Imperial Journal of Interdisciplinary Research (IJIR)
Vol-3, Issue-7, 2017
ISSN: 2454-1362, http://www.onlinejournal.in

Correlation of Neonatal Outcome with Labor Admission Test in Low Risk Obstetric Population

Dr. Ram Bharat Meena*[1], Dr. Lila Vyas[2], Dr. Lata Rajoria[3], Dr. Chetna Agarwal[4], Dr. Lata Ratnoo[5], Dr. Indira Lamba[6].
[2,3]Sr. Professor, [5,6]Assist. Professor, [1,4]Research Scholar,
Department of obstetrics & gynaecology, SMS medical College, Jaipur (Rajasthan). - 302001.

ABSTRACT

BACKGROUND: The labour admission test is a very useful screening test in early labour to detect compromised fetus on admission. It is used to select the woman in need of continuous fetal electronic monitoring during labour. It is a dynamic screening test to study fetal oxygenation at the time of admission of mother in labour room and increasing the APGAR score by early & appropriate interventions.

AIMS & OBJECTIVES: To assess the reliability of the admission cardio-tocogram in detecting fetal hypoxia. Correlate the result of the admission test with the mode of delivery and perinatal outcome in low risk obstetric population.

MATERIAL & METHODS: This study is a hospital based descriptive observational study including 130 low risk women's with complaints of labour pain after applying specific selection and exclusion criteria and compared for feto-maternal outcome in term of mode of delivery, APGAR score, admission in NICU & duration of stay in NICU. Statistical analysis is done using Chi square test and $p<0.05$ is considered as statistically significant. Sensitivity, specificity, positive and negative predictive values, diagnostic accuracy of the admission CTG is also measured.

RESULTS: According to statistically analysis there is a significant co-relation between the labour admission test and the mode of delivery, APGAR score and NICU stay of the neonates.

CONCLUSION: We concluded that Study is showing high Negative predictive value (94.29%) so this admission test is very useful prognostic tool in detecting compromised fetus very early in first stage of labour and helpful in predicting the fetal outcome and mother's wellbeing.

Keywords*: Labour admission test, Mode of delivery, Fetal outcome, APGAR score, NICU admission, Diagnostic accuracy.*

INTRODUCTION

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.

Care given to a mother during her pregnancy and childbirth is an index of civilisation. There is a sea change in the antenatal and intranatal care since the inception of the concept of antenatal care by Bellantyne in 1901.[1] While nutritional supplements, vaccinations and investigations as part of antenatal care have increased and improved for better maternal and fetal wellbeing, the ten centimetre journey from brim to the outlet of pelvis has remained the most dangerous journey in one's life since the evolution of the species.

Hence the necessity of monitoring of the fetus, in the antenatal and the intranatal period and hence an insight and research into the modern biomedical engineering and its application to fetal activity.

APGAR SCORE is a method to quickly summarize the health of newborn children.[2,3] Dr. Virginia Apgar, an anesthesiologist, developed the score in 1952 in order to quantify the effects of obstetric anesthesia on babies.

The Apgar scale is determined by evaluating the newborn baby on five simple criteria on a scale from zero to two, then summing up the five values thus obtained. The resulting Apgar score ranges from zero to 10. The five criteria are summarized using words chosen to form a backronym (**A**ppearance, **P**ulse, **G**rimace, **A**ctivity, **R**espiration).

The five criteria of the Apgar score:-

	Score of 0	**Score of 1**	**Score of 2**	**Component of backronym**
Skin color	blue or pale all over	blue at extremities body pink	no cyanosis body and extremities	**A**ppearance

		(acrocyanosis)	pink	
Pulse rate	absent	< 100 beats per minute	> 100 beats per minute	**P**ulse
Reflex irritability grimace	no response to stimulation	grimace on suction or aggressive stimulation	cry on stimulation	**G**rimace
Activity	none	some flexion	flexed arms and legs that resist extension	**A**ctivity
Respiratory effort	absent	weak, irregular, gasping	strong, robust cry	**R**espiration

Interpretation of scores:-
The test is generally done at one and five minutes after birth, and may be repeated later if the score is and remains low. Scores 7 and above are generally normal, 4 to 6 fairly low, and 3 and below are generally regarded as critically low.[3]

A low score on the one-minute test may show that the neonate requires medical attention[4] but does not necessarily indicate a long-term problem, particularly if the score improves at the five-minute test. An Apgar score that remains below 3 at later times—such as 10, 15, or 30 minutes-may indicate longer-term neurological damage, including a small but significant increase in the risk of cerebral palsy. However, the Apgar test's purpose is to determine quickly whether a newborn needs immediate medical care.

