

Role of Abnormal Intrapartum CTG in Predicting Adverse Fetal Outcome

Filza Habib¹, Maria Aslam², Hasina Sadiq³, Irum Sohail⁴, Mehak Asim⁵, Maria Habib⁶

^{1-3,5,6}Senior Registrar Obs & Gynae Shifa College of Medicine, Shifa Tameer-e-Millat University Islamabad

⁴ Professor Obs & Gynae KRL General Hospital Islamabad

Correspondence: Dr Filza Habib

Senior Registrar Obs & Gynae

Shifa College of Medicine, Shifa Tameer-e-Millat University Islamabad

filzasibtain@gmail.com

Abstract

Objectives: To determine the frequency of adverse fetal outcomes (Apgar score <7 at 1 minute) in females with abnormal CTG.

Methodology: A descriptive case series was conducted Obstetrics & Gynecology department, KRL Hospital, Islamabad, from 30th September 2018 to 29th March 2019. Ninety six pregnant females with abnormal intrapartum CTG at term with cephalic presentation and ages between 18 to 40 years were included. Patients with elective caesarian sections, obstetric emergencies e.g. severe APH, Cord prolapse, hand prolapse, and intrauterine fetal death were excluded. CTG was conducted by the trained staff in the labor room of all selected patients in an active phase of labor. All cases were followed till delivery, and adverse fetal outcome with Apgar score <7 noted.

Results: The mean age was found to be 28.05 ± 5.06 years, with a mean gestational age of 38.82 ± 0.92 weeks, and parity was 1.45 ± 1.90 . The mean BMI was 30.51 ± 2.33 kg/m². Adverse fetal outcome (in terms of Apgar score <7 at 1 minute) in females with abnormal CTG was found in 36 (37.50%) while 60 (62.50%) patients showed no adverse fetal outcome.

Conclusion: This study concluded that the frequency of adverse neonatal outcomes (Apgar score <7 at 1 minute) in females with abnormal CTG is quite low.

Keywords: Cardiotocography, adverse fetal outcome, Apgar score

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Introduction

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 cardiotocography (CTG) is the most common non-invasive and cost-effective technique. 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.¹ In labor fetal heart rate is usually checked through intermittent auscultation by a pinnards fetoscope however due to increased fetal morbidities and litigations, continuous electronic fetal monitoring (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.²

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.³

Reduced blood supply to the fetus during labor causes metabolic acidosis leading to temporary or permanent neurological damage. This can bring CTG changes which become a cause of raised cesarean section rates as well as litigations faced by obstetricians. However, there is a 30% predictive value of CTG in the early identification of adverse fetal outcomes with 60% false positive rates.⁴ NICE 2014 guidelines are mostly followed as standard in determining the relationship between uterine contractions and fetal heart pattern.

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There is enormous inter and intra-observer variation in CTG interpretation resulting in inappropriate interventions.⁵ Cardiotocographic abnormal traces show 2.3 folds increase in the risk of neonatal cerebral palsy, and a 6.7 times increase in perinatal mortality.⁶ However the problem remains constant that not all abnormal CTGs are associated with bad outcomes. Studies show a wide variation in results with neonatal outcomes of 3.6% and 75.2% in terms of APGAR scores less than 7 taken at 1 minute.^{7,8}

Due to the high false positive rate of CTG, it is difficult to judge its significance in the determination of adverse neonatal outcomes. Multiple studies show large variations in their results so in order to study the association between non-reassuring CTG and poor APGAR scores at birth we decided to conduct a study on our own population. This study will help to decrease the rising trend of caesarean sections based on false positive findings in CTGs. Also, if the predictive accuracy of CTG in adverse fetal outcomes will be found low, then an alternative antenatal test can be applied in our routine practice for fetal monitoring ultimately causing a reduction in fetal morbidity and mortality.

Methodology

It was a descriptive cross-sectional study, conducted at the Department of Obstetrics and Gynecology, KRL General Hospital, Islamabad, Pakistan, from 30th September to 29th March 2019. Ninety six patients were taken with a 95% confidence level, a 10% margin of error, and

The expected percentage of adverse fetal outcomes (Apgar score less than 7 at 1 minute) in females with abnormal CTG as 54.0%.⁹ Non-probability, consecutive sampling technique was used.

Inclusion criteria were all pregnant females with abnormal intrapartum CTG at term, singleton pregnancy, cephalic presentation, ages between 18-40 years, and parity from 0-5. Abnormal CTG included all non-reassuring and pathological CTGs and the term was defined as gestational age from 37+7 to 41+6 weeks of gestation calculated from the first scan.

Patients who had intrauterine fetal death (assessed on USG), who underwent planned elective caesarian sections for conditions like previous scars or placenta previa, and women with obstetric emergencies e.g. severe APH, Cord prolapse, hand prolapse were all excluded.

