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Original Research Article

The Validity of Labour Admission Test as Screening Test in Predicting Fetal Outcome

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Abstract:

Background: It is estimated that 20-40% stillbirths in the non-anomalous category occur as result of intrauterine hypoxia and are therefore potentiality preventable. In this context, a screening test is ideally needed at the time of onset of labour which can detect the already existing compromise on the fetus and which can predict its well-being for next hours in labour, so that timely intervention can prevent irreversible neurological damage and death. This study was undertaken with the purpose of evaluating the efficacy of labour admission test as a screening test to identify the compromised fetus or fetus at risk and to correlate with perinatal outcome.

Methodology: This study was conducted as a cross sectional studies in 400 antenatal women admitted in lab our ward in a tertiary care teaching hospital for the period of one year. Mothers were selected randomly who belonged to both low and high-risk group. Low risk cases are those pregnant women with singleton term fetus in cephalic presentation, with labour pains either spontaneous or accelerated. High-risk cases are those with post-dated pregnancy, hypertensive disorders of pregnancy, gestational diabetes, IUGR/ oligohydramnios, Anemia, Rh Incompatibility, Post caesarean pregnancy and heart disease complicating pregnancy "Fetal care" fetal monitoring system (CTG machine) was used in this study. In this study admission test was done for 400 patients at the time of admission to labour ward. Patients were followed according to the 'AT' results.

Results: of 400 patients in our study, 255 were low risk cases and 145 were high-risk cases. CTG was done in all patients.280 cases had reassuring pattern (70%), 68 cases had non reassuring pattern (17%), and 52 cases had abnormal tracing pattern. Of the 400 cases, 280 had labour natural, 114 (29%) went for Cesarean Section and 6 cases (1%) went for Forceps Delivery. Among 280 patients who had reassuring CTG, 15 babies were admitted in NICU. 35% of the babies of non-assuring group were admitted in NICU. 56% of the babies of the abnormal CTG group were admitted in NICU. Therefore, NICU admission is more in the non-reassuring and abnormal CTG group. Sensitivity was 83.54%. Specificity was 78.55% in our study. Diagnostic accuracy of the test was 79.25%.

Conclusion: An ideal screening test should have high sensitivity and negative predictive value as this test is found to have the above features in my study, it is certainly recommended as a screening test for fetal distress at the time of admission.

Keywords: Fetal Distress, Fetal Hypoxia, Labour Admission Test.

Introduction

"One of the worst outcomes of pregnancy is the delivery of an asphyxiated newborn. An asphyxiated newborn has no spontaneous respiration, is bradycardic, has poor or no muscle tone, does not cry and requires immediate resuscitation to avoid death. Many of these newborns will have a complicated course in the neonatal intensive care unit and will require mechanical ventilation and treatment of multiple organ failure. The majority of them will recover without apparent deficits but some will develop neurological sequelae". This dreadful clinical picture is the result of an abnormality in the total gas exchange resulting in severe hypoxia and acidosis, which has multiple causes that can be divided into three groups. Chronic fetal conditions, acute complications during labour, delivery and neonatal problems. [1,2] In an effort to avoid this outcome, a larger part of the current obstetric practice consists of methods to detect, avoid and treat fetal asphyxia. In the last few decades, technological advances have undoubtedly contributed significantly to improved maternal and perinatal outcome. The impact on assessment of the

fetus in utero has been particularly striking. It is now possible to assess the fetus not only for structural malformations, but also for its physiological states and well-being. It is estimated that 20-40% stillbirths in the non-anomalous category occur as result of intrauterine hypoxia and are therefore potentiality preventable.

In this context, a screening test is ideally needed at the time of on -set of labour which can detect the already existing compromise on the fetus and which can predict its well-being for next hours in labour, so that timely intervention can prevent irreversible neurological damage and death. Assessment at the admission to labour ward helps us to look carefully for high risk factors previously undetected and new factors that have since appeared. [3]

Two issues have be solved during assessment. Firstly, even after vigorous selection based on known antenatal risk classification system, fetal morbidity and mortality tend to occur in the so-called low risk groups (Hobel et al 1973) [4]. This leaves us with the task of determining who is at low risk. A new system must be developed to identify those who are at risk in labour by means of the "Admission test". Second problem we face is the difficulty in providing one to one care to offer optimal standards of intermittent auscultation with inadequate trained work force. For good results with auscultation, one has to listen to fetal heart rate for one minute every 15 minutes perfectly after a contraction in the first stage of labour and after each and every other contraction during the second stage of labour. This may not be feasible in many centers.

