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INTERPRETATION OF ABNORMAL CARDIOTOCOGRAPHY AND PERINATAL OUTCOME

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ABSTRACT

Introduction: Monitoring of fetal heart rate is an essential component of antenatal care. Use of intrapartum electronic fetal monitoring (EFM) with cardiotocography has reduced the incidence of intrapartum fetal morbidity and mortality. **Aim**: The purpose of the study is to evaluate the neonatal outcome of abnormal CTG in labour in terms of mode of delivery, APGAR score at birth, neonatal resuscitation and NICU admission. **Methodology**: This clinical study conducted in department of OBG Navodaya medical college hospital and research center, Raichur. 80 patients with abnormal cardiotocography were included in the study who were between 37-42 weeks period of gestation who were meeting the inclusion criteria. OF 80 patients, 23 patients were with the suspicious CTG and 57 patients with pathological CTG. **Results**: Of 80 patients with abnormal CTG, 43(53.75%) were primigravida and 37(46.25%) were multi. LSCS rate were 65.2% and 80.68% in suspicious and pathological group (p=0.33 NS) respectively. Apgar score at 1 and 5 minutes found to be statistically significant (p<0.05). NICU admission rates were higher in pathological group (40.37 vs 13.05) which is statistically significant (p=0.018 <0.05) suggesting higher morbidity in pathological group compared to suspicious group. **Conclusion:** It is concluded that cardiotocography can be continued as good screening test of fetal surveillance in modern obstetrics. Abnormal CTG influence the fetal outcomes. In suspicious CTG, good clinical correlation is required to reduce increased incidence cesarean section.

KEYWORDS: cardiotocography, fetal surveillance, fetal outcome, LSCS.

INTRODUCTION

- The modern obstetrics practice consists of methods to detects, avoid and treat fetal asphyxia. Advanced technology contributed significantly to improve maternal and perinatal outcome.[1] Initially, fetus was considered the outcome of pregnancy but now a days the fetus is considered as second patient. In a wide sense fetal monitoring means fetal surveillance but practically, it is an indirect way to measure fetal wellbeing or the adequacy of fetal oxygenation and as such it is an integral part of the concept of fetus as patient.[2]
- CTG has been used as a basic noninvasive method of evaluating the condition of fetus during pregnancy and labour. CTG is the short simple test usually of 20 minutes and advantages of CTG are, most widely used non-invasive method of fetal monitoring[3,4], there are no contraindications for CTG and finding can be written and documented. There is significant correlation between pathological CTG and state of newborn evaluated by APGAR score at birth, need of resuscitation and NICU admission.[5]
- Labour poses physiological stress over the fetus by interrupting the oxygenated blood supply to intervillous space and thus to the fetus. This compromise in fetal circulation is picked up by the brain with help of various stimuli such as chemoreceptors, baroreceptors and direct effect of metabolic changes within the brain itself. The brain sends signal to the fetal heart to alter its rate. These changes or alterations in FHR are thus recorded on the CTG.[6]
- CTG detect the fetal distress early and allow the obstetrician to take timely intervention to prevent the perinatal morbidity and mortality. So, it is a good screening method. Thus, today CTG is first line investigation for antepartum and intrapartum fetal assessment and its use has greatly increased over last 15-20 years.[7]

AIMS AND OBJECTIVE

- The purpose of the study is to evaluate the neonatal outcome of abnormal CTG in labour in terms of mode of delivery, APGAR score at birth, neonatal resuscitation and NICU admission.

MATERIAL AND METHODS

Study design and setting

- This is a prospective study conducted in department of obstetrics and gynecology, Navodaya Medical College Hospital and Research Center Raichur between June 2021 to November 2021.
- 80 patients with abnormal cardiotocography who were meeting inclusion and exclusion criteria included in the study.

Inclusion criteria

1. Pregnant women between 37-42 weeks period of gestation,
2. Cephalic presentation,
3. High-risk pregnancy like Anemia, PIH and chronic HTN, Post datism, Previous LSCS, IUGR and Oligohydramnios, Diabetes, Rh negative pregnancy, PROM <12 hours
4. And decreased fetal movement.

