

## OBSTETRICAL AND FETAL OUTCOME IN PATIENTS WITH ABNORMAL CARDIOTOCOGRAPH

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### ABSTRACT

*Purpose: The aim of this study was to evaluate the effect of abnormal CTG pattern in late antenatal period and labour on the obstetrical and neonatal outcomes, in terms of mode of delivery and Apgar score of baby.*

*Methodology: Patients were collected by non-probability consecutive sampling. All patients presenting in gynae outdoor department and labour ward, who were between 37- 42 weeks of gestation and cephalic presentation with high risk pregnancy and CTG was indicated on clinical indications were included in the study. Patients with multiple gestation, anomalous fetus and admitted for elective caesarean section were excluded from study. CTG was done and according to CTG findings, the patients were divided into two groups. Group A – patients with reactive trace and group B – patients with abnormal trace, including suspicious or pathological trace.*

*Results: In our study, 214 high risk pregnant patients were included. Group-A, included 124 patients with reactive CTG, whereas group-B included 90 patients having non-reactive CTG including both suspicious and pathological traces. In group-A, 58.0% of patients had vaginal deliveries and 42% had caesarean section but 23.3% delivered vaginally and 76.7% had caesarean section in group-B. In group-A, 37.9% of newborns had Apgar score < 7 at 1 minute whereas, patients in group-B had 64.4% babies with score of < 7. Low Apgar score at 5 minute persisted in 28.2 % of neonates in group-A and 46.66% of neonates in group-B. Resuscitation of newborns, neonatal intensive care unit (NICU) admissions and early neonatal death rate were greater in group B than group A.*

*Conclusion: Cardiotocography can be used as good screening tool for fetal surveillance especially in centers where fetal blood sampling or fetal ECG is not available. Abnormal CTG may influence the maternal and fetal outcome.*

*Key words: Cardiotocography, fetal surveillance, maternal outcome, fetal outcome.*

### INTRODUCTION

Monitoring of fetal heart rate is an essential component of antenatal care. Before the introduction of pinard stethoscope, the condition of the fetus was difficult to ascertain till birth of baby as it was only dependent upon the growth of uterus and perception of fetal movement by mother. Later on, auscultation of fetal heart sounds and nature of amniotic fluid were used as means of monitoring the status of fetus during labour. Meconium staining of liquor had long been considered as a traditional indicator for fetal distress but now a days, cardiotocography (CTG) is an up-to-date practical method for fetal surveillance during pregnancy and labour.<sup>1</sup>

Intrapartum fetal surveillance was traditionally carried out by intermittent auscultation of fetal heart. Use of intrapartum electronic fetal monitoring (EFM) with cardiotocography has steadily increased over the last three decades in an attempt to reduce the inci-

dence of intrapartum fetal morbidity and mortality.<sup>2</sup>

Electronic fetal monitoring (cardiotocography) record change in the fetal heart rate pattern and its relationship to uterine contractions.<sup>3</sup> Cardiotocography provides information about the fetal condition. A normal trace indicates a well oxygenated fetus but an abnormal trace indicates compromised fetus but it has poor specificity with up to 60% false positive rates being reported.<sup>2</sup>

The introduction of fetal scalp blood sampling (FBS) and pH estimation by Saling allowed further assessment of fetal condition. Fetal blood sampling is a complicated and time consuming technique which is uncomfortable for the labouring woman, especially if repeated at regular intervals throughout the labour.<sup>4</sup>

So CTG is used as a screening tool to assess fetal wellbeing and to identify the possibility of asphyxia<sup>5</sup> and is confirmed by FBS if it is available. Newer techniques, such as analysis of the ST segment of the fetal

electrocardiograph (STAN), the calculation of the fetal physiological score (FPS) and computer assisted interpretation of CTG are being studied for its efficacy<sup>6</sup> but are not available in all hospitals.

The normal or reactive fetal heart rate pattern is characterized by a baseline frequency between 110 to 160 beats per minute, presence of periodic accelerations, a normal heart rate variability with a variability between 5 and 25 beats per minute and the absence of decelerations.<sup>7</sup> If one or more of its parameter is abnormal, it is regarded as non-reactive trace.