Routine electronic fetal monitoring in labour has become an established practice in the labour wards. In labour wards with few monitors, an admission CTG is a very useful tool, which gives an early, easy and quick assessment of fetal wellbeing, at the same time doing away with continuous electronic fetal monitoring. [5] Based on this aim of our study is to find out the validity of admission test in predicting fetal distress and evaluation of admission test as a screening test to detect fetal hypoxia already present at the time of admission and to predict adverse outcome.

Methodology

This study was done as cross sectional study in 400 antenatal women admitted in lab our ward in a tertiary care teaching hospital for the period of one year. Mothers were selected randomly who belonged to both low and high-risk group. Low risk cases are those pregnant women with singleton term fetus in cephalic presentation, with labour pains either spontaneous or accelerated. High-risk cases are those with post-dated pregnancy, hypertensive disorders of pregnancy, gestational diabetes, IUGR/ oligohydramnios, Anemia, Rh Incompatibility, Post caesarean pregnancy and heart disease complicating pregnancy

Pregnant mothers who present with preterm labour, malpresentations, and multiple pregnancy, major anomalies of the fetus and antepartum hemorrhage were excluded.

"Fetal care" fetal monitoring system (CTG machine) was used in this study. In this study admission test was done for 400 patients at the time of admission to labour ward. Patients were followed according to the 'AT' results.

Patients with normal tracings were followed up by intermittent auscultation and electronic monitoring was done once in 4-5 Hours, during monitoring whenever we suspected fetal distress, emergency intervention was made according to the stage of labour.

In patients with non- reassuring and abnormal tracing immediate ARM was done and color of the liquor was assessed. In thin meconium stained cases amnioinfusion was given and the labour was allowed to progress. They were followed up carefully by intermittent auscultation and CTG monitoring for five minutes once in an hour when there is change of color of liquor or when abnormal pattern appeared in CTG, according to the stage of labour, the labour was terminated by either forceps (or) cesarean section.

The finding of the admission test was correlated with the outcome of the pregnancy. To evaluate the outcome of pregnancy, fetal distress was considered to be present when abnormal FHR changes led to cesarean section or forceps delivery for the indication of fetal distress or if the new born has an APGAR score <7 at 5 minutes following spontaneous delivery.

Results

This study was conducted in a tertiary care teaching hospital among 400 pregnant women who were selected randomly at the time of admission to labor ward with true labor pains and the LAT was performed on them using machine. Neonatal outcome was correlated with the test findings. Of them, 255 were low risk cases and 145 were high-risk cases. High-risk cases include, anemia, Pre-eclampsia, Oligohydramnios, GDM, post-dated pregnancy, heart disease complicating pregnancy, Rh incompatible pregnancy etc. Among our study population 63% were low risk cases and 36% high-risk cases.

Table 1: High and low risk cases

S. No	Cases	Total Number	%
1.	Low risk cases	255	63%
2.	High risk cases	145	36%
	Preeclampsia	29	20%
	Postdated Pregnancy	27	19%
	Anemia	3	2%
	RH incompatibility	3	2%
	Heart disease complicating pregnancy	15	10%
	Post caesarean pregnancy	5	3%
	oligohydramnios	5	3%
	Others (Multiple combination of risk factors)	49	34%
	Total	**400**	**100%**

In our study most of the patients were between 20-25 years. Teenage pregnant woman here about 28% Elderly mother were about 1% and the remaining between 26-30 years. Majority of the patients were Primigravida (57%) the second gravida were about 29%, the remaining were third (10%) and fourth gravidae (4%).

CTG was done in all patients. Among the four hundred cases, 280 cases had reassuring pattern (70%), 68 cases had non reassuring pattern (17%), and 52 cases had abnormal tracing pattern. Among the 255 low risk cases, 180 (71%) had reassuring tracing, 41 (16%) had non -reassuring tracing, 34 (13%) had abnormal tracing. Of the 145 high risk cases, 104 (72%) had reassuring pattern of tracing, 24 (16%) had non-reassuring pattern, 17(12%) had abnormal tracing.

