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Serum Lactate Dehydrogenase (LDH) Levels and Disease Severity in Neonates Admitted to the Neonatal Intensive Care Unit: A Prospective Study

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Abstract

Background: Elevated serum lactate dehydrogenase (LDH) may serve as an early biomarker of cellular stress and disease severity in neonates. This study evaluated the role of serum LDH levels in predicting disease severity in neonates admitted to the neonatal intensive care unit (NICU).

Methods: This prospective cross-sectional study included neonates admitted to two NICUs in Hamadan, Iran, during 2022–2023. Consecutive sampling was used, and maternal and neonatal data were collected. Analyses were performed using SPSS version 20, including multivariate linear and Cox proportional hazards regression to identify factors associated with LDH levels and mortality, respectively.

Results: Among 421 neonates, the mean gestational age was 33.2 ± 3.8 weeks, and 66 (15.7%) died during hospitalization. Serum LDH levels were significantly higher in neonates with sepsis, respiratory distress, asphyxia, poor feeding, respiratory support requirements, and mortality (P<0.05). LDH levels were positively correlated with NICU length of stay (r=0.403, P=0.001). Multivariate analysis showed significantly higher LDH levels in neonates with sepsis and those requiring mechanical ventilation or CPAP.

Conclusion: Elevated serum LDH levels were associated with greater disease severity and poorer outcomes in NICU-admitted neonates and may serve as an early biomarker of adverse outcomes.

Keywords: Neonates, Serum Lactate Dehydrogenase, Sepsis, Asphyxia

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Introduction

Globally, there has been a decline in child mortality in recent decades; however, neonatal mortality remains high. In 2015, the estimated worldwide neonatal mortality rate reached 19 deaths per 1,000 live births, as reported by WHO and UNICEF (1). Neonatal mortality varies across countries due to geographical, economic, or social conditions. In Iran, while child mortality rates for those under five years old have declined in recent years, a significant number of deaths still occur during the neonatal period (2). Early diagnosis of neonatal diseases is challenging as clinical symptoms are often nonspecific. Lactate dehydrogenase (LDH), an enzyme from the oxidoreductase group, holds significant medical importance as it is widely distributed in body tissues and released into the blood following tissue damage. This property makes LDH a crucial marker for identifying diseases, enabling timely diagnosis and appropriate treatment. As the disease improves, blood LDH levels return to normal, correlating positively with disease prognosis (3,4). Previous studies have shown a correlation between serum LDH levels and disease severity, such as

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Key Messages:

↑What is "already known" in this topic:

Lactate dehydrogenase (LDH) plays an important role in cellular metabolism, and elevated serum LDH levels may reflect tissue injury. Serum LDH may also help distinguish healthy neonates from those with underlying illness.

→What this article adds:

Serum LDH levels may be useful for predicting disease severity and duration of hospital stay in neonates. Elevated serum LDH levels are associated with poorer clinical outcomes.

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asphyxia and the duration of oxygen therapy in neonates (5,6). Accordingly, this study aimed to investigate the association between serum LDH levels and disease in neonates admitted to the NICU, aiming to improve early diagnosis and effective treatment to enhance neonatal health outcomes.

Methods

Study design and setting

We carried out a prospective cross-sectional investigation at Besat and Fatemieh Hospitals in Hamadan, Iran, between 2022 and 2023. Newborns receiving care in the hospitals' neonatal intensive care units (NICUs) were enrolled consecutively according to the study eligibility criteria.

Participants and eligibility criteria

The study population consisted of newborns receiving care in the NICUs of Besat and Fatemieh Hospitals in Hamadan, Iran, during the recruitment period. Exclusion criteria were the presence of multiple congenital anomalies identified during the initial examination and maternal addiction or maternal administration of magnesium sulfate or opioids within four hours before delivery.

After eligibility had been established, parental or legal guardian consent was obtained in writing before each neonate was included in the study. Participant recruitment continued throughout the study period until the predetermined sample size was reached.