Exclusion criteria: patients excluded from study are

1. Gestation age <37 weeks,
2. Elective LSCS,
3. Multifetal gestation,
4. Malpresentation,
5. Gross congenital anomaly of fetus detected by ultrasonography.

METHODOLOGY

- After obtaining institutional ethical committee approval, the study was started. Patients admitted in obstetrics unit with inclusion criteria were analysed. Written informed consent was obtained. Detail clinical history was taken and period of gestation was ascertained by the last menstrual period or ultrasonography of first trimester if mother not sure of LMP.
- CTG was done for 20 minutes in left lateral position and the baseline FHR, beat to beat variability, presence of acceleration and deceleration were assessed according to RCOG criteria of CTG.

Table 1: RCOG guidelines for usage of electronic fetal monitoring.

Feature	Baseline (bpm)	Variability (bpm)	Decelerations	Accelerations
Normal	110-160	≥5	None	Present
Suspicious	100-109 161-180	<5 for ≥40 ≤90 mins	Early deceleration, variable decelerations, Single prolonged deceleration for up to 3 mins	The absence of accelerations with otherwise normal trace is of uncertain significance
Pathological	<100 >180 Sinusoidal pattern >10 mins	<5 for >90 mins	Atypical variable decelerations, Late decelerations, Single prolonged deceleration for more than 3 minutes	

Table 2: Categorisation of fetal heart rate traces.

Category	Definition
Normal	A CTG where all four features fall into the reassuring category
Suspicious	A CTG where one of the features falls into 'non- reassuring category' and the remainder of the features is reassuring.
Pathological	A CTG whose features fall into two or more non- reassuring categories or one or more abnormal categories.

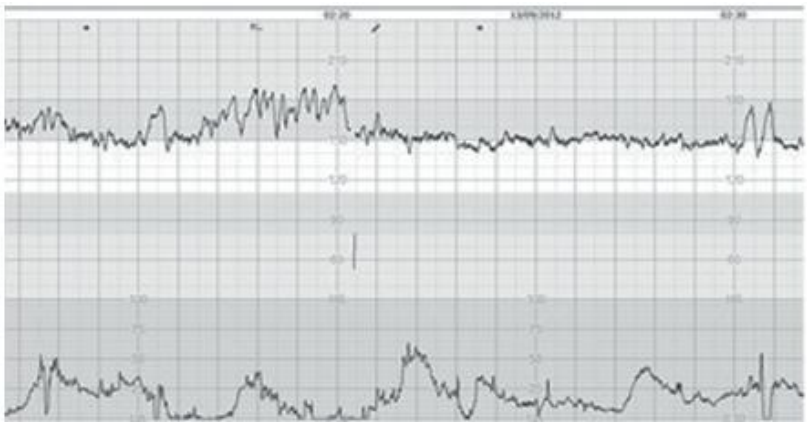


Figure 1: Normal CTG.

- In case of suspicious pattern CTG was repeated after hydration with 1000 mL of IV fluids and 10 L/min Oxygen for 30-40 minutes. If, it remained suspicious then action for delivery was taken. Mode of delivery

was dependent on stage of labour. Lower segment caesarean section was performed unless the vaginal delivery was imminent and if continuous deceleration present. In case of pathological pattern lower segment caesarean section was performed.

- The newborns were evaluated in terms of Apgar Score at 1 minute and at 5 minute i.e, good Apgar score >7, poor Apgar score 5-7 and bad Apgar score <5. Note was also kept weather or not baby required resuscitation and about NICU admission.
- The data was entered in SPSS 26.0 version and analyzed accordingly. The qualitative variables like mode of delivery, CTG pattern, Apgar score at 1 minute, Apgar score at 5 minutes and neonatal resuscitation were presented as frequency and percentages. Relation of abnormal CTG pattern with Apgar score, mode of delivery neonatal resuscitation, was done by using chi square test. P value of < 0.05 was considered as significant.

RESULTS

Table 3: Gravida status as per CTG.

	Suspicious		Pathological		Total	
	N	%	N	%	N	%
Primigravida	13	56.5	30	52.62	43	53.75
Multigravida	10	43.5	27	47.38	37	46.25
Total	23	100	57	100	80	100

Primigravida cases were 53.75% (43) and multi 46.25% (37). **P= 0.752 >0.05 NS**

Table 4: Mode of delivery as per CTG status.

