

## CARDIOTOCOGRAPHY IN EARLY LABOUR- A SCREENING TEST FOR PREDICTION OF FETAL OUTCOME.

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### ABSTRACT

**Background:**With the desire of viable and healthy fetus, its monitoring in antenatal and intranatal period has become necessary. The objective is to detect abnormal cardiocardiographic findings, correlation, predictability of neonatal outcome and possible preventability of morbidity and mortality.

**Methods:**Study was conducted for a period of 2 years, subjects were taken with complaints of labour pain, more than 32 weeks of pregnancy and 3-5cm cervical dilatation. Cardiotocography was performed for 20 minutes and any ominous sign found, was continued for 30 minutes.

**Results:**300 cases were evaluated in which 259(86.3%) CTG's were reactive and 41(13.6%) non-reactive. High risk factors were in which out of 65 cases with PIH, 56(28.1%) CTG's were reactive and in those with anaemia 28 out of 34(14%) were non-reactive. Caesarean section rate was much higher in the non-reactive group 41.4% than the reactive 4.2%. Out of the reactive group, 24 cases needed NICU and 235 cases(90.7%) did not. Whereas out of the non-reactive group of 41 cases, 17(41.4%) needed NICU and the rest 24 cases did not. 49(18.1%) cases in reactive group had Apgar 8-10 at 1 minute, and 29(02%) in the non-reactive group.

**Conclusion:**Out of reactive group, caesarean section rate was 11(4.2%) while in non-reactive group was 17(41.1%). Apgar score were comparable to standard studies. The NICU admission was less and the perinatal death was nil. Thus CTG is a simple, non-invasive, easy to perform and a very useful diagnostic tool in early labour helpful in predicting fetal outcome and maternal well-being.

### BACKGROUND

The reduction of family size a felt need of the current era, desire and necessity was inevitable in a viable and healthy fetus more now than ever in the history of homosapiens. There is a sea change in the antenatal and intranatal care since the inception of the concept of antenatal care by Bellantyne in 1901. The ten centimeter journey from brim to outlet of pelvis has remained the most dangerous journey of one's life since the evolution of the species.

Hence the necessity of monitoring of the fetus, in the antenatal and intranatal period and hence an insight and research into the modern biomedical engineering and its application to fetal activity. The fetal heart monitoring was heralded by Pinard with his funnel-shaped aluminium fetal stethoscope. After a lot of different fetal heart sound listening devices covering varieties of stethoscopes and even Doppler, the first electronic fetal monitoring compounding with recording of

uterine contraction was done by Caldeyro Barcia in the year 1952 in Uruguay of South America, putting a milestone in the evolution of whole of the science of obstetrics. The instrument known as cardiotocodynamometer was capable of recording and correlating fetal heart and uterine contraction.

Simultaneous development in ultrasonography for other parameters of fetal wellbeing for the diagnosis of fetal hypoxia and acidosis brought about a revolutionary change in the diagnosis of fetal distress. Although the statement is beyond the scope of this study or discussion, the already present velocimetry study by colour Doppler with its leap-frog advancements is heralding a new era in modern obstetrical care. The widespread introduction of EFM (electronic fetal monitoring) in the 1970's was associated with substantial falls in the perinatal mortality as reported by number of retrospective observational studies.<sup>[1,2]</sup>

However, the CTG study as a routine screening test in the ANC clinic and must use during labour underscores its own value atleast for the time being and may last for a considerable time. Hence the necessity of the present study.

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## OBJECTIVES

1. To detect the number of abnormal cardiotocographic findings and their correlation with the neonatal outcome.
2. To detect the correctness of cardiotocography (CTG) in management of low and high risk patients in labour.
3. To assess the predictability of the neonatal outcome and possible preventability of morbidity and mortality in the baby by the use of cardiotocography in early labour.

## METHODS

The present study was conducted for a period from October 2011 to September 2013. The subjects for study were taken from patients admitted in labour room for complaints of labour pain after applying specific selection and exclusion criteria. A detailed history was taken with emphasis on last menstrual period by Naegle's formula and ultrasonic records. Detailed medical history was taken. History of immunisation and diet was taken. All these patients were then subjected to a detailed general physical and systemic examination. In obstetric examination abdomen and per vaginal examination was done. In all cases routine investigations like hemogram, blood group, glucose screening and urine examination was done. In case of gestational hypertension platelet counts, renal functions, liver functions, coagulation profile and fundoscopic findings were evaluated. Special investigations like ultrasonography and admission cardiotocography was done.