ADMISSION CARDIOTOCOGRAPHY - A short recording of fetal heart rate over 20-30 minutes is done immediately after admission in the labour room. In this application of electronic fetal monitoring, women with low risk pregnancies are monitored for a short time on admission for labour, and continuous monitoring is used only if abnormalities of the fetal heart rate patterns are subsequently identified.

This test identifies a fetus with risk for hypoxia in the next 5-6 hours of labour. Ingermarsson I et al (1986)[5] observed that a reactive or normal CTG tracing guaranteed a progress of labour without fetal distress, provided delivery occurred in about next 6 hours.

A normal admission fetal cardiotocograph reassures and thus allows patient to be mobile by eliminating continuous monitoring. It reduces the burden on CTG machine, which is an important necessity for majority of the nations including ours.

Thus: -

- The labour admission test is a screening test in early labour to detect compromised fetus on admission.
- It is used to select the woman in need of continuous fetal electronic monitoring during labour.
- It is a dynamic screening test to study fetal oxygenation at the time of admission of mother in labour room.

AIMS & OBJECTIVES

- To assess the reliability of the admission cardio-tocogram in detecting fetal hypoxia.
- Correlate the result of the admission test with the perinatal outcome in low risk obstetric population.

MATERIAL & METHODS

The present study, a hospital based descriptive observational study was conducted in Department of Obstetrics & Gynaecology, S.M.S. Medical College & attached group of Hospitals, Jaipur from February 2015 to 2017.

After obtaining the institutional ethical committe approval, 130 pregnant women were admitted in the labour room in first stage of labour after applying inclusion (gestational age of ≥ 36 week, Singleton pregnancy, Cephalic presentation, Primi or multi-gravida) & exclusion (Bad obstetric history, Multifetal pregnancy, Congenital fetal anomalies, Mal-presentation, False labour pain, Elective LSCS or previous LSCS, Use of sedative drug, Admission interval > 24 hrs, IUGR, Medical disorders: Hypertension, anaemia, asthma, thyroid disorder etc.) criteria.

After included in the study, the patients were explained about the procedure and informed consent was obtained. The pregnant mother was asked to empty her bladder and all the procedure, what to expect during the procedure and what is expected of her were explained to her. She is placed in the semi fowler's position. The ultrasound transducer is applied to the maternal abdomen with a gel interface and the foetal heart rate is observed for 20 min. The patient is asked to press the event marker every time she perceives foetal movement. Presence of spontaneous foetal heart rate accelerations with foetal movement is an indicator of foetal well-being.

In the present study the observations for an admission CTG were done on following lines - According to NICE guideline [2014], Intrapartum care for healthy women and babies (CG190)[6].

1. Baseline fetal heart rate
2. Baseline variability
3. Decelerations
4. Accelerations

The admission test tracings were typed into (i) Reactive & (ii) Non- Reactive. If the tracings are non reactive, further management is decided based on individual condition. The admission test was used in comparison of neonatal outcomes such as mode of delivery, APGAR score, admission into neonatal intensive care unit (NICU) and duration of stay in NICU.

Table-1
Age Wise Distribution of Study Subjects

Age Group (in yrs)	Number	%
≤ 20	12	9.23
21- 25	49	37.69
26 - 30	55	42.31
>30	14	10.77
Total	**130**	**100.00**

This table reveals that most of the study subjects belonged to 21-30 years age (this is most fertile period) group 104 (80%). Only 10.77% of subjects were above 30 years of age & adolescent pregnancy contribute only 12 (9.2%) subjects.

Table-2
Gravidity Wise Distribution of Study Subjects

Gravity	Number	%
Primi	58	44.61
Second	56	43.08
Third	14	10.77
Fourth	2	1.54
Total	**130**	**100.00**

Above table reveals that most of the study subjects were primi gravida (44.61%) and 43.08% were 2nd gravida. Only 16 (12.31%) of women had gravida 3 or more.

RESULTS:
Result of Labour Admission Test :- Out of 130, 105 (80.77%) women had reactive and 25 (19.23%) had non-reactive CTG tracings.

Table-3
Result of Labour Admission Test

	Reactive	Non- Reactive	Total
Result of CTG	105 (80.77%)	25 (19.23%)	130 (100.00%)

Our study shows that labour admission test (LAT) applied on 130 study subject (all belonged to low risk obstetric population) after assessing inclusion & exclusion criteria. Out of 130, CTG was reactive in 105 (80.77%) cases and non-reactive in 25 (19.23%) cases.

