CTG. This is comparable to the study by Khurseed et al¹² and Sandhu et al¹⁴. Study by Rahaman et al¹⁰ shows a high (57%) incidence in NICU admission because of the selection of high risk patients in the study. The abnormal CTG patterns of the present study had 5.5% neonatal mortality which can be comparable to study by Sandhu et al¹⁴.

CONCLUSION:

The present study had shown that the abnormal test results on cardiocotography results in poor maternal and neonatal outcome

in terms of mode of delivery, meconium stained liquor, cord factor, low Apgar scores, neonatal asphyxia and admission to NICU. Normal CTG predicts fetal well being. Abnormal CTG patterns require vigilant monitoring. Continuous CTG monitoring identifies the conditions causing fetal compromise at an early stage of labour so that timely intervention can be taken. Perinatal death was encountered in 5.5% of the newborns born to women with abnormal CTG patterns and it was statistically significant at p-value <0.05. In the present study, the mean period of gestation in the women with normal CTG findings was 37.8 (\pm 0.7) weeks and in women with abnormal CTG findings it was 37.5 (\pm 0.5) weeks showing a statistically significant p value and it indicates that less mature infants are more likely to have abnormal CTG patterns. Fetal compromise is evident with Abnormal CTG patterns which necessitates increased operative interventions. However, still adjunctive methods are required to improve the efficacy of fetal monitoring to avoid unnecessary surgical interventions.

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