The inclusion criteria were-

1. Women more than 32 weeks of pregnancy.
2. 3-5 cm of cervical dilatation.

Exclusion criteria were-

1. Women less than 32 weeks of pregnancy.
2. Who are more than 5 cm of cervical dilatation.
3. Diagnosed congenital anomaly on ultrasound in fetus.
4. Intrauterine fetal death.

CTG study at the onset of labour after admission in labour room for 20 minutes was performed. Fetal heart rate (FHR) pattern and uterine contraction was recorded on a print paper. Any ominous sign on CTG tracing found, the test was continued for 30 minutes for that individual case. Intermittent strict monitoring of fetus and mother was done. The subject was followed till delivery, need of operative intervention and

neonatal outcome in terms of Apgar score at 1 and 5 minute or admission to NICU was noted. Any neonate after admission to NICU was followed up for 3 to 7 days till it was fit to be discharged. The observations were recorded. The machine used was Sepamon-fetal monitor. It gives a real time graph on an LCD and has a printer attached to it.

## STATISTICAL ANALYSIS

1. The study design is a period specific observational study.
2. The study sample included all the ANC cases which satisfied all the inclusion criteria and came to the labour room during the study period.
3. Data collected was entered in the Excel sheet and was summarised using appropriate tables and graphs and was expressed as percentages.

## RESULTS

In present study -300 subjects were studied using electronic fetal monitor. An admission CTG was used as indicator for antepartum and intrapartum surveillance. Results were analysed in terms of mode of delivery and perinatal outcome. The observations were further refined by segregating into high risk groups like- pregnancy induced hypertension, PIH with intrauterine growth retardation, intrauterine growth retardation, oligohydramnios, anemia, Rh incompatibility and bad obstetric history.

**Table 1: High Risk Factors**

RISK FACTOR		REACTIVE	NON-REACTIVE
Pregnancy induced hypertension	induced	65	9
Pregnancy induced hypertension with Intrauterine growth retardation	induced	14	2
Intrauterine growth retardation		16	2
Oligohydromnios		18	3
Prolonged pregnancy		62	3
Anemia		34	6
Bad obstetric history		26	0
Rh incompatibility		9	0
Total out of 300 subjects-		199	29

This table shows results in each high risk group. Out of 300 subjects, 199 CTG's were reactive (87.2%), while 29 (12.7%) were non-reactive. Out of 65 cases(graph-2) with pregnancy induce hypertension, 9 CTG's were non-reactive (86.1%) and in those with anemia, 6 out of 34 (17.6%) were non-reactive. In our study as per the

inclusion criteria the evaluation of all 300 cases is done. Out of 300 cases, 259 CTG's were reactive(86.3%), while 41 CTG's were non-reactive(13.6%). Out of 65 cases with pregnancy induced hypertension(table no.1), 56 CTG's were reactive(28.1) and in those with anemia, (Hb<8 gm%) 28 out of 34(14%) were non-reactive.

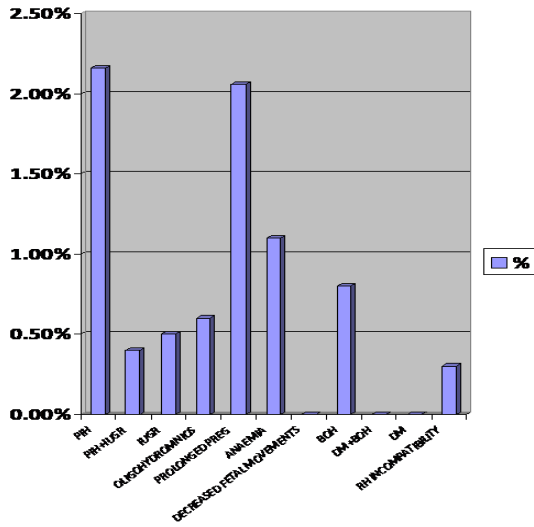


Fig. 1: this graph shows the results in each high risk group plotted as the percentage of number of subjects in each group.

In the present study, 94.5% cases from the reactive group delivered vaginally as compared to 58.5% cases from the non-reactive group. Caesarean section rate in the non-reactive group was much higher 41.4% than (4.2%) than the reactive group. It was observed that the caesarean sections were indicated in non-reactive CTG's in high risk group (graph 2). It can be derived from Table no. 5 that 90% of the caesarean sections from non-reactive group were done done for indications exclusively due to non-reactive CTG.