Of the 400 cases, 280 had labour natural, 114 (29%) went for Cesarean Section and 6 cases (1%) went for Forceps Delivery. Among the 255 low risk cases 85% went for labour natural and 14% went for LSCS. Among the high risk group, 56% went for LSCS and 42% went for LN. Hence, major proportion of low risk cases went for labour natural and major proportion of high risk cases went for cesarean section. Among 280 cases that had reassuring tracing, 78% went for labour natural, 21% (59 cases) went to LSCS and 2 cases went for forceps delivery. Among the 68 patients who had non-reassuring, 36 delivered normally and 29 patients underwent LSCS and 3 cases went for forceps delivery. Among the 52 patients who had abnormal tracing, 50% went to LSCS, 48% (25 cases) delivered normally. That is, majority of patients with reassuring tracing delivered normally, and majority of patients with abnormal tracing underwent LSCS (indications were & both for fetal distress and non-fetal distress).

Among low risk mothers, 180 patients who had reassuring tracing, 165 delivered normally and 14 went for LSCS. Among 41 patients who had non-reassuring tracing, 28 delivered normally and 11 underwent LSCS, 2 underwent forceps delivery. Among 34 abnormal cases, 23 cases delivered normally, 10 cases went for LSCS and 1 case went for forceps delivery.

Among 104 patients who had reassuring trace, 57 delivered normally, 46 went for LSCS and 1 went for forceps delivery. Among 24 patients who had non- reassuring trace, 4 delivered normally 19 went for LCSC and 1 delivered after forceps application. Among 17 patients who had abnormal tracing none delivered normally, 16 went for LSCS and 1 delivered by forceps.

Table 2: Correlation between the results of LAT and the incidence of fetal distress in low risk group

CTG Tracing	No. of cases	Fetal Distress
Reassuring	180	3 (1%)
Non reassuring	41	13 (31%)
Abnormal	34	12 (35%)

Among the patients who had reassuring tracing by 3(1%) had fetal distress. Among the patients who had non-reassuring tracing 31% had fetal distress. Among the patients who had abnormal tracing, 35% had fetal distress. Hence there is correlation between the results of AT and the occurrence of fetal distress.

Table 3: Correlation between the results of LAT and fetal distress in high risk group

CTG Tracing	Among high risk cases	Fetal Distress
Reassuring	104	6 (5%)
Non reassuring	24	12 (50%)
Abnormal	17	9 (53%)

Among 104 patients who had reassuring trace, only 5% had fetal distress, among 24 patients who had non reassuring tracing, 50% had fetal distress. Among 17 patients who had abnormal tracing 53%

had fetal distress. Among 280 patients who had reassuring CTG, 15 babies were admitted in NICU. 35% of the babies of non-assuring group were admitted in NICU 56% of the babies of the abnormal CTG group were admitted in NICU. So, NICU admission is more in the non-reassuring and abnormal CTG group. This was statistically significant, hence, there is correlation between abnormal CTG & NICU admission. So there is significant association between Admission test result and neonatal outcome. Coming to APGAR score Among 280 patients who had reassuring trace 186 had good APGAR score, 93 babies had moderate asphyxia, I have severe asphyxia. Among 68 patients who had non-reassuring trace, 24 babies had good APGAR, 36 babies had moderate asphyxia, 8 had severe asphyxia. Among 52 patients who had abnormal trace, 21 babies had good APGAR, 25 babies had moderate asphyxia, 6 babies had severe asphyxia. Statistical analysis of the data shows significant association between the AT and the neonatal outcome.

Table 4: Admission test predictive capacity

Sensitivity	83.54%
Specificity	78.55%
PPV	38.33%
NPV	96.79%

To evaluate the outcome, fetal distress was considered to be present when abnormal FHR tracing led to cesarean section or forceps delivery or if the newborn had an Apgar Score < 7 at 5 minutes after delivery. Here positive test result means non-reassuring and abnormal pattern of CTG and negative test result means reassuring CTG pattern. Those individuals found positive on the test developed fetal distress during the course of labour. Diagnostic accuracy of the test was 79.25%.

