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Original Research Article

Role of Labor Admission Test by CTG as A Predictor of Perinatal Outcome: A Cross-Sectional Study

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Abstract:

Background: Globally, perinatal hypoxia has a significant role in the morbidity and mortality of newborns. Fetal well-being assessment during childbirth has become a crucial component of labor management. The test of fetal well-being known as the labor admission test (LAT) can be used as a screening tool in the early stages of labor to identify fetuses that are compromised upon admission. This study aims to compare test results with newborn outcomes in order to examine the effectiveness of LAT in determining fetal well-being at the commencement of labor.

Methods: This was a cross-sectional study conducted among women admitted in labor room of Obstetrics and Gynaecology department of DMCH from September 2019 to August 2020. After LAT, the patients were categorized as "Reactive," "Equivocal," and "Non-reactive" based on the FHR tracings that were obtained. These patients' perinatal outcomes were also evaluated.

Results: 106 (64.2%) of the 165 patients who took part in the study showed reactive FHR traces on LAT, 6 (3.6%) had ambiguous FHR traces, and 53 (32.1%) had non-reactive FHR traces. Of the patients who had a non-reactive trace, 45 (84.9%) were delivered via LSCS, 8 (15.1%) had meconium-stained fluid at 5 minutes, and 8 (15.1%) had an APGAR score of less than 7. In this group, about 27 (50.9%) neonates needed to be admitted to the NICU.

Conclusion: LAT is a straightforward, non-invasive, low-cost screening method that can be used to identify fetuses that are unlikely to experience the stress of labor and go hypoxic, particularly in cases where financial limitations prevent every patient from having access to continuous electronic fetal monitoring.

Keywords: Labour Admission, Reactive, Nonreactive, Perinatal Outcome.

Introduction

For the patients, labor is a happy and stressful moment. This is the shortest stage of pregnancy, when the fetus is most vulnerable. It is estimated that intrapartum problems account for 23 percent of newborn fatalities worldwide each year. [1,2] According to labor physiology, uteroplacental perfusion might be reduced by as much as 60% during labor contractions. [3]

The majority of fetal hypoxia develops gradually as a result of uterine contractions, with severe hypoxia arising from acute events such placental abruption, uterine rupture, or cord prolapse occurring rarely. [4] In most cases, placental function is enough to handle the hypoxic strains of labor; but, in certain women, intrapartum fetal impairment may arise, resulting in perinatal hypoxia. One of the main causes of cerebral palsy, stillbirth, and hypoxic ischemic encephalopathy (HIE) is perinatal hypoxia. Many infants with HIE do not make it beyond the first month of life, and those who do often have chronic conditions like cerebral palsy [5]. Nowadays, with the help of medical technology, it is feasible to identify fetuses that will not survive periods of intermittent hypoxia. These fetuses exhibit this compromise in a variety of ways, including irregular heart rates and meconium passing in utero. [6] These abnormalities can be easily identified and patients can be managed accordingly.

As a result, monitoring the fetal condition throughout childbirth has become a crucial component of labor management. When a woman is admitted to the hospital while in labor, the labor admission test (LAT) is used to evaluate the health of the fetus [7]. Fetuses that are hypoxic or unlikely to survive the strains of labor can be identified with

the aid of this test, and they can then be delivered or evaluated with further fetal hypoxia testing. Fetal heart rate characteristics, including baseline variability, can all be evaluated using LAT.

Additionally, auscultation can provide the baseline heart rate and show whether accelerations or decelerations are present, but it is unable to characterize the type of decelerations or help determine baseline variability [7]. Nonetheless, the Liver Analyzer Test (LAT) is a visual examination that can assist in assuring patients that the foetus is not at risk of hypoxia upon admission and is not anticipated to experience hypoxia within the next few hours [7].

Therefore, LAT can be used as a screening method in the early stages of labor to identify fetuses that are compromised at the time of hospital admission. Thus, the purpose of this study was to compare the test results with newborn outcomes in order to examine the effectiveness of LAT in assessing fetal well-being at the commencement of labor.

Materials and Methods

This was a cross-sectional study conducted among women admitted in labor room of Darbhanga Medical College and Hospital, Laheriasarai, Bihar from September 2019 to August 2020.

