



Original Research Article

Admission cardiotocography: Forecasting perinatal outcome

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ABSTRACT

Background: The Admission test (AT) in high risk pregnancy for continuous monitoring of FHR (fetal heart rate) has become crucial in the modern day obstetric practice. As it senses the presence of fetal intrapartum hypoxia and assist the obstetrician in making decision on the mode of delivery to improve perinatal outcome in high risk pregnancy.

Materials and Methods: A prospective observational study was carried out in 230 pregnant women with high risk pregnancy in KIMS BBSR, Odisha during period of 2018-2020 who were admitted to labor room with gestational age more than 33 weeks for continuous FHR monitoring with CTG (cardiotocography) for 20 minutes.

Results: Among 230 patients majority of them were primigravida in age group of 21-25 years. About 39.1% were postdated pregnancy followed by Pregnancy Induced Hypertension (PIH) (21.1%), Premature Rupture of the Membranes (PROM) (10.4%), Bad Obstetric History (BOH) (6.9%), PIH with IUGR (Intrauterine Growth Restriction) (6.5%), IUGR (5.6%), Oligohydramnios (4.3%), Diabetes (3.5%) and Rh negative pregnancy (2.6%). The admission test were normal in (68.7%), suspicious in (21.7%) and pathological in (9.6%). The incidence of fetal distress, meconium stained liquor, NICU (Neonatal Intensive Care Unit) admission and APGAR score less than 7 was significantly higher with pathological AT as compared with suspicious and normal AT.

Conclusion: The admission CTG appears to be simple noninvasive tool for screening the high risk pregnancy and prioritizing fetuses and deciding the mode of delivery.

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1. Introduction

In India 20-30% pregnancies belong to high risk category which is responsible for 75% of perinatal morbidity and mortality. To prevent this we needed a tool which lead to the introduction of Admission CTG.

It is a non-invasive, brief fetal heart rate recording procedure immediately after admission to the labor ward that forecasts hypoxia encountered in intrapartum period. Hypoxial injuries caused by stress and contractions during childbirth are endured by the fetus.¹

The incidence of hypoxia during or before labor may lead to complications such as mental retardation, cerebral palsy

so early diagnosis and encouraging response is essential and vital for the fetus and mother.^{1,2} The prime reason for CTG admission test is that uterine contractions minimise placental blood flow during childbirth and unusual tracing reflects inadequacy and thus suggests fetal compromise in order to facilitate intervention at an early point.³

The NICE guidelines 2017 do not propose CTG in low-risk women but suggests admission CTG for high-risk cases.⁴

Therefore the present study was carried at our tertiary care centre to evaluate the correlation between the labor admission test and adverse perinatal outcome in high risk pregnancy.

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2. Materials and Methods

A hospital based prospective observational study was conducted on 230 high risk pregnant patients conducted in Kalinga Institute of Medical Sciences, Bhubaneswar, Odisha to see correlation between labor admission test and adverse neonatal outcome in high risk pregnancy and to establish the efficacy of CTG as a tool for fetal surveillance in high risk obstetrics. All high risk pregnant patients with gestational age more than 33 weeks in labor were included in the study after taking detailed clinical history and performing detailed examination as per proforma.

After approval from the Institutional Ethic Committee a valid informed consent was obtained and data was collected from all research participants. The inclusion criteria were all high risk patients with gestational age more than 33 weeks in labor (High risk patients included postdated, gestational hypertension, premature rupture of membranes, gestational diabetes mellitus, oligohydramnios, Rh negative pregnancy, bad obstetric history, etc). Patients were subjected to 20 minutes continuous fetal monitoring and classified as Normal, Suspicious and Pathological.

Definition of CTG tracings (NICE guidelines 2017).

2.1. Normal

An HR trace in which features are classified as reassuring.

2.2. Suspicious

An FHR trace with 1 no reassuring feature AND 2 reassuring features.

2.3. Pathological

An FHR trace with 1 abnormal feature OR 2 no reassuring features.

Patients with a normal reactive test were assessed by periodic auscultation for a minute, every half an hour in the first stage of labor and every 5 minutes in the second stage of labor. Continuous CTG recordings were applied to women who had suspicious tracings.

Fetal outcome were noted in terms of

1. Live birth
2. Still birth
3. Weight of the baby
4. APGAR score (Appearance, Pulse, Grimace, Activity, Respiration)
5. NICU admission
6. Neonatal seizure and
7. Maternal outcome in terms of NVD and LSCS. (Normal vaginal delivery and Lower segment cesarean section).

Operative, instrumental intervention, depending on the stage of labor was promoted in patients with pathological

tracing. In terms of liquor appearance, APGAR score, NICU admission and perinatal mortality, the perinatal outcome was evaluated.