Discussion

This study was conducted in a tertiary care teaching hospital to evaluate the role of admission test as a screening test in predicting fetal distress. 400 women who were admitted in labour ward were randomly selected for admission test. Among those 400 patients, 255 were belonging to low risk group (63%) and 145 were (36%) were belonging to high risk group. They were cases of hypertensive disorders of pregnancy, postdatism, Anemia, GDM, Rh incompatibility, heart disease complicating pregnancy etc. The results can be compared with the findings of Dwarakanath et al study (40.5% in high risk and 59.5% in low risk group) and Buckshee K et al study, (32% in high risk and 68% in low risk). [6,7]

Among these 400 patients 112 were below the age of 20 years, 248 were between 20-25 years, 35 were between 26-30 years and 5 were more than 30 year age group. Among 400 patients, 229 (57%) were primigravida, 114(29%) were second gravida, 41(10%) were third gravida and 16(4%) were fourth gravida and above.

Admission test results were normal (Reassuring) in 280 (70%) patients, non-reassuring (suspicious) in 68 (17%) patients and abnormal in 52 (13%) patients. In 255 low risk patients, 180 (71%) had reassuring tracing, 41 (16%) had non- reassuring tracing and 34(13%) had abnormal tracing. Among 145 high risk patients, 104(72%) had reassuring pattern, 24 (16%) had non- reassuring pattern and 17 (12%) had abnormal pattern. Among 400 patients, 280 (70%) delivered normally, 114 (29%) delivered by Cesarean section and 6 (1%) cases delivered by forceps application. (Out 114 cesarean Sections 54 were done for fetal distress as indication and the rest for other indications and out of 6 forceps cases, 3 were for fetal distress as indication and 3 were for other indications).

When we see the mode of delivery according to CTG pattern, out of 280 normal tracing cases 219(78%) delivered normally, 2 delivered by forceps application (both were due to non-fetal distress indication), 59 delivered by Cesarean Section (9 were for fetal distress indication and the rest were for non-fetal distress indication)

Out of 68 patients who had non-reassuring tracing, 36 delivered normally, 3 delivered by forceps application (2 for fetal distress as indication and 1 for non-fetal distress indication) and 29 (7%) delivered by LSCS (Among them 22 were done for fetal distress indication)

Among 52 patients who had abnormal tracing, 25 delivered normally, 1 delivered by forceps application for fetal distress and 26(50%) delivered by LSCS (among them 23 were done for fetal distress as indication and 3 were for other reasons). On comparing the mode of delivery in low risk and high risk population, labour natural (85%) was more in low risk group and LSCS was more on high risk group (56%). On seeing the mode of delivery in reassuring type of CTG pattern in low risk group. Of 180 reassuring tracing (normal), 92% delivered normally and only 8% needed emergency intervention. On seeing the mode of delivery in abnormal type of CTG in high risk group, out of 17, 16 cases went for emergency intervention and only 1 delivered normally. Out

of 24 patients in non-reassuring group 20 cases needed emergency intervention. These results are in concordance with studies by Gurung G, Hegde A, Kulkarni A A and Bhat R A. [8-11]

On seeing the neonatal APGAR score, out of 280 reassuring (normal) tracing 186 (66%) had no asphyxia, and (33%) had moderate asphyxia at 5 min (but become normal at 10 minutes) and only 1 care (0.3%) had severe asphyxia (Here baby delivered 8 hours after the AT was done). Hence, there is good correlation between CTG findings and fetal outcome. Admission test correctly predicted the wellbeing of the fetus. But out of 68 suspicious cases, 24 had no asphyxia and out of 52 abnormal cases 21 had no asphyxia. This can be explained by the fact that those babies were delivered soon by an emerging intervention.

