

Relationship between Abnormal Cardiotocography and its Fetal Outcome - A Cross-Sectional StudyPushpa Kumari¹, Amrita Roy²¹Assistant Professor, Department of Obstetrics and Gynaecology, Madhubani Medical College and Hospital, Madhubani, Bihar²Professor and Head of Department, Department of Obstetrics and Gynaecology, Madhubani Medical College and Hospital, Madhubani, Bihar

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Conflict of interest: Nil

Abstract:

Background: Contextual details first, prenatal heart rate monitoring was used to detect situations such as foetal acidemia and hypoxia, which can both cause major issues for the developing infant. Data gathered from the medical literature indicates that there is a correlation between the circumstances of the newborn as determined by the Apgar score and hypoxic-ischaemic encephalopathy and pathological CTG. The frequency of aberrant cardiotocography during labor was to be ascertained, and the importance of these patterns in assessing fetal well-being was to be assessed.

Methods: From May to September of 2023, a cross-sectional study was conducted at the Department of Obstetrics and Gynecology at Madhubani Medical College and Hospital in Madhubani, Bihar. For the study, one hundred admitted pregnant women were enrolled. After a 30-minute left lateral cardiotocography, the results were classified as normal, suspect, or abnormal. After hydration with 1000 ml of intravenous fluid and oxygen inhalation, suspicious pattern cardiotocography was repeated; if the results were still suspicious, delivery measures were implemented. The delivery method was determined by the labor stage.

Results: 77 women had abnormal CTG traces, and 23 had questionable ones. With a p-value of 0.668, it was observed that the percentage of varied modes of administration did not significantly differ between the suspicious and abnormal CTG groups. With a p-value of 0.889, the Apgar score observed according to mode of delivery shows that there was no significant correlation between the score at one minute and the manner of delivery. With a p-value of 0.006, the relationship between low Apgar and the pathological and TG groups was significant. Out of all newborns, 81 (84.4%) did not require resuscitation, whereas 15 (15.6%) did.

Conclusion: A low Apgar score at one minute and beyond, a higher rate of cesarean sections, and the need for neonatal resuscitation are all results of abnormal and TG fetal outcomes.

Keywords: Apgar score; cardiotocography; labour; mode of delivery; neonatal resuscitation.

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Introduction

The fetus was previously monitored during labor by intermittent auscultation of fetal heart sounds and the kind of amniotic fluid. These days, fetal heart rate variations and their temporal correlation with uterine contractions are displayed on an electronic fetal monitoring (cardiotocography) record. [1]

More consistently, cardiotocography has been able to identify fetal distress. [2] The mother and medical professional are reassured of the healthy state of the fetus by the reactive cardiotocography trace. [3] The perinatal death rate is linked to significant decreases with the widespread use of electronic fetal monitoring, falling to 0.7/1000 from 1.8/1000 in the auscultation group. [4] Meconium aspiration syndrome is more likely to cause

abnormal cardiotocography. [5]

The prevalence of an aberrant fetal heart rate rhythm was 6.7 times higher in perinatal deaths and 2.3 times higher in newborns with cerebral palsy. [6] Interobserver heterogeneity also exists in the evaluation of aberrant cardiotocography data and therapeutic suggestions. [7] An investigation conducted in 2000 at RGUMS in Karnataka, India, revealed that in 64.15% of instances, the Apgar score was less than 7 at one minute, while in 35.84% of cases, it was greater than seven. In the pathological CTG group, it improved or remained steady in 81.13% of cases, but in 18.86% of cases, it remained less than 7 at 5 minutes. [3] By assisting in the early detection of fetal distress, this research can help to avert poor fetal outcomes.

Cardiotocography, albeit associated with a higher probability of cesarean sections, is still a primary means of tracking high-risk pregnancies. [8]

Material and Methods

From April 2023 to September 2023, a cross-sectional study was conducted in the Department of Obstetrics and Gynecology, Madhubani Medical College and Hospital, Madhubani, Bihar. Pregnancy between 37 and 42 weeks gestation, either latent or active, and abnormal cardiotocography were the requirements for admission.