3. Results

In the prospective observational study of 230 patients, majority of them were primigravida (61.8%) and in age group of 21-25 years (40.5%). Pathological Admission test was higher in age more than 30 years. Majority of the patients were more than 37 weeks of gestational age (68.3%), while 31.7% were between 32-37 weeks of gestational age. Out of all the 230 patients included in the study 158 (68.7%) patients had normal tracings, 50 (21.7%) patients had suspicious tracings and 22 (9.6%) patients had pathological tracings.

Delivery route was Lower Segment Caesarean Section (LSCS) in 81 (35.2%) patients while Spontaneous Vaginal delivery was performed in 122 (53.1%) patients. Instrumental deliveries were performed in 27 (11.7%) patients. In pathological AT group, incidence of LSCS was 65% while incidence of LSCS in normal AT and suspicious AT group was 30.1% and 40.4% respectively. Incidence of spontaneous vaginal delivery in normal AT group was 56.4% while incidence of spontaneous vaginal delivery in suspicious AT and pathological AT group was 53.2% and 25% respectively. Instrumental delivery was higher in normal AT patients (13.5%) while pathological AT patients had 10% and suspicious AT patients had 6.4% cases.

3.1. Distribution of patients according to risk factors

The most common risk factor was postdated (39.1%) followed by Gestational Hypertension (GH) (21.1%), Premature Rupture of the Membranes (PROM) (10.4%), Bad Obstetric History (BOH) (6.9%), GH with IUGR (Intrauterine Growth Restriction) (6.5%), IUGR (5.6%), Oligohydramnios (4.3%), Diabetes (3.5%) and Rh negative pregnancy (2.6%).

3.2. The incidence of fetal distress was 20 % in our study

Out of 158 (68.7%) patients with normal admission test, 21 (13.3%) patients were associated with fetal distress. A higher percentage of fetal distress was observed in suspicious AT (26%) and the pathological AT showed significantly higher incidence of fetal distress (54.5%) as per Chi-Square test ($p < 0.05$).

Moderate thick meconium stained liquor (mod –thick MSL) was seen 32 (13.9%) patients. The incidence of APGAR <7 at 5 mins and Cord blood Ph<7.2 was 10.9% and 9.6% respectively. 16 (6.9%) neonates required NICU admission while there were 3 (1.3%) neonatal deaths in our study.

Table 1: Distribution of patients according to mode of delivery

Mode of Delivery	Normal	Suspicious	Pathological	Total
Lower Segment Cesarean Section	30.10%	40.40%	65%	35.20%
Spontaneous Vaginal	56.40%	53.20%	25%	53.10%
Instrumental Delivery	13.50%	6.40%	10%	11.70%
Total	70.90%	20.40%	8.70%	100%

Table 2: Distribution of patients according to risk factors

Risk Factors	Normal		Suspicious		Pathological		Total	
	N	%	N	%	N	%	N	%
Postdated	60	66.7%	22	24.4%	8	8.9%	90	39.1%
GH	30	62.5%	14	29.2%	4	8.3%	48	21.1%
PROM	21	87.4%	1	4.2%	2	8.4%	24	10.4%
BOH	14	81.4%	1	12.4%	1	6.2%	16	6.9%
GH with IUGR	10	66.7%	3	20%	2	13.3%	15	6.5%
IUGR	9	69.2%	3	23.1%	1	7.7%	13	5.6%
Oligohydramnios	7	70%	2	20%	1	10%	10	4.3%
Diabetes	7	87.5%	0	-	1	12.5%	8	3.5%
Rh negative pregnancy	5	83.3%	1	16.7%	0	-	6	2.6%
Total	163	70.9%	47	20.4%	20	8.7%	230	100%

GH - Gestational Hypertension; IUGR - Intrauterine Growth Restriction; PROM - Premature Rupture of the Membranes BOH - Bad Obstetric History

Table 3: Association of admission test (AT) results and neonatal outcome

Neonatal Outcome	N	%
Mod-thick MSL	32	13.9%
APGAR <7 at 5 mins	25	10.9%
NICU Admission	22	9.6%
Cord blood Ph<7.2	16	6.9%
Neonatal death	3	1.3%

In patients with pathological AT, the incidence of moderate thick meconium stained liquor (mod-thick MSL) was significantly higher than in the suspicious AT (14.9%) and normal AT (9.8%) category ($P < 0.05$). The incidence of APGAR score <7 at 5 minute and cord blood pH < 7.2 was significantly higher in neonates with a pathological AT (45% and 30% respectively). NICU admission was also the highest in the pathological AT group (30%). There was one neonatal death each in patient with normal, suspicious and pathological AT. There was significant association of admission test (AT) results and neonatal outcome as per Chi-Square test ($p < 0.05$).

