

## ADMISSION TEST CARDIOTOCOGRAPHY AS A SCREENING TEST IN HIGH RISK PREGNANCIES AND PREDICTOR OF NEONATAL OUTCOME

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### ABSTRACT

**Background:** Admission cardiotocography or Labour admission test is a test of fetal well being performed on women admitted in labour ward for 20 -30 minutes. CTG can identify foetuses which are compromised in early labour and who need continuous foetal monitoring. Various randomized control trials reported that the admission test cardiotocography carries an increased risk of interventions including operative vaginal deliveries, caesarean deliveries, augmentation of labour, and offers very less additional benefits to newborn in low-risk pregnancies. **Material & Methods:** In the present study a total of 100 pregnant women who had  $\geq 37$  weeks of gestation, singleton fetus with a cephalic presentation, who were in the 1st stage of labour (spontaneous in onset), and classified as high risk at the time of admission were enrolled by using a predefined inclusion and exclusion criteria. Written informed consent from each participant was taken prior to the study. Admission cardiotocography was performed for 20 minutes in left lateral position. **Results:** Out of 100 women 74% had normal/reactive CTG tracings, 10% had equivocal/suspicious CTG tracings and 16% had abnormal/nonreactive CTG. Around 75% women were in the age group 21-30 years and 60% were multigravidae. Women with suspicious and abnormal CTG tracings on admission tests showed higher rates of instrumental and operative deliveries. Neonates born of mothers showing suspicious and abnormal CTG showed lower Apgar scores at 1 and 5 minutes and also subsequent NICU admission. **Conclusion:** We conclude from the present study that Admission cardiotocography is a simple, non-invasive, reliable test to detect fetal distress at onset of labour and to predict adverse foetal outcome in high-risk pregnancies.

**Keywords:** Admission cardiotocography, CTG, High-risk pregnancy.

### INTRODUCTION

Non-reassuring fetal status or fetal distress is a direct result of fetal hypoxia which is a most important cause of perinatal morbidity and mortality and short and long term complications including encephalopathy, seizures, cerebral palsy, and neurodevelopmental delay (1). In addition uterine contractions during labour cause stress on placental circulation resulting in fetal hypoxia more so in compromised fetuses like intrauterine growth restriction, hypertension, pregnancy-induced hypertension, oligohydramnios, etc. Therefore,

intrapartum fetal surveillance is crucial to assess fetal hypoxia at the early stage so that it can be corrected (2).

Fetal monitoring during labour is important to ensure the delivery of a healthy baby in good condition with minimal intervention (3). Fetal well being during labour can be assessed by auscultation of fetal heart by stethoscope and doppler and electronic fetal heart monitoring which is routine practice in labour wards with good resource settings. In developing countries with poor resource settings

and busy labour wards electronic fetal monitoring for every patient is not possible (4). However, baseline foetal heart rate monitoring can be done by intermittent auscultations but other features such as accelerations, decelerations, and baseline variability in response to the uterine contraction remains undiagnosed.

Admission cardiotocography or Labour admission test is a test of fetal well being performed on women with low-risk pregnancy admitted in labour ward. It comprises a fetal heart tracing of 20 to 30 minutes along with a simultaneous recording of uterine contractions done on admission to Labour ward (5). Admission CTG helps to identify compromised fetuses and allow proper early intervention. It can be used as a screening test to reallocate patients who need delivery or other means of fetal surveillance like continuous electronic fetal monitoring (14). Various randomized control trials reported that the admission test cardiotocography result in early intervention with no additional benefits in a newborn in low-risk pregnancies (6). ACOG stated in their recommendations that intermittent auscultation is equivalent to continuous electronic foetal monitoring in diagnosing the intra-partum foetal compromise. So intermittent auscultation is preferred in low-risk patients due to lesser incidence of interventions, lower false positive rate, and greater contact of maternity staff with mother (7). The objective of our study was to correlate the admission CTG test results with perinatal and neonatal outcome in high-risk obstetric patients.

## **MATERIALS & METHODS**

The present cross-sectional prospective study was conducted in the Department of Obstetrics & Gynaecology, Pacific Medical College and Hospital, Udaipur which is a tertiary care teaching Hospital. The study duration was of one year from September 2018 to August 2019. Approval of ethics committee was taken and written informed consent was obtained from 100 women who were included in this study.

**Inclusion criteria:** Women admitted in Labour ward in 1st stage of labour, spontaneous in onset with singleton pregnancy, cephalic presentation, gestational age  $\geq 37$  weeks, and classified as high risk at the time of admission.

**Exclusion criteria:** Women with multiple pregnancy, malpresentation, congenital anomalies

The criteria for high-risk pregnancy included pregnant women who had Previous history of

stillbirth, Pregnancy with a concurrent medical illness like Hypertension, diabetes mellites, SLE, Thrombophilias, Antiphospholipid syndrome, Renal disease, hepatic disease, anemia, Preeclampsia, Premature rupture of membranes, Intrauterine growth restriction, Oligohydramnios, Rh-alloimmunization, Postdatism and decreased foetal movements.