After an ethical review, 96 pregnant females who presented to the inpatient department of Obstetrics & Gynecology, fulfilling the inclusion criteria were enrolled. Details of the study were explained, informed written consent was taken, and documented clearly in her antenatal card that she would be part of the trial once she came into labor. CTG was conducted by the trained staff in the labor room of selected patients at admission and in the active phase of labor. Patients were followed till delivery, and adverse fetal outcomes in terms of Apgar scores less than 7 (yes/no) were noted by the researcher herself. Data with demographic data (age, gestational age, and parity) were recorded on a specially designed proforma.

Data analysis is done through SPSS version 22. Mean and standard deviation were calculated for the quantitative variables i.e. age, gestational age, parity and BMI. Frequency and percentage calculated for a mode of delivery (vaginal/caesarean) and Apgar score at 1 minute less than 7 (yes/no). Stratification for age, gestational age, parity, BMI and mode of delivery (vaginal/caesarean) was done with post-stratification. chi-square test was applied and a P-value ≤ 0.05 was taken as significant.

Results

A total of 96 pregnant females were included in the study. The age range in this study was from 18 to 40 years with a mean age of 28.05 ± 5.06 years. The majority of the patients i.e. 74 (77.08%) were between 18 to 30 years of age. The mean gestational age at the time of delivery was 38.82 ± 0.92 weeks. The mean parity was 1.45 ± 1.90 . The mean BMI was 30.51 ± 2.33 kg/m².

Adverse fetal outcome (in terms of Apgar score <7 at 1 minute) in females with abnormal CTG was found in 36 (37.50%) while 60 (62.50%) patients showed no adverse fetal outcome (Figures I and II). However, there was no neonatal mortality and morbidity among the neonates of both groups. 3 neonates in the Apgar score < 7 group were admitted to NICU and 2 in the other group. They were just admitted for observation and handed over to the mother within 24 hours.

Table I has shown the stratification of adverse fetal outcomes with respect to parity, BMI & mode of delivery. There was no statistically significant association of the Apgar score with the parity, BMI and the mode of delivery.

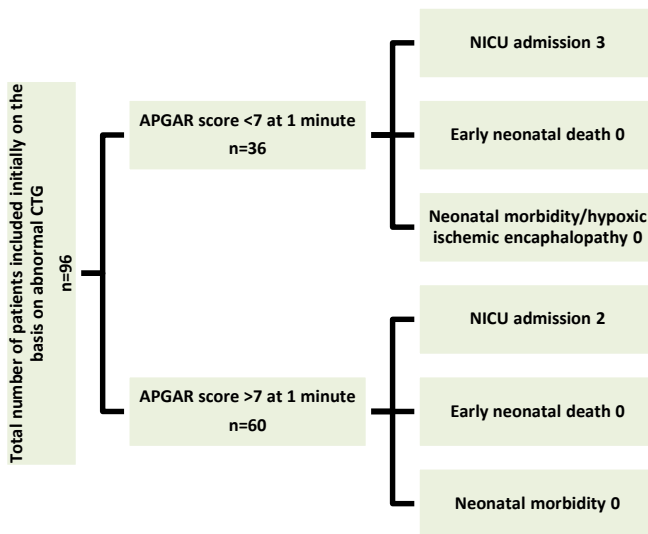


Figure I: Flow chart showing the fetal outcomes.

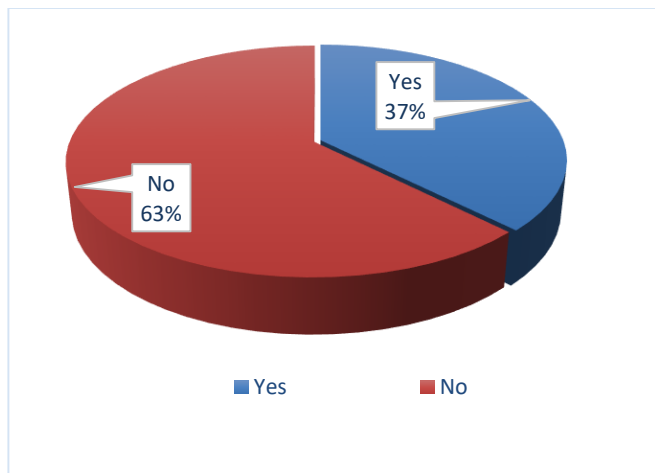


Figure II. Frequency of adverse fetal outcome (in terms of Apgar score <7 at 1 minute) in females with abnormal CTG.