In present study Labor admission test has high sensitivity (52.71%), specificity (74.87%) and Negative predictive value (NPV) (85.57%) for predicting fetal distress. The proportion of false negatives were low (10.3%).

4. Discussion

Labor is a troublesome process continuous monitoring of fetal heart rate by electronic fetal monitoring is crucial during this time. So Admission test is necessary. It is a screening test for the state of oxygenation of fetus on admission. It evaluates the placental reserve by checking

the response of fetal heart during the phase of temporary occlusion of utero placental blood flow during uterine contraction. Hence, it checks the ability of fetus to endure the process of labor. Therefore, the admission CTG has 2 possible functions:

1. It can be used in early labor as a screening test to identify distressed fetuses on admission.
2. Identify women who need regular fetal monitoring.⁵

In our study, majority of the cases with pathological Admission test were in age group of more than 30 years. It was observed in our study, LSCS (Lower segment cesarean section) was done in majority in the pathological admission test group (65%), followed by suspicious (40.4%), and normal (30.1%) respectively and incidence of instrumental delivery was higher with normal admission test patients (13.5%), followed by Pathological admission test (10%) and suspicious admission test (6.4%) respectively. Normal spontaneous vaginal delivery was higher in normal admission test group (56.4%).

The most common risk factor in our study was postdated (39.1%) followed by Gestational Hypertension (GH) (21.1%), Premature Rupture of the Membranes

(PROM) (10.4%), Bad Obstetric History (BOH) (6.9%), GH with IUGR (Intrauterine Growth Restriction) (6.5%), IUGR (5.6%), Oligohydramnios (4.3%), Diabetes (3.5%) and Rh negative pregnancy (2.6%).

The incidence of fetal distress (FD) was 20% in our study. Out of 158 (68.7%) patients with normal admission test, 21 (13.3%) patients were associated with fetal distress. A higher percentage of fetal distress was observed in suspicious AT (26%) and the pathological AT showed significantly higher incidence of fetal distress (54.5%) as per Chi-Square test ($p < 0.05$).

It was observed in our study that the patients with fetal distress (FD) was significantly higher in pathological AT group who underwent LSCS delivery. There was significant association of mode of delivery and fetal distress as per Chi-Square test ($p < 0.05$).

In our study, moderate thick meconium stained liquor (mod –thick MSL) was seen 32 (13.9%) patients. The incidence of APGAR <7 at 5 mins and Cord blood Ph<7.2 was 10.9% and 9.6% respectively. 16 (6.9%) neonates required NICU admission while there were 3 (1.3%) neonatal deaths in our study.

In the current research, the prevalence of moderate meconium-stained liquor (mod-thick MSL) was reported to be higher in patients with pathological AT (45%) in comparison to suspicious AT (14.9%) and normal AT category (9.8%) ($p < 0.05$). The incidence of AGPAR score <7 at 5 minute and cord blood pH<7.2 was significantly higher in neonates with a pathological AT (45% and 30% respectively). NICU admission was also the highest in the pathological AT group (30%). There was one neonatal death each in patient with normal, suspicious and pathological AT. There was significant association of admission test (AT) results and neonatal outcome as per Chi-Square test ($p < 0.05$).

It was observed in our study that labor admission test has high sensitivity (52.71%), specificity (74.87%) and Negative predictive value (NPV) (85.57%) for predicting fetal distress. The proportion of false negatives was low (10.3%). It was observed that the positive predictive value was low for adverse fetal outcome.

The sensitivity and specificity of the admission test were good when benign fetal outcomes like development of fetal distress during labor were excluded in favor of more ominous fetal outcomes like severe asphyxia at birth and neonatal ICU admissions.

5. Conclusion

The admission cardiotocography test is a easy, non-invasive, economical measurement of both antepartum and intrapartum fetal well being. It is a precise screening modality to distinguish and separate high risk from low risk patients. Admission test in intrapartum surveillance detects fetal distress if already present at admission and predicts fetal well-being for the next few hours (5-6 hrs) unless interfered by an acute event (eg-cord prolapse, abruptio placenta). As most patients with a pathological tracing eventually ended up in Caesarean delivery, the role of AT in preparing for early intervention is crucial. The load of constant monitoring in high risk patients can be decreased thus proving to be a time saving method in intervention required especially in institutes with a high patient load. After CTG screening obstetrician should be able to assess that fetus is healthy and needful intervention can be taken.

6. Source of Funding

None.

7. Conflict of Interest

The authors declare that there is no conflict of interest.

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