On admission, all demographic details of pregnant women were recorded. A detailed clinical history, general physical examination, systemic examination, obstetric examination, and per vaginal examination was done. After that, all study participants were subjected to admission CTG for 20 minutes in the left lateral position. The results of the CTG test were categorized as normal/reassuring, suspicious/nonreassuring, and pathological/abnormal as per NICE (National institute of clinical excellence) guidelines 2017 (8). Patients with normal/reassuring CTG tracing were monitored by intermittent auscultation, and those with suspicious tracing were put on continuous CTG recording. Women with abnormal CTG trace were delivered by LSCS or by instrumental delivery depending on stage of labour. The perinatal outcome was recorded in terms of meconium staining of liquor, APGAR score  $< 7$  at 1 and 5 minutes, NICU admission, and perinatal mortality. The data were analyzed by using software's MS Excel 2010, Epi Info v7, and SPSS v22.

### **Description of cardiotocograph trace features**

#### **1. Baseline fetal heart rate**

Reassuring 110 -160 beats /minute

Non reassuring 100 – 109 beats/minute and 161-180 beats / minute

Abnormal below 100 and above 180 beats/minute

#### **2. Baseline variability**

Reassuring 5 -25 beats /minute

Non-reassuring less than 5 beats/minute for 30-50 minutes

More than 25 beats/minute for 15-25 minutes

Abnormal less than 5 beats/minute for more than 50 minutes

More than 25 beats/minute for more than 25 minutes and Sinusoidal

### 3. Decelerations

Reassuring No decelerations, Early decelerations, variable decelerations with no concerning characteristics for < 90 minutes

Non-reassuring variable decelerations with no concerning characteristics for 90 minutes or more variable decelerations with any concerning characteristics in 50% contractions for  $\geq 30$  minutes or in > 50% contractions for < 30 mts.

Late decelerations in > 50% contractions for < 30 minutes

Abnormal variable decelerations with any concerning characteristics in > 50% contractions for  $\leq 30$  minutes / Late decelerations for 30 minutes /Acute bradycardia

Concerning characteristics are lasting > 60 sec, reduced baseline variability, W shape Biphasic, no shouldering

### 4. Accelerations

#### Interpretation of CTG traces

Category	Definition
Normal/reassuring	All features are reassuring
Suspicious/Non-reassuring	1 non-reassuring AND 2 reassuring features
Pathological / Abnormal	1 abnormal OR 2 non-reassuring features

### RESULTS

In our study, 75 % women were in the age group 21-30 years, 20% in group 31-40 years, and 5%  $\leq 20$  years. Around 60 % were multigravida and 40 % were primigravida. Out of the total study participants 74% of pregnant women had normal/reactive CTG tracings, 10% had equivocal/suspicious CTG tracings and 16% had abnormal CTG tracings.

In the present study out of 74 women who had normal/reactive CTG tracings 62% had normal labour, 13. 5% had instrumental delivery and 24 % had lower segment caesarean section as the mode of delivery. Out of those who had non-reassuring/suspicious CTG tracings 60% had normal labour, 10% had instrumental delivery and 30% had lower segment caesarean section while in women with pathological/ abnormal CTG tracings 6. 25% had normal labour, 12. 5% had instrumental delivery

and 81% underwent lower segment caesarean section (Table 1)

**Table1: Distribution of study participants according to CTG tracings and mode of delivery.**

CTG tracings	VD	Instrumental	LSCS	Total
<b>Normal n=74</b>	46 (62.1%)	10 (13. 5%)	18 (24.3%)	74
<b>Suspicious n=10</b>	6 (60%)	1 (10%)	3 (30%)	10
<b>Abnormal n=16</b>	1 (6,25%)	2 (12. 5%)	13 (81.2%)	16

Moderate to thick meconium staining of liquor was found in 9. 45% cases with normal/reassuring CTG tracings, 30% cases with suspicious / non-reassuring CTG tracings and 69% women with abnormal CTG tracings (Table 2)

**Table 2: Distribution of study participants according to CTG tracings and fetal distress**

CTG tracings	Meconium staining of liquor	
	N	%
<b>Normal n= 74</b>	7	9. 45 %
<b>Suspicious n= 10</b>	3	30%
<b>Abnormal n= 16</b>	11	68. 75%

Our study reveals that 13.5% neonates of mothers with normal CTG, 20 % neonates born of women with suspicious CTG, and 62. 5 % neonates of women showing Abnormal CTG needed admission to NICU. There was one neonatal death in Suspicious CTG group while in the group with abnormal CTG, two neonatal deaths were observed. (Table 3)

**Table 3: Distribution of study participants according to CTG tracings and perinatal outcome.**

CTG tracings	Fetal distress	NICU admission		Still birth	Neonatal death
		N	%		
<b>Normal n= 74</b>	9 (12. 16%)	10	13.5 %	NIL	NIL
<b>Suspicious n= 10</b>	3 (30%)	2	20%	NIL	1(10%)
<b>Abnormal n= 16</b>	12 (75%)	10	62. 5%	NIL	2 (12. 5%)

In our study the Apgar score calculated at 1 minute after birth was < 7 in 13. 5% neonates in normal

CTG group, in 20% from the suspicious group, and in 81% neonates belonging to abnormal CTG group. Fetal distress was also observed with Apgar score < 7 at 5 minutes in 69% newborns whose mothers had abnormal CTG tracings as compared to 20% and 8% with suspicious and normal admission CTG respectively. (Table 4).