The following conditions had to be met in order to be excluded: people with medical conditions such as diabetes and hypotension, decreased fetal movement, malpresentations during many gestations, ruptured membranes lasting more than 24 hours, intrauterine growth restriction, and known fetal congenital malformations. One hundred expectant mothers who met the requirements for admission were partogrammed. CTG was performed in the left lateral position for 30 minutes in order to monitor the fetal condition. CTG was repeated in the event of a worrisome pattern following hydration with 1000 ml of intravenous fluid and oxygen at a rate of 10 L/minute for 20–30 minutes.

Delivery-related action was taken if it continued to look suspicious. The delivery method was determined by the labor stage. Unless there was a

high risk of vaginal delivery, a lower segment cesarean section was performed. When a vaginal delivery was not imminent, a lower segment cesarean section was performed in the event of a pathological pattern. The babies were assessed for good Apgar score >7, poor Apgar score 5-7, and dismal Apgar score <5 at one minute and five minutes. Whether or if the newborn required resuscitation was also noted. For a full day, the babies were watched for any indications of hypoxia ischemic encephalopathy.

The computer program SPSS version 1+ was used to enter and evaluate the data. The mean and standard deviation were displayed for the quantitative variable, such as age.

Frequency and percentages were used to represent the qualitative variables, which included neonatal resuscitation, CTG pattern, mode of delivery, and Apgar scores at 1 and 5 minutes. Using the chi square test, the relationship between the aberrant CTG pattern and the Apgar score the manner of delivery for neonatal resuscitation was examined. A P value of less than 0.05 was deemed significant.

Results

There were 77 pathological and 23 questionable fetal heart rates among the 100 abnormal CTG results. As seen in Table 1, the percentage of different modes of delivery in both groups, however, did not demonstrate a statistically significant difference (p = 0.663).

Table 1: Mode of delivery as per CTG status of patients

Apgar Score	Groups					
	Suspicious		Pathological		Total	
	No.	%	No.	%	No.	%
Spontaneous	2	8.7	6	7.8	8	8.0
Vacuum	4	17.4	8	10.4	12	12.0
Caesarean Section	17	73.9	63	81.8	80	80.0
Total	23	100	77	100	100	100

p-value=0.663.

In the pathological CTG group, there were fifteen neonates (20.5%) with an Apgar score of less than five at one minute; no similar observations were observed in the suspicious group, whose p value is displayed in Table 2.

Table 2: One minutes Apgar score as per CTG status

Apgar Score	Groups					
	Suspicious		Pathological		Total	
	No.	%	No.	%	No.	%
<5	0	0.0	15	20.5	15	15.6
5-7	13	56.5	40	54.8	53	55.2
>7	10	43.5	18	24.7	28	29.2
Total	23	100	73	100	96	100

p-value=0.006.

Of the neonates with suspicious CTG and an Apgar score more than 7, 19 (82.6%) belonged to the pathological group, while 33 (45.2%) did not. Table 3 indicates that there were no newborns with an Apgar score of less than five in the suspicious group (p = 0.003).

Table 3: Five minutes Apgar score as per CTG status

Apgar Score	Groups					
	Suspicious		Pathological		Total	
	No.	%	No.	%	No.	%
<5	0	0.0	6	8.2	6	6.3
5-7	4	17.4	34	46.6	38	39.6
>7	19	82.6	33	45.2	52	54.2
Total	23	100	73	100	96	100

p-value=0.003.

Table 4 indicates that only 15 infants (20.5%) with abnormal CTG required resuscitation.

Table 4: Neonatal Resuscitation as per CTG status

Resuscitation	Groups					
	Suspicious		Pathological		Total	
	No.	%	No.	%	No.	%
Yes	0	0.0	15	20.5	15	15.6
No	23	100	58	79.5	81	84.4
Total	23	100	73	100	96	100

Ten of the 77 infants with a pathological CTG trace died at birth, and four were stillborn. In the suspect CTG group, there were no stillbirths or newborn deaths.