Table-4
Mode of Delivery

Mode of Delivery	Reactive		Non-reactive	
	Number	%	Number	%
Vaginal	97	92.38	3	12.00
Ventouse (Instrumental Vaginal)	1	0.95	0	0.00
Caesarean Section	7	6.67	22	88.00
Total	**105**	**100.00**	**25**	**100.00**

$\chi^2 = 77.077$ *d.f. = 2* *$p < 0.001$* *Sig*

Present table shows that in subjects with reactive CTG, 97 (92.38%) delivered by normal vaginal delivery, 1 (0.95%) had delivered by ventouse application and C section was required in only 7 (6.67%) cases, where as in subjects with non reactive CTG, 88% required C section and normal vaginal delivery was possible only in 12% subjects.

Application of Chi-square test showed that this difference was statistically significant at p<0.00 and non reactive CTG is significantly associated with requirement of C section.

Similarly Khatun A et al (2009)[8] conducted a study on Hundred consecutive normal and hundred consecutive abnormal CTG tracings, There was significantly higher rate of caesarean delivery.

Blessy D et al (2014)[11] conducted a study on 400 patients. On comparing admission test tracings with the mode of delivery, 80 out of 267 women of the reactive group had caesarean delivery (29.96%), and 124 (93.25%) had caesarean delivery in Non-Reactive group.

While in a study conducted by Khursheed F et al (2009)[9] on 210 women, 62.57% delivered vaginally & 37.43% had LSCS in reactive group CTG. While in Non-Reactive CTG group 27.27% delivered vaginally & 72.73% required LSCS.

Hafizur Rahman et al (2012)[10] conducted a study on 192 patients, Operative delivery for fetal distress was required in only 2.3% (4 of 169) women of the reactive group, in 36.3% (4 of 11) women of the equivocal group and in 83.3% (10 of 12) women of the ominous group.

Most women aim for spontaneous vaginal delivery, when complications arise in the second stage of labour there is a choice between instrumental vaginal delivery and caesarean section. Obstetricians are increasingly choosing caesarean section when complications arise in the second stage of labour. Thus instrumental vaginal delivery becoming rare in current era.

Table-5
Correlation of Fetal / Neonatal Outcome with Admission Test

	Reactive (n = 105)		**Non-Reactive (n = 25)**		**p-value**
	No.	**%**	**No.**	**%**	
APGAR Score at 5 min < 7	0	0.00	3	12.00	0.004
Observation Under Paediatrician	8	7.62	13	52.00	<0.001
NICU Admission	0	0.00	11	44.00	<0.001
Neonatal Seizures	0	0.00	1	4.00	0.433
Neonatal Death	0	0.00	0	0.00	N/A

Above table shows that 3 (12%) subjects out of 25 subjects of CTG Non- Reactive group had APGAR score <7 at 5 minute interval. Observation under paediatrician were required in 8 (7.62%) of CTG Reactive & 13 (52%) of CTG Non-Reactive Group. NICU admission was also predicted in all 11 cases (44%) that required NICU admission, in which 1 (4% of all CTG Non-Reactive cases) out of 11 had neonatal seizure with in 24 hour of delivery in CTG Non-Reactive Group. No any neonatal death reported in all cases of NICU admission. Application of Chi-square test revealed that CTG result is significantly associated with fetal outcome as shown in the table.

Similarly Hafizur Rahman et al (2012)[10] was conducted a study on 192 pregnant women, incidence of neonatal intensive care unit (NICU) admission was also significantly high (about 42%) in babies delivered from mother in ominous test group as compared to those with equivocal (27%) and reactive (1.2%) test groups.

Dwarakanath L et al (2013)[12] was conducted a study on 200 pregnant women, There was increased incidence of NICU admissions in suspicious and ominous tracings.

Blessy David et al (2014)[11] was conducted a study on 400 patients, among 267 patients with reactive CTG only 3 babies (1.12%) were admitted in the NICU. 14 out of 114 babies (12.28%) in the equivocal group and 9 out of 19 (47.37%) babies in the ominous group required NICU admission.

While in a study conducted by Liu W et al (2001)[7] on 262 cases in intrapartum period, during intra partum there was no significant relationship between baseline and variability of CTG with APGAR scores.

Khatun A et al (2009)[8] conduct a study on hundred consecutive normal and hundred consecutive abnormal CTC tracings, there was significantly higher perinatal death among the abnormal CTG group.

Khursheed F et al (2009)[9] conducted a study on 210 women, In reactive group, 142 (98.61%) babies were born alive and 2 (1.38%) were still born. Out of 142 live born babies, there were 4 (2.81%) early neonatal deaths. In non-reactive group 62 (93.93%) babies were born alive and 4 (6.06%) were still born. Among 62 alive born babies in non reactive group, there were 10 (16.12%) early neonatal deaths. Resuscitation at birth was required for 44 (30.98%) babies of reactive group and 33 (53.22%) babies of non reactive group.