Sample-size calculation

The sample size estimation drew on the findings reported by Van Anh et al. (6), using a two-sided alpha level of 0.05 and an assumed accuracy of 30%. The calculated sample size was 421 neonates.

$$n = (\frac{(z\alpha/2(\alpha)}{E})2$$

Data collection and clinical assessment

Demographic, perinatal, clinical, laboratory, and outcome data were prospectively collected using a standardized data-collection form. The recorded variables included neonatal age, sex, weight at birth, gestational age, delivery method, pregnancy complications, Apgar scores, presenting symptoms, primary and secondary diagnoses, duration of hospitalization, therapeutic interventions, and clinical outcomes.

Serum lactate dehydrogenase (LDH) concentration was measured within the first 12 hours after birth. LDH levels were categorized according to the laboratory reference range of 100–500 U/L. Laboratory measurements were performed using the routine clinical laboratory methods available at the participating hospitals.

Asphyxia was diagnosed based on the clinical criteria corresponding to Sarnat stages I, II, and III and supported by magnetic resonance imaging (MRI) findings when available. Respiratory distress syndrome (RDS) was diagnosed based on clinical findings, chest radiography, surfactant administration, and the need for respiratory support, including continuous positive airway pressure (CPAP) or mechanical ventilation.

Respiratory complications, including pneumothorax and pulmonary hemorrhage, were diagnosed based on clinical assessment and chest radiographic findings. Congenital heart disease was evaluated using echocardiography. Renal disease and renal failure were assessed using serum creatinine concentration, urine output, and renal ultrasonography; renal dysfunction was defined as a serum creatinine level >1.5 mg/dL and/or urine output <0.5 mL/kg/h, together with supportive ultrasonographic findings when applicable.

Central nervous system (CNS) disorders were assessed based on clinical findings, including seizures and evidence of intracranial hemorrhage, as well as cranial ultrasonography and MRI findings. Gastrointestinal disorders and necrotizing enterocolitis (NEC) were diagnosed based on clinical manifestations and abdominal radiography and/or ultrasonography.

Sepsis and meningitis were evaluated using clinical findings, complete blood count (CBC), and microbiological cultures of blood, urine, and cerebrospinal fluid (CSF), when clinically indicated. Congenital anomalies were assessed by clinical examination and, when indicated, genetic investigations.

The use of blood products, inotropic medications, surgical interventions, respiratory support, and other major therapeutic interventions was recorded. Duration of hospitalization and final clinical outcome were also documented.

Study exposure and outcomes

The primary exposure of interest was the serum LDH concentration measured within the first 12 hours after birth. The primary outcome was neonatal clinical outcome during hospitalization. Secondary outcomes included disease severity, major neonatal morbidities, requirement for respiratory support, inotropic therapy, blood products, surgery, and duration of hospitalization.

Statistical analysis

Statistical analyses were carried out using SPSS software (version 20). A P value of less than 0.05 was considered statistically significant. Quantitative data were summarized as means and standard deviations, whereas categorical data were reported as percentages. Between-group differences in continuous variables were assessed using the independent-samples t-test, while associations between categorical variables were examined using the chi-square test.

A multivariable linear regression model was fitted to examine the factors independently associated with elevated serum LDH levels. In the regression table, both the unstandardized coefficient (B) and the standardized coefficient (β) are reported.

Cox proportional hazards regression was performed to determine significant predictors of mortality. The primary outcome was time to death (event). Neonates who survived to hospital discharge were censored at the time of discharge. The proportional hazards assumption was checked using Schoenfeld residuals and was not violated. The final model included gestational age, birth weight, mode of delivery, resuscitation at birth, and serum LDH level (measured within the first 12 hours of admission).

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Results

This cross-sectional study included 421 neonates. The mean gestational age was 33.2 ± 3.8 weeks, the mean birth weight was 2002.6±774.4 grams, and the mean length of hospital stay was 14.9 ± 14.1 days. The baseline characteristics of the study population are presented in Table 1.

Serum lactate dehydrogenase (LDH) levels were significantly elevated in neonates with sepsis, asphyxia, respiratory support needs, poor feeding, and respiratory distress. Term neonates had higher LDH levels compared to preterm neonates, though the difference was not statistically significant (Table 2).

Multivariate linear regression analysis showed that LDH levels were 124.98 units higher in neonates with sepsis compared to those without, after adjusting for other outcomes. Similarly, neonates requiring mechanical ventilation and CPAP had serum LDH levels elevated by 131.65 and 245.7 units, respectively. The R^2 value indicated that these factors explained 45% of the variability in LDH levels (Table 3).