In this study for evaluation of the outcome of admission test, fetal distress was considered to be present when ominous (abnormal) FHR changes led to forceps delivery (or) Cesarean section for the indication of fetal distress (or) when the APGAR is <7 at 5 minutes, when delivered spontaneously. So, in normal (reassuring) tracing cases (n=280), 9 (3%) developed fetal distress, almost 97% had no fetal distress. In non-reassuring (suspicious) tracing cases (n=68) 25 (36%) developed fetal distress. In abnormal tracing (n=52), 50% developed fetal distress. These observations were similar to the studies done by Rahman et al, Nagure et al, Kansal et al and Hegde et al studies. [5,12,13,9]

On comparing the development of fetal distress in low risk group and high risk group, In high risk cases, 5% of reassuring tracing developed fetal distress, 50% of non - reassuring and 53% of abnormal tracing developed fetal distress. In Low risk group, only 1% of reassuring group developed fetal distress 31% of non- reassuring 35% of abnormal tracing developed fetal distress. So, the occurrence of fetal distress is more in non-reassuring and abnormal group and is almost negligible in reassuring group. In both how and high risk groups, the incidence of fetal distress were certainly more on the non-reassuring and abnormal CTG group.

When we see the NICU admission for asphyxiated babies, in 280 reassuring tracing, 5% of babies needed NICU admission, among 68 non-reassuring group 35% needed admission and of 52 abnormal tracing babies 56% needed admission for asphyxia. This is in agreement with studies by Rahman et al, Nagure et al. [5,12]

Finally analysing the predictive value of admission test (AT) in predicting fetal distress sensitivity = 83.54% specificity = 78.55%. PPV was 38% and NPV was 96%, this is similar to previous studies done by Ingemrasson et al [3], Low et al [14], Sueha et al [15] and Kamal Bakshee et al [7]

In this study, statistical analysis shows high sensitivity (83%) and high predictive value for normal test. That is, admission test correctly diagnosed the well-being of the fetus. But the predictive value of a positive (abnormal) test to predict fetal distress is low which is evidenced by low positive predictive value. To improve the specificity and positive predictive value, false positive and false negative results are to be reduced. This can be achieved by doing additional tests like fetal scalp blood sampling (FBS) to diagnose the fetal distress exactly. But the above cannot be applied in all settings due to difficulty in technique and lack of facilities.

Arulkumaran and Ingemarsson in their study said that if the AT is normal, Oxytocin and epidural analgesia have not been used, the risk of fetal hypoxia occurring in the next few hours is low. When it occurs, such hypoxia is likely to be from acute events. [3]

As per Shakira parveen et al [16], AT was useful to detect fetal distress already present at admission and had the ability to propose fetal wellbeing for the next few hours of labour. It is simple, convenient, non-invasive and economical for screening purpose.'

In a study by Low et al [14], Interpretation of FHR patterns by computer and more judicious use of biochemical parameters eg. pH and lactate estimation will reduce intervention resulting from variable interpretation. In this way. EFM should be seen as an admission screening test for intrapartum hypoxia and other parameters used as diagnostic tests.

Another study done by Philipp J et al [17] depicted the accuracy of the admission test in predicting intrauterine fetal hypoxia. A total of 229 subjects were included, a short continuous electronic fetal monitoring recording, was made immediately on admission, on all patients on labour and was categorized as reassuring, equivocal or ominous. Reassuring tracing is associated with low risk (6.5%) for asphyxia as measured by APGAR and umbilical cord PH, while "ominous" tracing is associated with high risk (50%) for asphyxia. In detecting an umbilical cord PH of 7.2, fetal heart rate variability is most specific (8%), while absence of acceleration is the most sensitive (50%).This was similar to our study.

A study by Elimian A, Lawlor P, Figereroa R et al [18], concluded that the fetal admission test is useful in predicting the absence of intrapartum fetal distress irrespective of the criterion used for evaluation. Redefined reactivity appears to be most predictive of intrapartum fetal distress.

Conclusion

Admission test can defect fetal distress already present at the time of admission and it can predict fetal wellbeing for the next few hours of labour. Hence both undue delay in intervention and unnecessary intervention can be avoided. AT provides an early, easy and quick assessment of fetal wellbeing. It is a good screening test to detect fetal distress. So we recommend it to be implemented in all mothers at the time of admission to labour ward. An ideal screening test should have high sensitivity and negative predictive value as this test is found to have the above features in my study, it is certainly recommended as a screening test for fetal distress at the time of admission.

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