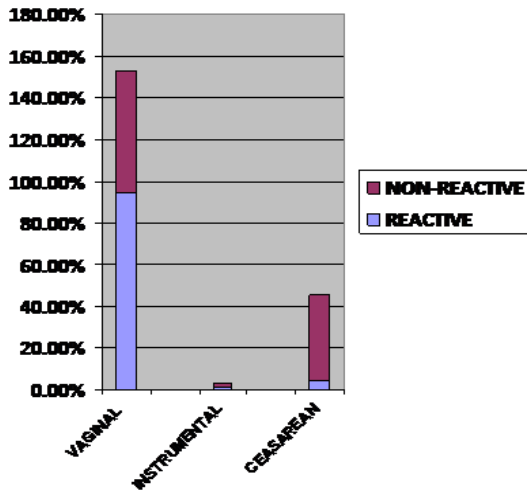


Fig. 2: This graph shows the mode of delivery in relation to CTG

In our study, 11 cases with reactive CTG required CTG required caesarean section of which 6 were for meconium stained amniotic fluid. In remaining 50% of subjects underwent section for other indications like cephalopelvic disproportion, failure to progress, previous caesarean section. Out of the 22 cases with non-reactive CTG's, 13 CS were done for meconium stained amniotic fluid, while 2 were done for fetal distress:persistent bradycardia (Graph 3).

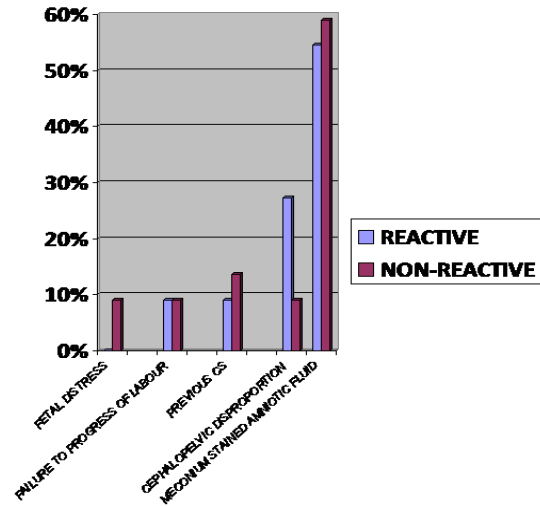


Fig. 3: This graph shows the percentage of each indication of the caesarean sections performed in reactive and non-reactive cases.

The incidence of meconium stained amniotic fluid was 29.2% subjects in non-reactive group as compared to 4.7% in reactive group as per(Graph 4).

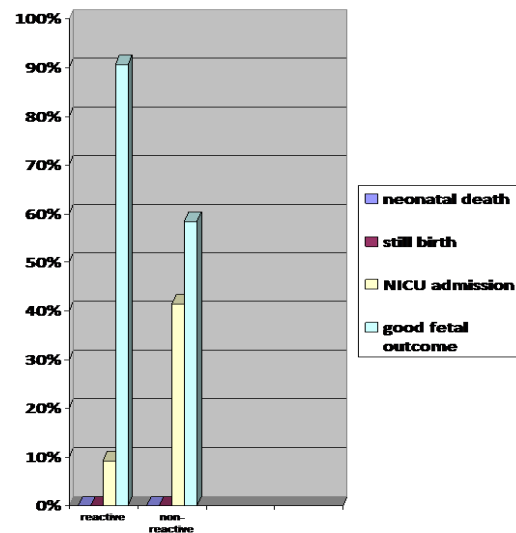


Fig. 4: This graph shows the perinatal outcome in relation to CTG.

In this study, out of 300 cases who underwent admission test, 259 cases had reactive CTG's, out

of which 24 cases needed NICU admission and 235 cases (90.7%) had good fetal outcome and needed no intensive care. Whereas out of the non-reactive group of 41 cases, 17 cases (41.4%) cases needed NICU care while remaining 24 cases did not. In our set up, any fetus with meconium stained amniotic fluid were admitted to the neonatal intensive care unit as a part of routine NICU care. So as per the hospital protocol 9.2% neonates were taken to the NICU for observation. After a strict observation for a period of 7 days the neonates were discharged. During their course in NICU complications like post partum asphyxia, jaundice, meconium aspiration syndrome, septicemia etc, were not observed and the

**Table no 2 : Apgar Score at 1 minute.**

Apgar score	Reactive		Non- reactive	
	No.	%	No	%
0	0	0	0	0
1-4	2	0	5	0.04
5-7	9	0.2	7	1.6
8-10	49	0.2	29	0.2
total	259	6.3	41	13.6

neonates had good condition on discharge.