According to NICE guidelines the CTG pattern is divided into normal (reassuring), suspicious (non-reassuring) and pathological (abnormal). If one of the four features is abnormal the pattern will be suspicious and if two or more features are abnormal then the trace will be pathological.<sup>7</sup>

Several studies have shown association between abnormal CTG and fetal acidosis, elevated cord nucleated red blood cell count, which is a predictor of adverse fetal outcome<sup>8</sup>. Accurate interpretation of CTG is essential and it is important to recognize a fetus that shows pathological CTG in labour that may imply possible hypoxia and birth asphyxia<sup>5</sup>.

Antepartum and intrapartum fetal testing and fetal monitoring help to detect fetal distress. Appropriate timely action based on these observations may help to prevent birth asphyxia.<sup>5</sup> Advantages of CTG are, the most widely used non-invasive method of fetal monitoring, there are no contraindications and the findings can be written and documented. There is significant correlation between pathological CTG and the state of newborn evaluated by Apgar score, existence of acidosis, hypoxic-ischemic encephalopathy and subsequent neuromotor development.<sup>9</sup>

The aim of our study was to evaluate the effect of abnormal CTG pattern in late antenatal period and labour on the obstetrical and neonatal outcomes in terms of mode of delivery and Apgar score of baby.

## MATERIAL AND METHODS

This was a cross-sectional study conducted from January 2015 to December 2016 in Obstetrical and Gyneecology department of Akhtar Saeed Trust Teaching Hospital, Lahore which is a teaching hospital affiliated with Akhtar Saeed Medical & Dental College.

Patients were collected by non-probability consecutive sampling. Sample size was not calculated by scientific method but all patients admitted in labour ward who were between 37-42 weeks of gestation and cephalic presentation with any risk factor like prelabour rupture of membranes, decreased fetal movements, antepartum hemorrhage, hypertensive disorders of pregnancy, gestational diabetes, postdate pregnancy and bad obstetrical history were included in the study. Patients with multiple gestation, anomalous fetus and admitted for elective caesarean section were

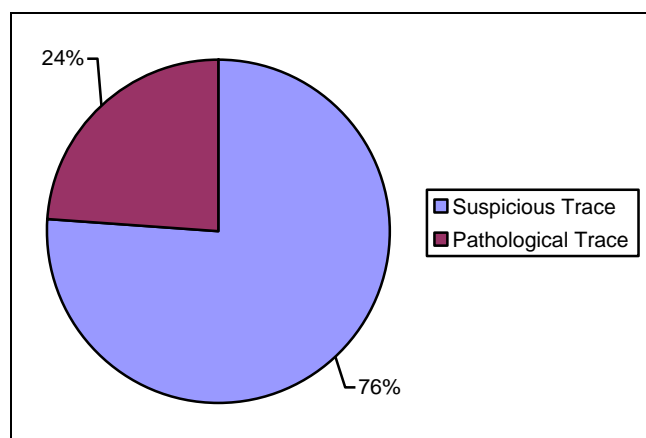
excluded from study. Verbal consent was taken from patients and included in the study.

Admission CTG was done for 30 minutes in left lateral position and labeled as reactive or non-reactive. According to CTG findings then patients were divided into two groups. Group-A, patients with reactive trace and group-B, patients with non-reactive trace including suspicious and pathological traces. In case of suspicious pattern, CTG was repeated after hydration with intravenous fluid and oxygen inhalation (if no contraindication) and was labeled again reactive or non-reactive. If it remained suspicious or abnormal then action for delivery was taken. Mode of delivery was dependent upon stage of labour. In case of pathological pattern prompt action was taken regarding mode of delivery. The newborns were evaluated in terms of Apgar score at 1 minute and at 5 minutes, babies need resuscitation and need of neonatal intensive care unit admissions were also noted. The confidentiality of all the data was maintained.

Data was analyzed by SPSS version 21. Qualitative data was presented in the form of frequency and percentage. Mean  $\pm$  Standard deviation (S.D) was used for quantitative data like age and parity. Chi-square test was used for statistical analysis. P value of  $\leq 0.05$  was considered as significant.

## RESULTS

In this study, 214 high-risk patients were included who fulfill the inclusion criteria. Cardiotocography was performed and depending upon CTG findings two groups of patients were made. Group A includes 124 patients with normal or reactive CTG, whereas Group B includes 90 patients having abnormal or non-reactive CTG including both suspicious and pathological traces.



**Fig. 1:** CTG pattern in patients having abnormal trace (group-B):  $n = 90$ .

As the demographic data of patients was concerned, the mean age of patients in group-A was 28.5 ( $\pm 3.85$ ) years, mean ( $\pm$  S.D) and in group-B was 29.4

(± 4.27) years (Table 1).