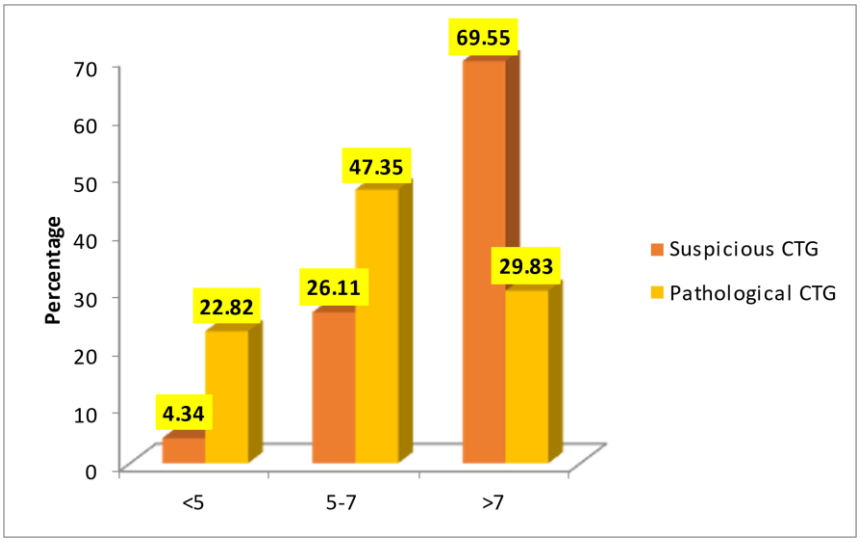
	Suspicious CTG		Pathological CTG		Total	
	N	%	N	%	N	%
Spontaneous	4	17.4	5	8.70	9	11.25
instrumental	4	17.4	6	10.52	10	12.50
Caesarean section	15	65.2	46	80.68	61	76.25
Total	23	100	57	100	80	100

Overall LSCS rate is 76.25% (61), 65.2% cases of suspicious CTG and 80.68% cases of pathological CTG delivered by caesarean section. **P= 0.33 >0.05 NS**

Table 5: APGAR at 1 minute as per CTG status.

APGAR Score	Suspicious CTG		Pathological CTG		Total	
	N	%	N	%	N	%
<5	1	4.34	13	22.82	14	17.5
5-7	6	26.11	27	47.35	33	41.25
>7	16	69.55	17	29.83	33	41.25
Total	23	100	57	100	80	100

APGAR score <5 at 1 minute were 13 cases (22.8%) in pathological group and 1 case (4.3%) in suspicious group. Neonate with APGAR between 5-7 were 27 (47.35%) in pathological and 6 in suspicious group. **P= 0.004 <0.05 significant**

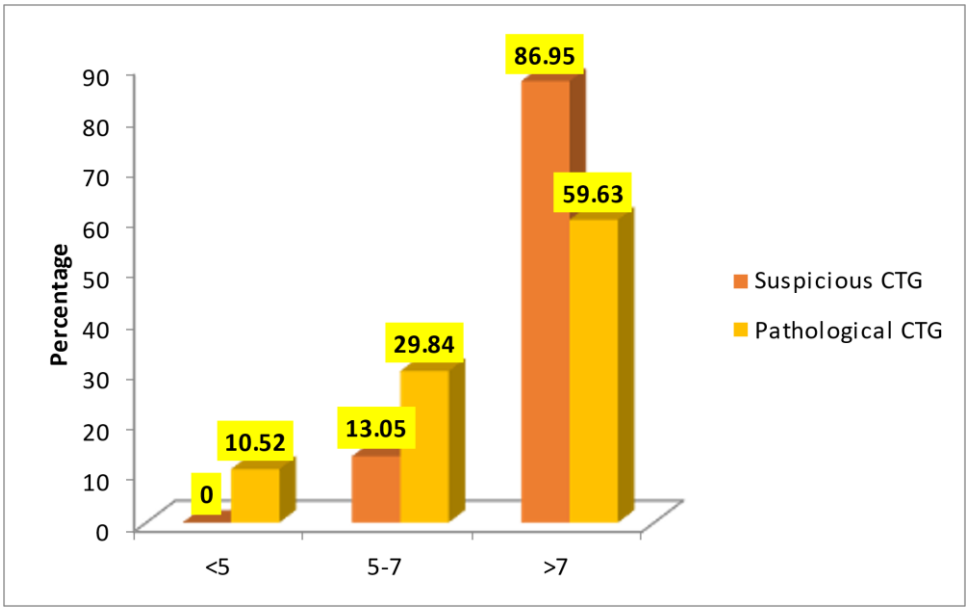


Graph 1: Showing APGAR at 1 minute.