**Table4: Distribution of study participants according to CTG tracings and APGAR score.**

CTG tracings	APGAR score at 1 min. < 7		APGAR score at 5 min. < 7	
	N	%	N	%
<b>Normal n= 74</b>	10	13.5 %	6	8.1 %
<b>Suspicious n= 10</b>	2	20%	2	20%
<b>Abnormal n= 16</b>	13	81%	11	68.7%

## DISCUSSION

The Labour Admission Test was introduced as a screening test in early labour to detect fetal distress already present at the time of admission and to identify high-risk cases who need continuous electronic fetal monitoring during labour (4, 14). The British guidelines (2001) do not recommend Labour admission test in low-risk women while Swedish guidelines recommend this test in all women (9). Impey et al believe that neonatal outcome is not significantly improved using the admission test CTG as compared to Intermittent fetal heart auscultation during labour (15). These observations hold true in developed countries with high resource settings, proper antenatal care, and good health care provider : patient ratio. But in developing countries where women may have inadequate or many times no antenatal care, labour wards are overcrowded with poor resource settings, low healthcare provider : patient ratio and high-risk pregnant women being referred to tertiary centres, admission CTG is reliable, informative and effective. In our study 74% women had normal/reassuring CTG tracings, 10% pregnant women had suspicious/ non-reassuring CTG tracings and 16% of pregnant women had pathological/abnormal CTG tracings. Nearly similar findings were reported by Behuria S et a (10) 82% normal, 7% suspicious, and 11% abnormal while Bhartiya V et al (11) observed 60% suspicious, 37% normal and 3% abnormal CTG recordings.

There were 60% multigravidae and 40% primigravidae in our study similar to the study of

Bhartiya V et al (66% and 34%) but different from the study of Kumar A et al (16) (primigravida 62%, and multigravida 38%).

Foetal distress was observed in 12% women with normal tracing, 30% women with suspicious tracings, and 75% with pathological CTG. Sandhu GS et al (12) also found fetal distress in 73% women with pathological CTG, Nagure GS et al (13) reported in 86%, and Kumar A et al only in 55% cases with pathological CTG.

In the present study meconium staining was seen in 9% women with normal CTG tracing, 30% women with suspicious, and 69 % women with pathological CTG tracings. Nagure AG et al reported similar findings 8.9%, 39%, and 71% in normal suspicious and pathological CTG groups respectively. Meconium staining of liquor was more common in cases which had non-reassuring and abnormal admission test in the studies of Nagure AG et al (39% and 71%), Kumar A et al (15% and 48%) but Bhartiya V found meconium staining liquor in a group with non-reassuring CTG.

The present study shows that among women who had normal/reassuring CTG tracings 62% had normal labour, 13.5% had instrumental delivery and 24% had lower segment caesarean section as the mode of delivery. Out of the total pregnant women who had suspicious/ non-reassuring CTG tracings 60% had normal labour, 10% had instrumental delivery and 30% had lower segment caesarean section as the mode of delivery. Out of the total pregnant women who had pathological /abnormal CTG tracings 6% had normal labour, 12.5% had instrumental delivery and 81% had lower segment caesarean section as the mode of delivery. Various studies found increased rates of Caesarean section in women having abnormal admission cardiotocography.

In the present study low, Apgar score at 1 and 5 minutes was found in 81% and 68% neonates in the abnormal CTG group, 20 % each in non-reassuring CTG group, and 13.5% and 8% in normal CTG group. Also in this study subsequent admission of newborns to NICU was 13.5%, 20%, and 62.5% in women with normal, suspicious, and pathological admission test respectively. We reported three neonatal deaths one in non-reassuring and two in abnormal CTG group. Similar findings were reported by researchers Sandhu GS et al, Behuria S et al, Kumar A et al, Nagure GS et al. On the contrary Bhartiya V et al reported that more number of neonates had lower Apgar score at 5 minutes in

women having suspicious CTG as compared to those with abnormal CTG. Around 12.5% neonates were admitted in NICU following non-reassuring CTG tracing and only 1% neonates admitted to NICU with abnormal tracing.

## CONCLUSION

We conclude from the present study that Admission cardiotocography is a simple, non-invasive screening test to detect fetal distress already existing at the onset of labour and to predict adverse foetal outcome in high-risk pregnancies. It is an effective tool for managing high-risk pregnancies in institutions with low resource settings and heavy patient burden. Further studies with large sample size are recommended to assess the efficacy of Admission test in low and high-risk pregnancies.

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