In present study, 49 cases (18.1%) of the neonates in the reactive group had Apgar 8-10 at 1 minute and to 0.2%(29) in non-reactive group. Also 235 neonates (90.7%) from the reactive group had good neonatal outcome with Apgar score of 8-10 at 1 minute. Whereas only 13.6% subjects belonged to non-reactive group.

This table shows perinatal outcome in relation to CTG

**Table no 3 : Perinatal outcome.**

Perinatal outcome	Reactive		Non-reactive	
	No.	%	No	%
Neonatal death	0	0	0	0
Still birth	0	0	0	0
NICU admission	24	9.2	17	41.4
Good fetal outcome	235	90.7	24	58.5
Total out of 300	259	100	41	100

## DISCUSSION

The continuum of search for a correct, immediate yielding result, essentially non-invasive method for antepartum evaluation of fetal wellbeing, has resulted in various inventions and innovations, of which cardiotocography is an important product. Obstetricians have long searched for methods of antepartum evaluation of fetus that would be non-invasive accurate and yield results that were immediately available.

Dr. Orvan Hess first started preliminary research into the development of cardiotocography as early as the 1930's. In the late 40's, he joined hands with Dr. Edward Hon to further his attempts to develop a form of technology that could record fetal heart signals.<sup>[3]</sup>

The ideal test should be easy to perform, less expensive, repeatable without causing inconvenience to the patient. It should be specific and sensitive. It should not have any side effect and should not cause any harm to the mother or the fetus. CTG test is one such test which fulfills most of these criteria and thus it is now generally accepted as a clinically useful method in assessing uteroplacental insufficiency and fetal risk during antepartum period.

In this study 300 cases were evaluated. High risk factors were taken into account which are proved to be affecting uteroplacental circulation reducing placental oxygen reserve, causing hypoxia and thus risking the life of the fetus. Many similar studies have been carried out over years in various countries.

By comparing in graph 3 the caesarean section rate for non-reactive group was double to the rate for reactive group, where as present study correlates well with series by Imam Bano et al and Patil et al<sup>[4]</sup>, where caesarean section rate in non-reactive test was thrice to caesarean section rate in reactive test.

In 2001, Liu W, Li X, Tang D<sup>[5]</sup>, conducted study of relationship between computerised cardiotocography and perinatal outcome. 308 CTG's in the third trimester pregnancies were performed, 46 cases in antepartum, 262 cases in intrapartum stage. In antepartum group there was a significant relationship between baseline recording and Apgar score. But in intrapartum group there was no significant relationship between baseline and variability on CTG, quality and colour of amniotic fluid and the indices of blood gas analysis of umbilical artery blood. though the above study mentions no relationship between above mentioned factors, this study shows some

relationship between colour of liquor and perinatal outcome.(Graph 4)

Perinatal death in case of reactive as well as non-reactive groups in present study was nil ( Table 3 ). Studies by Rochard et al, Imam Bano et al, Habeebullah et al and Patil et al also showed nil perinatal mortality.<sup>[6,7]</sup> A similar study conducted by Mhatre V N; Parulekar P N; Shah S V; Purandare V.(1982)<sup>7</sup> conducted a study of correlation of intrapartum cardiotocography and neonatal Apgar scores in high risk pregnancy.

We are able to save babies in cases of non-reactive CTG by prompt termination of pregnancy when the fetus was salvageable. Prolonged trial of labour was avoided as these fetuses were unlikely to bear the stress of labour. Continuous intrapartum monitoring was done in many cases where earlier and prompt diagnosis of fetal distress. Fetuses with jeopardy like intrauterine growth retardation, fetal distress were taken immediately for caesarean section. All these measures helped us to reduce perinatal morbidity and mortality. By comparing in graph 4 we can find out that perinatal mortality in reactive CTG was much lower than non-reactive tests.

The admission CTG appears to be a simple non-invasive test that can serve as a screening tool in 'triaging' fetuses in non-industrialised countries with a heavy work load and limited resources.

## CONCLUSION

Thus to conclude cardiotocography test is a simple, non-invasive, inexpensive test for antepertum fetal surveillance. It is easy to perform and causing no inconvenience or complications to the patient. CTG test should be performed for diagnostic performance in light of clinical circumstances. Reactive CTG test is positive predictor of fetal wellbeing in the utero. With prompt decision of termination of pregnancy, for non-reactive CTG, perinatal morbidity and mortality can be reduced. Finally we came to the conclusion that admission test is a very useful diagnostic tool in early labour helpful in predicting the fetal outcome and mother's wellbeing.

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