In group-A, 32.3% of patient were primigravida and 67.7% were multigravida, similarly 33.3% were primigravida and 66.7% multigravida in group B (Table 1).

Amongst the patients included in group-B, 22% of cardiotocographs were done in antenatal period and 78% were done during labour. Suspicious trace was seen in 24% and pathological trace in 76% of patients having abnormal CTG in group-B (Fig. 1).

When Apgar score at 1 minute was observed, 37.9% of neonates delivered to patients of group-A and 64.5% of newborns delivered to group-B patients had

score of < 7. At 5 minute, the Apgar score of group-A neonates improved, 28.2 % had score < 7 and only 4.8% had score < 5. Apgar score of neonates of group-B also improved but still 33.4% had score between 5-7 and 13.3% had score < 5 at 5 minute and this difference was statistically significant ( P value = 0.001) (Table 2).

Resuscitation was needed in 7.3% of group-A and 15.6% of group-B neonates. Admissions to neonatal intensive care unit (NICU) and early neonatal death rate were greater in group-B than neonates born to group-A (Table 2).

**Table 1:** Demographic Data and Obstetrical Outcome in Study Patients.

	Group A	Group B	P value
<i>Age (Years):</i>	Reactive CTG (n = 124)	Non-reactive CTG (n = 90)	
≤ 25	27 (21.8%)	19 (21.1%)	< 0.001
26 – 30	38 (30.7%)	30 (33.3%)	
31 – 35	35 (28.2%)	26 (28.9%)	
36 – 40	15 (12.1%)	10 (11.1%)	
> 41	9 (7.2%)	5 (5.6%)	
<i>Parity:</i>			
Primigravida	40 (32.3%)	30 (33.3%)	< 0.001
Multigravida	84 (67.7%)	60 (66.7%)	
<i>Mode of Delivery:</i>			
Normal vaginal delivery	66 (53.2%)	12(13.3%)	< 0.004
Instrumental delivery	6 (4.8%)	9 (10.0%)	
Caesarean section	52 (42 %)	69 (76.7%)	

**Table 2:** Fetal and Neonatal Outcome in Study Patients.

	Group-A neonates	Group-B neonates	P value
<i>Apgar Score at 1 Minute</i>	Reactive CTG (n=124)	Non-reactive CTG (n=90)	
< 5	12 (9.7%)	17 (18.9%)	< 0.001
5 – 7	35 (28.2%)	41 (45.6%)	
> 7	77 (62.1%)	31 (34.4%)	
<i>Apgar Score at 5 Minute:</i>			
< 5	6 (4.8%)	12 (13.3%)	< 0.001
5 – 7	29 (23.4%)	30 (33.4%)	
> 7	89 (71.8%)	48 (53.3%)	

<i>Resuscitation Required:</i>			
Yes	9 (7.3%)	14 (15.6%)	< 0.001
No	115 (92.7%)	76 (84.4%)	
Delivered alive	121 (97.6%)	86 (95.6%)	
Stillbirths	3 (2.4%)	4 (4.4%)	
Early neonatal deaths	5 (4.1%)	12 (13.9%)	

## DISCUSSION

Cardiotocography is one of the reliable methods of fetal monitoring in pregnancy and during childbirth<sup>10</sup>. In majority of the hospitals of developed and developing countries, it is the most commonly used tool for fetal surveillance. Reason to carry out this study to analyze the impact of abnormal CTG on fetomaternal outcome.

The mean age of the patients with non-reactive CTG pattern in our study was  $29.4 \pm 4.27$  years. This is comparable to the study conducted by Amena et al where mean age of the patients was  $26.7 \pm 4.91$  years.<sup>11</sup> Another study conducted in Karachi also had patients with mean age of  $30.51 \pm 6.11$  years.<sup>12</sup>

Regarding the mode of delivery, in this study 58.0% of patients had vaginal deliveries and 42.0% had caesarean section, when CTG was reassuring but 23.3% delivered vaginally and 76.7% of patients had caesarean section when CTG was non-reactive. In studies done by Gordana et al and Oladrian et al, they also showed increased caesarean section rate, which was 64% and 72% respectively.<sup>10,13</sup> Amena et al made similar observations and their caesarean section rate was 82%, which is also comparable with our study<sup>11</sup>. Abnormal CTG is associated with increased caesarean section rate, which is also shown in our study because when abnormal CTG pattern occurs, then urgent medical aid is sought and preparation is made to expedite delivery.