Table-6

Diagnostic Parameters of Admission Test

Diagnostic Parameters	**% (95% CI)**
Sensitivity	70% (45.72 – 88.11%)
Specificity	90% (82.81 – 94.90%)
Positive Predictive Value	56% (40.40 – 70.49%)
Negative Predictive Value	94.29% (89.39 – 97%)
False Negative	5.70%
False Positive	44.00%

Above table shows that CTG at admission has high sensitivity and specificity for predicting fetal distress (70 % and 90% respectively). Proportion of false negative results is very low. A high NPV (94.29%) allows a clinician to accurately exclude fetal distress in individual patient.

Hafizur Rahman et al (2012)[10] conducted a study on 192 patients, has a sensitivity of 73.7%, specificity of 94.8%, positive predictive value of 60.9%, and negative predictive value of 97.0%.

Dwarakanath L et al (2013)[12] was conducted a study on 200 pregnant women, this study has a sensitivity of 76% and positive predictive value (PPV) of 96%, specificity of 77% and negative predictive value (NPV) of 33% for a reactive test.

Blessy David et al (2014)[11] was conducted a study on 400 patients. The study concluded that admission CTG has 92.85% sensitivity and 94.16% specificity. The positive predictive value was 87.96% and negative predictive value was 96.62% with a diagnostic accuracy of 93.75% indicating that reactive admission CTG correlates well with the fetal wellbeing.

SUMMARY

This observational study was conducted in department of Obstetrics and Gynaecology during the period from 2015 to 2017.

130 cases, admitted in labour ward with 36 weeks onward of gestation in labour, on clinical examination with 3-5 centimetre of cervical dilatation. These cases were from primigravida to multiparous without high risk pregnancies like Bad obstetric history, Multifetal pregnancy, Congenital fetal anomalies, Mal-presentation, False labour pain, Elective LSCS or previous LSCS, Admission interval >24 hrs, IUGR, Use of sedative drug, Medical disorders like Hypertension, anaemia, asthma, thyroid disorder etc.

In the present study the observations for an admission CTG were done on following lines - According to NICE guideline [2014], Intrapartum care for healthy women and babies (CG190).

All these patients were subjected to admission test or admission CTG. Out of 130 tests performed, 105 (80.77%) were reactive and 25 (19.23%) were non-reactive. In certain non-reactive tests, the test was repeated for another 30 minutes to confirm the previous abnormal finding. If again the test was non-reactive, a decision of termination of pregnancy was taken accordingly.

APGAR score at 1 ($p < 0.001$) and 5 (p-value = 0.006) minute was comparable to standard studies. Application of chi-square test revealed that CTG result is significantly associated with APGAR score at 1 and 5 minute. APGAR score at 5 minute interval <4 was not reported with all three modes of delivery. APGAR score 5 to 6 were reported in 1 (4%) vaginal delivery and 2 (8%) LSCS in Non-Reactive group and APGAR score >7 was seen with most of the cases, 97 (92.38%) in reactive & 2 (8%) out of three vaginal delivery respectively reactive & non reactive group. 27 (93.10%) out of 29 LSCS in Reactive & Non-Reactive group were reported with APGAR score >7 at 5 minute interval. This APGAR score >7 in mostly cases was seen due to early intervention taken in cases of Non-Reactive CTG group.

NICU admission was also predicted in all 11 cases (44%) that required NICU admission, in which 1 (4% of all CTG Non-Reactive cases) out of 11 had neonatal seizure with in 24 hour of delivery in CTG Non-Reactive Group. No any neonatal death reported in all cases of NICU admission.

This study shows that CTG at admission has high sensitivity and specificity for predicting fetal

distress (70% and 90% respectively). Proportion of false negative results is very low. A high NPV (94.29%) allows a clinician to accurately exclude fetal distress in individual patient.

CONCLUSION

It is evident from the results of the cardiotocography testing is a simple, non-invasive, inexpensive test for antepartum fetal surveillance. It is easy to perform, well accepted by patients and causing no inconvenience or complications to the patient. CTG test should be performed for diagnostic performance in light of clinical circumstances.

Our study has shown that Non-Reactive CTG is an alarming sign for active intervention as early as at the time of admission because those who have Non-Reactive CTG (approximately 20% [25 cases] in our study) majority of them landed in caesarean delivery for fetal distress. Hence early intervention decreased the neonatal morbidity due to increasing APGAR score by early interventions.

Study showing high Negative predictive value (94.29%) so this admission test very useful in detecting compromised fetus, in very early in first stage labour.

Finally conclude that admission test is a very useful prognostic tool in early labour for triaging of fetus and helpful in increasing the APGAR score and predicting the fetal's wellbeing in optimal utilization of limited labor room resources.

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