ORIGINAL ARTICLE

Diagnostic Accuracy of LDH in Detecting Birth Asphyxia: Cross sectional study

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ABSTRACT

Background: Among neonates, lack of oxygen results in multi-organ failure especially causing brain hypoxia resulting in hypoxic-ischemic encephalopathy (HIE).
Aim: To determine diagnostic accuracy of LDH in detecting birth asphyxia keeping clinical signs of HIE as gold standard.
Study Design: Cross-sectional study.
Methodology: Neonates (n=180) fulfilling inclusion criteria were enrolled in this study from the Emergency Neonatal Unit and Neonatology Ward of Sir Ganga Ram Hospital, Lahore. Following informed consent, blood (1cc) was taken and LDH levels were measured. Antenatal scans determined gestational age. Chi-square test was applied with P-value <0.05 taken as significant.
Results: Diagnostic accuracy of LDH for detection of perinatal asphyxia in term neonates had 90.20% sensitivity, 92.59% specificity and accuracy rate of 90.56%.
Conclusion: It was concluded that the diagnostic accuracy of LDH is higher in detecting birth asphyxia keeping clinical signs of HIE as gold standard, and this test can be performed for evaluation of perinatal hypoxia.
Keywords: Perinatal asphyxia, LDH and diagnostic accuracy.

INTRODUCTION

Perinatal asphyxia is an important cause of neonatal morbidity, mortality and permanent brain damage resulting in cerebral palsy and mental retardation in later life. According to few previous studies by WHO, it has been shown that Pakistan being a developing country is among those in the list of high infant mortality rates. They concluded that almost 46 deaths/1000 live births while 20% of these deaths results from perinatal asphyxia[1-3].

There are various methods that have been used to determine fetal well-being. These parameters include fetal heart rate monitoring by cardiotocography, APGAR Score of less than 7 at 1 minute of life and profound metabolic or mixed acidemia (PH <7.00) in an umbilical artery blood sample if-obtained[4,5]. Most reliable method still to diagnose or detect hypoxic ischemic encephalopathy is the assessment and recognition of clinical signs of hypoxic. Clinical manifestation of hypoxia includes changes in level of consciousness, muscle tone, poor sucking, decreased respiration or presence of seizures[6].

In developing countries, correct diagnosis of the disease is still a major issue that results in mis-management and treatment failure. There are many reasons but most common issue is that many sick newborns are delivered by untrained medical staff or uneducated health workers. No clear history of perinatal asphyxia is given by attendants. Lack of documentation for asphyxia at time of delivery is another important reason.[7] However, these signs of perinatal asphyxia are non-specific and overlap with other illnesses hence diagnosis of perinatal asphyxia becomes a difficult task.

Leakage of Intracellular enzymes such as LDH, AST ALT after perinatal asphyxia signal multi-organ dysfunction and hypoxic ischemic encephalopathy[8,9]. Among them LDH has risen as a better predictor of perinatal asphyxia in recent studies. It. can be used to distinguish an asphyxiated from a non-asphyxiated baby and hence can be used by pediatricians in referral hospitals to diagnose asphyxia, who receive sick neonates whose birth details are not well recorded[3].

Literature review revealed that LDH value of >580 U/L had low sensitivity (59.18%) while having high specificity (92%) for detecting perinatal asphyxia[4]. However, another study documented that LDH value of >580U/L at 72 hours has 100% sensitivity with a specificity of 88%[3].

In our country where neonatal mortality is high and many deliveries are unattended, there is a need of a reliable diagnostic marker that will diagnose birth asphyxia retrospectively in tertiary

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care hospitals. As LDH is a simple, cost-elective test which is readily available in many tertiary care hospitals it is rationale to perform this study in Pakistan.

The objective of the study was to determine diagnostic accuracy of LDH in detecting birth asphyxia keeping clinical signs of HIE as gold standard.

METHODOLOGY

Neonates (n=180) fulfilling inclusion criteria were enrolled in this study from the Emergency Neonatal Unit and Neonatology Ward of SGRH, Lahore. Following IRB approval and informed consent, blood (1cc) was taken and LDH levels were measured. All information including demographics, name, age, gender weight, address, detailed maternal history, fetal wellbeing by CTG, meconium staining of amniontic fluid, birth events and APGAR score was recorded in predesigned proforma. Antenatal scans determined gestational age. All enrolled neonates had full clinical and neurological examination. The asphyxiated neonates were monitored for seizures, hypotonia conscious level, respiration and sucking in Neonatology Unit of SGRH. Outcome was recorded as patients who are found positive or negative for birth asphyxia on LDH and clinical signs of HIE.