Table 6: APGAR score at 5 minutes as per CTG status.

APGAR SCORE	Suspicious CTG		Pathological CTG		Total	
	N	%	N	%	N	%
<5	0	0	6	10.52	6	7.5
5-7	3	13.05	17	29.84	20	25.0
>7	20	86.95	34	59.63	54	67.5
Total	23	100	57	100	80	100

Neonate with <5 APGAR were 6 cases (10.5%) in pathological CTG and no neonate in suspicious CTG group. Neonate with APGAR 5-7 were 17 (29.8%) in pathological, and 3 (13%) in suspicious group **P=0.048 <0.05 significant**



Graph 2: APGAR score at 5 minutes.

Table 7: Need of resuscitation as per CTG status.

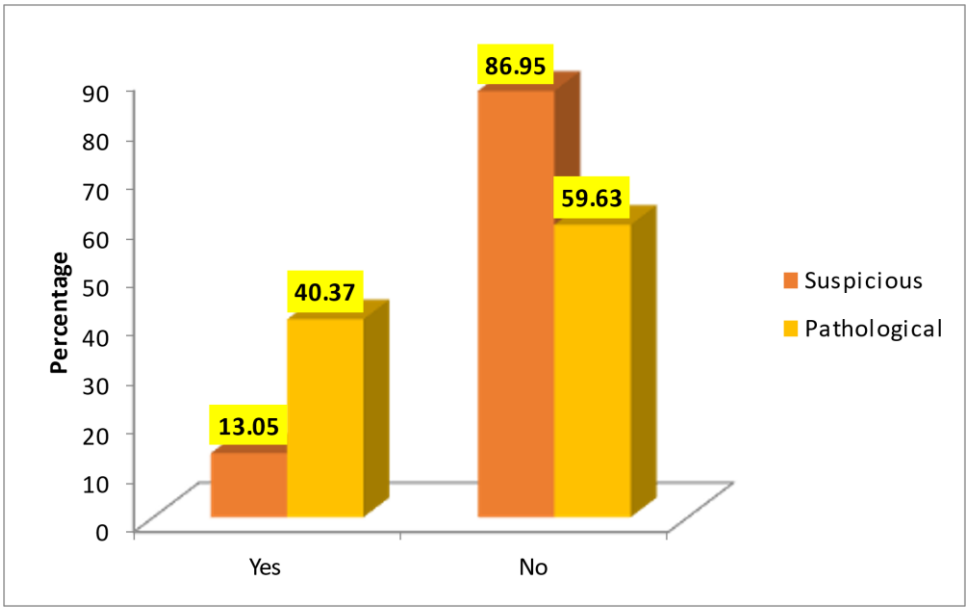
	Suspicious		Pathological		Total	
	N	%	N	%	N	%
Yes	1	4.35	11	16.37	12	15
No	22	95.65	46	83.63	68	85
Total	23	100	57	100	80	100

11(16.37%) neonates in pathological and 1(4.35%) in suspicious group needed resuscitation at birth. **P=0.09 >0.05 NS**

Table 8: NICU admission as per CTG status.

	Suspicious		Pathological		Total	
	N	%	N	%	N	%
Yes	3	13.05	23	40.37	26	32.5
No	20	86.95	34	59.63	54	67.5
Total	23	100	57	100	80	100

23 (40.3%) neonates with pathological CTG and Only 3 (13%) with suspicious CTG group admitted in NICU**. P=0.018 <0.05 significant**



Graph 3: NICU admission as per CTG status.

Table 9: Number of days of NICU admission as per CTG status.