Discussion

Assessment of the foetal status was dependent on quite narrow methods until the second half of the 20th century. [9] At the time, the unexpected lack of fetal movements in the second half of pregnancy was a major diagnostic issue in addition to being extremely upsetting. [10] Whether or not the fetus had died in utero was a persistent question that served as the primary driving force behind the invention of cardiotocography. [11] During labor, the technique used worldwide for fetal monitoring is cardiotocography (CTG). Despite being widely used, this approach is still up for discussion. [12–14] Unlike other techniques, cardiotocography delivers immediate information about the fetal status. It continues to be the cornerstone of intrapartum fetal assessment despite its lack of specificity.

In our study, 77 patients (77%) had pathological evidence and 23 patients (23%) had worrisome CTG traces. A study by Mamatha found that, of 150 patients with abnormal CTG patterns, 39 (26%) had suspicious patterns and 111 (74%) had pathological fetal heart rate patterns. These findings are equivalent to those of our study. In a different study by Shiekh, 36% of the admission traces were abnormal, and 34% of the patients were in the suspect group.

Similar to our investigation, this one also revealed a problematic fetal heart rate rhythm that was very suspect. Therefore, almost half of all deliveries have CTG patterns that differ from the norm. Overreaction to these frequently occurring CTG patterns is prevalent, which results in needless

intervention. In our study, 20% of women with suspicious and abnormal CTG patterns delivered their babies vaginally, whereas roughly 80% of patients had their babies delivered via cesarean section. Comparable to our data, a study by Amena (16 82% of patients) had cesarean sections because to abnormal CTG. In a similar vein, a different study conducted by Farkhunda et al. [17] found that high rates of cesarean sections (72.72%) were present when aberrant CTG patterns were present. The study conducted by Oladrian et al. (2018) revealed a comparable finding, with a 72% rate of caesarean sections. Additionally, a research by Kulkarni and Shrotri [19] demonstrated the steadily increasing number of surgical births for fetal distress.

If electronic fetal monitoring is utilized without any adjunctive testing, the high rate of caesarean sections for fetal distress cannot be decreased. Therefore, further testing (fetal ECG, fetal pulse oximetry, and fetal blood collection for pH) is required in order to lower the number of false positive instances. The high rate of caesarean sections in our study may be related to the fact that the fetal status was evaluated solely by CTG.

In our research, 15% of the neonates in the problematic group had an Apgar score of less than five at one minute. The suspect group did not contain any newborns with an Apgar score lower than 5. In another study done by Mamatha, [15] 75.2% newborns had Apgar score <7 in pathological group and 20.7% in suspicious group. This discrepancy might result from the newborns in our study being divided into three groups based on their Apgar scores: poor (5-7), good (>7), and awful (<5). In Mamatha's study, neonates with abnormal CTG had low Apgar scores, which is comparable to our data. In Mamatha's study, neonates were divided into two groups: poor (<7)

and good (>7) scores. However, it was seen in the aforementioned investigations that infants with aberrant CTG had low Apgar scores, which were also consistent with the findings of the Dellinger et al [20] study. 6.3% of neonates with abnormal CTG in our study had an Apgar score of less than five at five minutes, compared to 18.86% of neonates in Sheikh's study, which is not comparable to ours because Sheikh divided the neonates into two groups for their study and three groups for ours.

As a result, we have a different group of neonates with an Apgar score of five to seven at five minutes that is not included in Sheikh's study. An additional issue to take into account is that the aforementioned study also recognized the impact of intrauterine growth restriction, precious pregnancy, and meconium-stained wine on the Apgar score. 15.6% of the newborns in our research required resuscitation. This is similar with the study conducted by Tan et al [21] where 12.8% neonates needed resuscitation for low Apgar score at 1 min.

In newborns with abnormal CTG traces, our study found 13.7% neonatal deaths, 5.2% stillbirths, and 18.9% overall neonatal mortality; in contrast, Sheikh's study found 16% neonatal deaths. 10% of stillbirths and 26% of all newborn deaths occurred. The author of the study, Sheikh, acknowledges that delayed action and incorrect interpretation of CTG are the reasons for the higher rate of infant mortality in his work. It is advised to critically reevaluate the obstetrician and midwifery profession's supervision, evaluation, and training in light of this. The need of providing frequent training to clinicians involved in antepartum and intrapartum care about the use and interpretation of CTG cannot be overstated.