Statistical analysis: SPSS v.26 analyzed the data. Chi-square test was applied with p-value ≤ 0.05 as significant. Descriptive data presented as frequency and percentages. The data was stratified for age and gender.

RESULTS

Age distribution showed that mean±SD of age was 5.63+1.76 hours as shown in table-1 while other descriptive parameters of enrolled subjects were shown in table-1 as percentage and frequency.

Table-1: Baseline parameters (n=217)

Characteristics	Categories	Study Sample
Age (Hours)	≤ 6	113 (62.78%)
	>6	67(37.22%)
	Mean ± SD	5.63+1.76
Gender	Male	72 (40%)
	Female	108 (60%)
Weight (kg)	Mean ± SD	2.74±0.47
G. Age (weeks)	Mean ± SD	37.94±0.69
Perinatal asphyxia On Gold Standard	Yes	153 (85%)
	No	27 (15%)
Perinatal asphyxia On LDH	Yes	140 (77.78%)
	No	40 (22.22%)

The diagnostic accuracy of LDH for detection of perinatal asphyxia showed 90.20% sensitivity and 92.59% specificity respectively as shown in Table-2.

Table-2: Diagnostic accuracy of LDH

| LDH | Clinical assessment | | Total |
	Perinatal asphyxia (Positive)	Perinatal asphyxia (Negative)	
Positive	TP 138	FP 2	140
Negative	FN 15	TN 25	40
Total	a + c 153	b + d 27	**180**

The diagnostic accuracy of LDH for detection of perinatal asphyxia in term neonates when data was stratified for age 100% sensitivity and specificity respectively as shown in Table-3.

Table-3: Diagnostic accuracy of LDH for perinatal asphyxia with Age stratification

| LDH | Clinical assessment | | P value |
	Perinatal asphyxia (positive)	Perinatal asphyxia (Negative)	
Positive	TP 138	FP 2	0.000*
Negative	FN 15	TN 25	

*Statistically significant

However, when data was stratified for male gender had sensitivity (96.49%) and specificity (53.33%) as shown in Table-4.

Table-4: Diagnostic accuracy of LDH for perinatal asphyxia with Male gender

| LDH | Clinical assessment | | P value |
	Perinatal asphyxia (positive)	Perinatal asphyxia (Negative)	
Positive	55	7	0.0001*
Negative	2	8	

*Statistically significant

When data was stratified for female gender, LDH had sensitivity 91.21%, specificity 100% and accuracy rate of 92.5% (Table-5).

Table-5: Diagnostic accuracy of LDH for perinatal asphyxia with Female gender

| LDH | Clinical assessment | | P value |
	Perinatal asphyxia (positive)	Perinatal asphyxia (Negative)	
Positive	83	0	0.000*
Negative	8	17	

*Statistically significant

DISCUSSION

In our country where neonatal mortality is high and many deliveries are unattended, there was a need of a reliable diagnostic marker that may diagnose birth asphyxia retrospectively in tertiary care hospitals. As LDH is a simple, cost-elective test which is readily available in many tertiary care hospitals it is rationale to perform this study in Pakistan.

In our study, frequency of perinatal asphyxia on gold standard was recorded as 153(85%). Diagnostic accuracy of LDH for detection of perinatal asphyxia in term neonates had 90.20% sensitivity, 92.59% specificity and accuracy rate of 90.56% as shown by our results. Results of many other studies supported our findings as mentioned. Literature review revealed that LDH value of >580 U/L had low sensitivity (59.18%) while having high specificity (92%) for detecting perinatal asphyxia[4]. However,

another study documented that LDH value of >580U/L at 72 hours has 100% sensitivity with a specificity of 88%[3].

One previous study evaluated biochemical consequences and platelet counts of birth asphyxia in neonates. They documented that neonates having asphyxia had high levels of LDH, ALT, AST, creatinine, bilirubin and urea levels in comparison to healthy infants but had low platelet count than healthy infants.[10] Thus LDH level can be helpful in diagnosing asphyxia among neonates.

Many studies documented that high level for LDH in serum has high sensitivity (85.7%) and specificity (80%)[11,12]. Thus these studies supported our results in their own way.

In summary, LDH being a simple, cost-elective test which is readily available in many tertiary care hospitals, it can be performed for evaluation of perinatal asphyxia.

Limitations: Single centre study with financial constrains and limited resources. No genetic workup was done.

CONCLUSION

It was concluded that the diagnostic accuracy of LDH is higher in detecting birth asphyxia keeping clinical signs of HIE as gold standard, and this test can be performed for evaluation of perinatal hypoxia.

Author's contribution: MI&II: Conceptualized the study, analyzed the data, and formulated the initial draft, **AJ&HI:** Contributed to the proof reading, **AH&MA:** Analyzed data and collected data.

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