In this study, the rate of caesarean section in reactive CTG group was also 42% because in study hospital a major number of patients are referred from peripheral areas and caesarean section is mandatory for obstetrical reasons in those patients.

High caesarean section rate in patients with abnormal CTG pattern was also because we had used only CTG as a tool to detect fetal distress in patients with non-reassuring CTG. If other tests like fetal ECG or fetal scalp blood sampling for pH or lactate estimation were used, the high caesarean section rate can be brought down. Fetal blood sampling is a sensitive test for identification of acidemic babies but it has to be repeated in labour, which is uncomfortable for many laboring women and requires equipment, training and expenses, that's why it is not widely available in many of our hospitals.

In this study, better Apgar score at one minute was seen in babies born to patients with reassuring CTG pattern, where 62.1% had score of  $> 7$  and 37.9% had Apgar score  $< 7$ . However, patients with non-reactive CTG had 65.6% babies with Apgar  $< 7$  and out of them 18.9% had score of less than 5. Low Apgar score at 5 minute persisted in 28.2% of neonates in reassuring CTG group and 46.7% of neonates in non-reactive CTG group.

Many studies found no significant association between pathological CTG and fetal Apgar score.<sup>14,15</sup> The study by Rotich et al found no immediate adverse neonatal outcome but their NICU admission (15.2%) for suspected birth asphyxia was significantly higher.<sup>15</sup> According to Sheikh et al study Apgar score at 1 minute was  $< 7$  in 64.1% patients with pathological traces and score persisted  $< 7$  in 18.9% of cases at 5 minutes<sup>14</sup>. Their initial score is comparable to our study but low Apgar score  $< 7$  at 5 minutes is significantly higher in our study group with non-reactive CTG which is not comparable. The reason of this higher number could be inclusion of high-risk cases in our study, where some fetuses are already at risk of intrauterine hypoxia.

Similar observations were made by Rotich et al,<sup>16</sup> where low Apgar score at 1 minute was noted in 59% of newborns with fetal distress compared with 31% in newborns without fetal distress, which are highly comparable with our study. In their study, low Apgar score was seen at 5 minute in 24.1% of neonates with clinical fetal distress compared to 3.4% in those without fetal distress in their study.<sup>16</sup> This improved 5 minute Apgar score might be due to the fact that they had done study on those clinical fetal distress cases that were delivered by caesarean section only and patients with vaginal deliveries were not included.

There was increased need of resuscitation in babies born to non-reactive CTG group. In current study, 9 (7.2%) babies needed resuscitation in reactive CTG group whereas 14 (15.5%) babies required resuscitation in non-reactive CTG group. Out of 121 alive newborn in normal CTG group, 8.3% needed admission in neonatal intensive unit (NICU), whereas 18.6% of neonates with abnormal CTG were admitted and treated in NICU. This was comparable to Rotich et al observation where NICU admission was 15.2%.<sup>15</sup> Amongst the

reactive CTG group, there were 2.4% stillbirths and 4.1% early neonatal deaths but number of stillbirths and early neonatal deaths (ENND) were much higher in non-reactive CTG group, which were 4.4% and 14.4% respectively. Observed rate of stillbirths and ENND were lower than Sheikh et al, which were 11.6% and 16.9% respectively.<sup>13</sup> This lower rate may be due to timely intervention and specialized neonatal facilities available for neonatal care in current setup. The same findings were also seen in other studies where incidence of morbidity and mortality in newborns exposed to fetal distress was twice that of newborns without fetal distress.<sup>16,17</sup> There were significant differences in patients with reactive and non-reactive CTG regarding maternal and early fetal outcome. So CTG is an important test to assess the fetal condition in both antepartum and intra-partum period. Large randomized studies in high-risk population also provide evidence that perinatal morbidity and mortality is reduced when CTG is used in high-risk pregnancy, which require immediate institution of supportive therapy and delivery.

It is **concluded** that Cardiotocography can be used as good screening tool for fetal surveillance especially where fetal blood sampling or fetal ECG are not available. Abnormal CTG influence the maternal and fetal outcome. There is a need to invent some non-invasive and cheap methods to reduce the incidence of false positive findings and it also prevents unnecessary intervention especially the caesarean section.

**Disclaimer:** None.

**Financial Support:** None.

**Equipment:** Cardiotocography Machine of Hospital.

**Conflict of Interests:** The authors declare that they have no conflict of interests.

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