	Suspicious CTG		Pathological CTG		Total	
	N	%	N	%	N	%
<24 hours	2	66.66	12	52.2	14	53.9
1-3 days	1	33.33	6	26.1	7	26.9
>3 days	0	-	5	21.7	5	19.2
Total	3	100	23	100	26	100

12 neonates admitted for <24 hours and 6 neonate for 1-3 days and 5 neonate for >3 days in pathological group and 2 neonate for <24 hours and 1 for 1-3 days in suspicious group. **P=0.668 >0.05 NS**

Table 10: Status of neonates as per CTG.

	Suspicious CTG		Pathological CTG		Total	
	N	%	N	%	N	%
Alive	23	100	55	96.5	78	97.5
stillbirth	0	-	0	0	0	0
Early neonatal death	0	-	2	3.5	2	2.5
Total	23	100	57	100	80	100

2(3.5%) neonates showed early neonatal death in pathological CTG group. **P=0.363 >0.05 NS**

DISCUSSION

- Cardiotocography (CTG) has become a popular method for monitor fetal wellbeing and it is assisting the obstetrician in making decision on the mode of delivery to improve perinatal outcome. Initial studies suggested, no role of CTG monitoring in good perinatal outcome, however recent studies suggest that CTG monitoring has good role in improving perinatal outcome.
- A total of 80 cases with abnormal CTG were included in the study. Out of 80 cases 28.75% (23) had suspicious CTG and 71.25% (57) had pathological CTG. There is similar to study carried out by Mamatha et al where out 150 patients with abnormal CTG pattern 39 (26%) patients showed suspicious CTG and 111(74%) showed pathological CTG.[8]
- Primigravida cases were 53.75% (43) and multi 46.25% (37). Overall LSCS rate in our study is 76.25% (61), 15 cases of suspicious CTG and 46 cases of pathological CTG delivered by caesarean section. Instrumental delivery 12.5% (10, 4 suspicious and 6 pathological) and spontaneous vaginal delivery in 11.25% (9, 4 suspicious and 5 pathological) cases. The study carried out by Oladrian et al showed caesarean section rate of 72%.[9]
- It is observed that there is progressive rise in operative delivery for the fetal distress particularly rise in caesarean section rate around the world. Thus, it necessitating the need for additional test such as fetal blood sampling for pH, fetal pulse oximetry, fetal ECG apart from electronic fetal monitoring to reduce the number of false positive cases and thus to reduce number of operative delivery.[10]
- APGAR score < 5 is bad, 5-7 is poor and >7 is good APGAR score. in our study neonate with APGAR

score <5 at 1 minute were 13 cases (22.8%) in pathological group and 1 case (4.3%) in suspicious group. Neonate with APGAR between 5-7 were 27 (47.35%) in pathological and 6 in suspicious group. 17 (29.8%) neonates in pathological and 16 (69.55%) in suspicious CTG had good APGAR score at 1 minute.

- In our study neonate with <5 APGAR at 5 minute were 6 cases (10.5%) in pathological CTG and no neonate in suspicious CTG group. Neonate with APGAR 5-7 were 17 (29.8%) in pathological, and 3 (13%) in suspicious group.
- 11(16.3%) neonates in pathological and 1(4.3%) in suspicious group needed resuscitation at birth in our study. This is similar with study conducted by Tan et al[11] where 12.8% neonate needed resuscitation for low APGAR score at 1 minute. 23 (40.3%) neonates with pathological CTG admitted in NICU of which 12 neonates admitted for <24 hours and 6 neonate for 1-3 days and 5 neonate for >3 days. Only 3 (13%) neonates in suspicious CTG group admitted in NICU of which 2 neonates for <24 hours and 1 for 1-3 days.

CONCLUSION

It is concluded that CTG is a simple noninvasive test where maternal and fetal status recorded in single slip. CTG can be used as good screening test of fetal surveillance and to detect the fetal distress already present or likely to develop and thus it prevents unnecessary delay in intervention. Abnormal CTG influence the fetal outcomes, i.e., poor APGAR score at 1 minute and 5 minutes, increased rate of cesarean section, neonatal resuscitation and NICU admission. With use of CTG in high-risk cases timely intervention can be implied to reduce the perinatal morbidity and mortality.

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