Table I: Stratification of adverse fetal outcome with respect to parity, BMI and mode of delivery

Parameters	Adverse Fetal Outcome		P-value
	Yes (N=36)	No (N=60)	
Parity	0-2	30(28.8%)	0.836
	3-5	06(5.76%)	
BMI (kg/m ²)	≤30	16(15.36%)	0.915
	>30	20(19.2%)	
Mode of Delivery	Vaginal	16(15.36%)	0.451
	Cesarean	20(19.2%)	

Discussion

Although CTG is routinely used for antepartum and intrapartum fetal monitoring worldwide, its ability to detect neonatal hypoxia and acidosis remains uncertain.¹⁰ This study was carried out to determine the frequency of adverse fetal outcomes (as measured by

Apgar score < 7 at 1 minute) in females with abnormal CTG.

Our study showed adverse fetal outcomes (in terms of Apgar score <7 at 1 minute) in females with abnormal CTG, in 36 patients (37.50%) while 60 (62.50%) patients showed no adverse fetal outcome. In one study done in Karachi, fetal outcome in terms of a 1 min Apgar score <7 was seen in 54% of neonates.⁹ However, no NICU mortality, morbidity, or admission was noted in this group. They had improved Apgar score at 5 minutes and were all healthy. This was in accordance with the findings of our study. In another study conducted at Dow University of Health Sciences and Civil Hospital Karachi, the fetal outcome in terms of 1 min Apgar score <7 was seen in 7 (63.6%) neonates. But then only 2 (18.1%) neonates had Apgar scores less than 7 at 5 minutes as well.⁷ The main outcome studied in their study was the Apgar score at 5 minutes which was not recorded in our study. However, contrary to our results, a study conducted in 2022 in Bangladesh stated that 47.2% of their patients had abnormal CTGs and 66% of babies had low Apgar scores and 83.3% of babies were admitted to NICU.¹⁰ While a study in India showed Apgar score <7 at 1 minute in 59.22% of neonates. However, they illustrated an association between reduced AFI, abnormal CTG, and reduced Apgar score.¹¹

There was no statistically significant relationship between abnormal CTG (suspicious and pathological) and the mode of delivery in our study (p value=0.451). Similar results were seen in a local study conducted in Lahore where it was stated that mode of delivery depends upon the stage of labor but there was no statistically significant association between Apgar score at 1 minute and mode of delivery with a p-value of 0.889⁸ Whereas, in another study, it was advocated that abnormal CTG are associated with the higher incidence of caesarean section and instrumental delivery (p=<0.05 and p value=<0.001).¹⁰ A study in India and Bangladesh also showed an increased incidence of LSCS with abnormal CTG.^{11,12}

A study conducted in Rawalpindi in which 117 pregnant females with abnormal CTG were taken and the Apgar score < 7 was seen in 72 neonates (61.54%), the figures were higher as compared to our results. But out of them the Apgar score at 5 min was less than 7 in 24 neonates (20.5%). While the stratification of the adverse outcome with regards to the ages of the mother, gestational age and parity revealed no statistical significance.¹ The stratification done in our study according to parity also

showed no statistically significant association with adverse fetal outcomes in patients with abnormal CTG. In accordance with our results, there was no association of abnormal CTG with parity in another study as well.¹² However, both of these studies showed a significant correlation of poor perinatal outcomes in those with oligohydramnios, meconium-stained liquor and reduced fetal movements. But these variables were not considered in our study.

There is a retrospective review done in Lady Reading Hospital, Peshawar over a period of 1 year from June 2015 to 2016.⁴ They reviewed all those LSCS done over this period with an indication of fetal distress on the basis of abnormal CTG and they showed good Apgar score at 5 minutes. However, Apgar score at 1 minute was not noted. 91% of neonates did not require NICU admission. Hence, they advocated a poor correlation of the abnormal CTG with the neonatal outcomes. Moreover, in another local study poor relationship of abnormal CTG particularly variable decelerations with the neonatal outcomes was noted. However, the study demonstrated that 36 neonates out of 145 had an Apgar score <7 at 5 minutes and the majority of them had meconium-stained liquor.¹³

There was no neonatal mortality and morbidity (birth asphyxia including hypoxic-ischemic encephalopathy) in our study. One of the studies correlated non-reassuring CTG with early neonatal death and birth asphyxia in those with reduced fetal movements.¹⁴ While in accordance with our results, abnormal CTG was associated with early intervention like instrumental delivery but no increased risk of NICU admissions and perinatal mortality.¹⁵

Nowadays, research is undergoing regarding the computer-based analysis of CTG during the antenatal period, using specific criteria (Dawes Redman Criteria) and has been considered superior to the visual interpretation of CTG.¹⁶ This is believed to be associated with a reduction in perinatal mortality. But still requires more validation.

Conclusion

This study concluded that the frequency of adverse fetal outcomes (in terms of Apgar score <7 at 1 minute) in females with abnormal CTG is quite low. So, we recommend that an alternative antenatal test should be applied in our routine practice for fetal monitoring in order to reduce the morbidity and mortality of the fetus.

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