Conclusion

It is determined that cardiotocography can go on being an effective fetal surveillance screening test. Unusual CTG in the flow affects the fetal results, such as low Apgar scores at 1 and 5 minutes, a higher incidence of cesarean sections, and the need for neonatal resuscitation. In order to lower the frequency of false positive results, which could lead to an increase in the incidence of needless intervention, particularly cesarean sections, it is required to define a consistent and unambiguous definition of FHR tracing.

References

- Alfirevic Z, Devane D, Gyte GM. Continuous cardiotocography as a form of electronic fetal monitoring for fetal assessment during labour. *Cochrane Database Syst Rev*. 2008; CD0066066.
- Gardosi J. Monitoring technology and the clinical perspective. *Bailliere's Clin Obstet Gynaecol*. 1996; 10:325-40.
- Bansal A, Murli M, et al. Role of pathological cardiotocography in evaluating fetal wellbeing. *J Coll Physicians Surg Ind*. 2006; 16:404-7.
- Atanasov B, Ignatov P. Quantitative cardiotocography. *Akush Gynaecol*. 2008; 47:11-5.
- Ash AK. Managing patients with meconium stained amniotic fluid. *Hospmed*. 2002; 161:Y2+-Y1.
- Danielian P, Steer PJ. Fetal distress in labour. High risk pregnancy management option. 3rd ed. New Delhi: Elsevier; 2006.p.450-72.
- Palomaki O, Iuukkaala T, Luoto R, Tuimala R. Intrapartum cardiotocography. The dilemma of interpretational variation. *J Perinat Med*. 2006; 34:298-302.
- Bix E, Reiner LM, Klovning A, Oian P. Prognostic value of labour admission test and its effectiveness compared with auscultations only: A systematic review. *Brit J Obstet Gynaecol*. 2005; 112:1595-1604.
- De Snoo K, Leerboek der verloskundde. Wolters Uitgeversmaatschappij Groningen. 1946.
- Herman PG, Kurjak A. Cardiotocography. *Textbook of Perinatal Medicine*. 1998; 2:1424-8.
- Sureau C. The history of fetal surveillance. In: Van Geijn HP, Copray FJA, editors. A critical appraisal of fetal surveillance. Elsevier; 1994:3-10.
- Hagberg B, Hagberg G, Beckung E, Uvebrant P. Changing panorama of cerebral palsy in Sweden: prevalence and origin in the birth year period 1991-94. *Acta Paediatr*. 2001; 90:271-77.
- Low JA, Pickersgill H, Killen H, Derrick EJ. The prediction and prevention of intrapartum fetal asphyxia in term pregnancies. *Am J Obstet Gynaecol*. 2001; 184:724-730.
- Pare JT, King T. Fetal heart rate monitoring: Is it salvageable? *Am J Obstet Gynaecol*. 2000; 182:982-7.
- Mamatha K. A one year cross-sectional study for evaluation of cardiotocography monitoring for intrapartum fetal surveillance and its correlation with Apgar score and cord blood with PH. [Dissertation] Rajiv Gandhi University of Health Science, Karnataka, Bangalore, India. 2006.
- Amena K, Nurun NK, Fahmida N. Role of elaborate cardiotocography in pregnancy management. *BSMMU J*. 2009; 2:18-24.
- Farkhunda K, Chandra MD, Nasreen J. Cardiotocography: obstetric and neonatal outcome. *J Rawal Med Coll*. 2009; 13:86-8.
- Oladian FA, Raphael JP. Abnormal antepartum cardiotocography and major fetal abnormalities. *ANZJOG*. 2008; 28:120-23.
- Kulkarni AA, Shrotri AN. Admission test: a

- predictive test for (fetal) distress in high risk labour. J Obstet Gynaecol Res. 1998; 24:255-59.
20. Dellinger EH, Boehm FH, Crane MM. Electronic fetal rate monitoring: early neonatal outcomes associated with normal rate, fetal stress and fetal distress. Am J Obstet Gynaecol. 2000; 182:214-20.
21. Tan KH, Wyldes MP, Settatee R, Mitchell T. Confidential regional enquiry into mature stillbirth and neonatal death-a multidisciplinary peer panel perspective of the perinatal care of 238 deaths. Singapore Med J. 1999; 40:251-5.