The study included both registered and unregistered prenatal patients who were admitted for labor. Nevertheless, the study did not include patients who were not willing to participate, patients who were in labor and were not full term (gestational age of less than 36 weeks), or patients who had advanced past the first stage of labor at the time of admission. During the trial period, all patients who met the inclusion and exclusion criteria were enrolled. After outlining the study's approach, the participants gave their written informed consent. Patients had the option to discontinue the trial at any time or to decline participation. Their hospital care was unaffected by their decision to decline trial participation. To collect data, a standardized proforma was employed. Information about the patient's medical and obstetric history was recorded. Pregnant women who had any of the following illnesses were deemed high-risk prenatal cases: hypothyroidism, heart disease, hypothyroidism, severe anemia (Hb < 7 gm %), any other medical condition, pregnancy-induced hypertension, and prior abortions or LSCS. To ascertain the stage of labor after which a bilateral examination was conducted, LAT was carried out.

The patient was in the semi-lateral position in the labor room when the cardiotocography (CTG) machine captured the fetal heart rate (FHR) trace for 20 minutes. For CTG, the external abdominal transducers were utilized; one was used for FHR tracing and was positioned on the mother's abdomen where FHS were most audible, and the other was used to record uterine pressure and was placed on the uterus' fundus following the application of aquasonic gel. The patients were then categorized as "reactive," "equivocal," and "nonreactive" based on FHR tracings acquired, as per the National Institute of Clinical Excellence (NICE) clinical recommendations 2017. [8] Patients with "reactive" traces were followed up on after the admission test, with auscultation monitoring occurring every 30 minutes for the first stage of labor and every 5 minutes for the second stage after contraction. Cases with "equivocal" traces were placed under constant CTG observation. Depending on the stage of labor, either surgical or instrumental intervention was used to expedite delivery in individuals with "non-reactive" tracings, appearance of late, major variability, or protracted decelerations. Data on the manner of birth, the color of the liquor, the APGAR score at one and five minutes, the admission to the newborn intensive care unit, and the neonatal mortality were recorded.

Statistical analysis: SPSS statistics version 21 was used to examine the data. Probability and proportion were used to characterize variables that were measured on a nominal scale. The relationship between the LAT CTG tracings and the outcome variables was examined using Pearson's chi square test.

Results

The LAT was performed on 165 people in total. 102 (61.8%) of the 165 patients were multigravida, and 63 (38.2%) were primigravida. Of the patients, 86 (52.1%) had a high-risk pregnancy, whereas 79 (47.9%) had a low-risk pregnancy.

The risk factors of the study patients are given in table 1.

Table 1: Risk factors present in study patients (n=165)

Factors	No. of patients	Percentage
Previous abortions	32	19.4%
Previous LSCS	14	8.5%
Severe anemia (Hb <7gm%)	4	2.4%
Cardiac disease	14	8.5%
Hypothyroidism	22	13.3%
Other medical conditions	17	10.3%
Pregnancy induced hypertension (PIH)	14	8.5%

53 (32.1%) had a non-reactive FHR trace, 106 (64.2%) had an ambiguous FHR trace, and 6 (3.6%) had a reactive FHR trace (table 2).

Table 2: Distribution of patients according to FHR tracings

FHR trace	No. of patients	Percentage
Reactive	106	62.2%
Equivocal	6	3.6%
Non-reactive	53	32.1%

Patients with high-risk and low-risk pregnancies had comparable numbers of patients with reactive, equivocal, and non-reactive FHR tracings (p=0.730) (table 3).

Table 3: Comparison of pregnancy risk with CTG trace on LAT

Pregnancy risk	CTG trace on LAT			Total
	Reactive	Equivocal	Non-reactive	
High risk	53(50.0%)	3(50.0%)	30(56.6%)	86(52.1%)
Low risk	53(50.0%)	3(50.0%)	23(43.4%)	79(47.9%)
Total	106(64.2%)	6(3.6%)	53(32.1%)	165(100.0%)

$\chi^2 = 0.629$, p = 0.730

Four (66.7%) individuals with reactive traces and 78 (73.6%) patients with normal accelerations were auscultated. Table 3 displays the pregnancy outcomes based on entrance test results. 45 (84.9%) patients with non-reactive FHR tracings had LSCS, while 78 (73.6%) patients with reactive FHR tracings had vaginal birth. There was a statistically significant difference. Eight (15.1%) patients with non-reactive FHR tracing had an APGAR score of less than seven at five minutes; no patients with reactive or ambiguous FHR tracing had this score.

For 3 (2.8%) and 27 (50.9%) newborns delivered to patients with reactive and non-reactive FHR tracings, respectively, NICU admission was necessary. Both of these outcome factors showed a statistically significant difference. In all categories, there were no newborn deaths (table 4).

Table 4: Comparison of CTG trace on LAT with perinatal outcome

Perinatal outcome	CTG trace on LAT			p-value
	Reactive (106)	Equivocal (6)	Non-reactive (53)	
Mode of delivery				
• Vaginal delivery	78(73.6%)	0	8(15.1%)	<0.001
• Instrumental delivery	2(1.9%)	3(50.0%)	0	
• LSCS	26(24.5%)	3(50.0%)	45(84.9%)	
Meconium stained liquor	0	3(50.0%)	8(15.1%)	<0.001
APGAR <7 at 1 minute	101(95.3%)	6(100.0%)	50(94.3%)	0.825
APGAR <7 at 5 minutes	0	0	8(15.1%)	<0.001
NICU admission	3(2.8%)	1(16.7%)	27(50.9%)	<0.001

Discussion

Although LAT is now used in both low-risk and high-risk pregnancies, it was first intended to be used as a screening tool for women with low-risk pregnancies at the beginning of labor.

53 (32.1%) had a non-reactive CTG trace on LAT, 106 (64.2%) had an ambiguous CTG trace, and 6 (3.6%) had a reactive CTG trace.We contrasted the results of our investigation with those of other, related investigations. According to a research by Joshi H et al, a comparable percentage of patients (67%) had reactive CTG tracing.

Additionally, 21% of patients exhibited ambiguous CTG tracings, and 12% had alarming CTG tracings. Patients with aberrant tracings approximately 3-8% have been described in similar studies by Mohd R et al and Bhartiya V et al [10,11]. According to current standards, patients with high-risk pregnancies should use CTG.

High-risk pregnancies are associated with higher fetal morbidity and death; nevertheless, at full term, the incidence of intrapartum events-related morbidity and mortality is comparable in low-risk and high-risk pregnancies. [7] In individuals with both high- and low-risk pregnancies, intrapartum problems can happen fast and without warning [12].

According to our research, patients with high-risk and low-risk pregnancies had comparable numbers of reactive, equivocal, and non-reactive FHR tracings. According to a research by Rekha B et al, the admission test was non-reactive in 30% of high-risk cases and 16% of low-risk cases, but reactive in 70% of high-risk cases and 84% of low-risk cases [13]. In our study, the rate of instrumental delivery and LSCS was higher among those with a non-reactive CTG trace when the manner of delivery was compared as part of the pregnancy outcome.

Vaginal birth was more prevalent in patients with reactive trace than in the ominous and suspicious group, according to Joshi H et al. Conversely, cesarean sections were more common when the AD was alarming. According to their findings, 58% of patients with reactive CTG had normal vaginal, instrumental, and LSCS delivery rates, compared to 9% for those with alarming CTG.

Additionally, 8% of those patients had normal vaginal delivery. [9] We observed that patients with non-reactive CTG trace on LAT had poor perinatal outcomes, including meconium-stained liquor, an APGAR score of less than 7 at five minutes, and newborn admission to the NICU.

Similar studies have found that the APGAR scores at minutes 1 and 5 in the abnormal admission test group were lower than those in the normal admission test group [10,14].

These findings are consistent with our findings. Joshi et al. found that 7.4% of newborns had both an APGAR score of less than 7 at five minutes and NICU admission, and 10.4% of patients with reactive CTG traces had meconium-stained liquid.

But in the concerning CTG group, 75% of the newborns had meconium-tainted liquor, and 66.7% of them had an APGAR score of less than 7 at five minutes and a NICU admission score of nine. [9] A systematic review evaluated the LAT's efficacy in averting unfavorable outcomes in comparison to auscultation alone.

They came to the conclusion that although the women randomized to the LAT had a higher number of surgical deliveries and LSCS, these differences were not statistically significant. Furthermore, none of the newborn outcomes or the augmentation of labor between the two groups differed significantly [15].

Conclusion

Meconium stained liquid was seen in the majority of patients with an equivocal and non-reactive LAT; neonates with an APGAR score of less than 7 at five minutes necessitated NICU admission.

Therefore, LAT can be used as a straightforward, non-invasive, low-cost screening method to identify fetuses that are unlikely to be able to withstand the stress of labor and become hypoxic, particularly in situations where financial limitations prevent every patient from having access to continuous electronic fetal monitoring.

But a lack of strong evidence does not always translate into ineffectiveness. Further research is necessary to determine whether this test can reliably identify fetal hypoxia without increasing the need for surgical intervention during childbirth.

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