The mean serum LDH levels and outcomes of hospitalized neonates were analyzed. For the neonates who survived (n=335), the mean serum LDH level was 692.7 ± 383.9. In contrast, for those who did not survive (n=66), the mean serum LDH level was significantly higher at 1109.2 ± 431.1 (P=0.001).

Several variables showed significant associations with mortality in the Cox proportional hazards model. Higher serum lactate dehydrogenase (LDH) levels were associated with a slightly lower hazard of death (hazard ratio [HR] = 0.9993, P<0.001), corresponding to an approximately 0.07% reduction in the hazard of death for each one-unit increase in LDH.

Overall, gestational age, birth weight, and delivery mode were associated with an increased hazard of death, whereas higher LDH levels and resuscitation at birth were associated with a decreased hazard. All variables included in the final Cox regression model were statistically significant, indicating their independent association with the study outcome (Table 4).

A moderate positive association was observed between the duration of NICU stay and serum LDH levels, with higher LDH levels associated with a longer duration of hospitalization (Figure 1).

Discussion

The findings of this study revealed that serum lactate dehydrogenase (LDH) levels were significantly higher in neonates with sepsis, requiring respiratory support, asphyxia, respiratory distress, and those who died. Additionally, higher serum LDH levels were associated with a longer hospital stay.

In neonates, due to the nonspecific signs and symptoms of the disease, diagnostic methods that can identify critically ill infants are highly valuable. In severe diseases, due to oxygen deficiency, glucose is metabolized anaerobically,

Table 1. Baseline characteristics of the patients

Variable		Mean±SD or Frequency (%)
Gestational age (week)		33.2±3.8
Birth weight (gram)		2002.6±774.4
Hospital stay (day)		14.9±1.14
Sex	Male	228(54.2)
	Female	193(45.8)
Plurality	Single	340(80.8)
	Twin or more	81(19.2)
Mode of delivery	Cesarean section	292(69.4)
	NVD	129(30.6)
Antenatal steroids	Yes	129(30.6)
	No	292(69.4)
Resuscitation at birth	Yes	210(49.9)
	No	211(50.1)
Outcome	Recovery	355(84.3)
	Death	66(15.7)

Table 2. Comparison of mean serum LDH levels with baseline and clinical characteristics of the patients

Variables		Frequency (%)	Mean±SD	P -value
Birth weight	Low birth weight	307	778.9±332.8	0.435
	Normal	114	749.9±355.6	
Gestational age	Preterm	284	752.0±320.2	0.096
	Term	137	810.5±370.9	
Poor feeding	Yes	89	903.4±356.3	<0.001
	No	332	735.6±324.7	
Sepsis	Yes	103	685.2±277.5	<0.001
	No	318	106.3±371.1	
Asphyxia	Yes	54	1195.3±379.2	<0.001
	No	367	708.6±282.8	
Respiratory distress	Yes	210	894.2±400.8	<0.001
	No	211	648.5±196.6	
Need to CPAP	Yes	93	888.2±331.6	<0.001
	No	328	737.9±333.1	
Need for mechanical ventilation	Yes	167	838.1±399.6	<0.001
	No	254	727.0±283.2	

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Table 3. Multivariate linear regression analysis for predicting factors associated with elevated LDH levels

Predicting Factors	Coefficient (B)	Standardized coefficient (β)	SE (β)	SE (B)	*P*-value	t-value	R^2
Neonatal infections	124.98	0.16	0.05	39.43	0.002	3.17	0.45
Need for mechanical ventilation	131.65	0.19	0.04	28.07	<0.001	4.69	
Need for CPAP	245.70	0.30	0.04	32.67	<0.001	7.52	

Table 4. Cox Regression Analysis Results for Predictors of Expiring

Variable	Haz. ratio	Std. err.	z	P>z	[95% conf. interval]
LDH	.9992879	.0002024	-3.52	<0.001	.9988913 - .9996847
Gestational age	1.053947	.0181537	3.05	0.002	1.018961 - 1.090135
Resuscitation at birth	.3024428	.0455861	-7.93	<0.001	.2250841 - .4063888
Weight	1.00066	.0000972	6.80	<0.001	1.00047 - 1.000851
Cesarean Delivery	1.469006	.1744299	3.24	<0.001	1.163997 - 1.853939

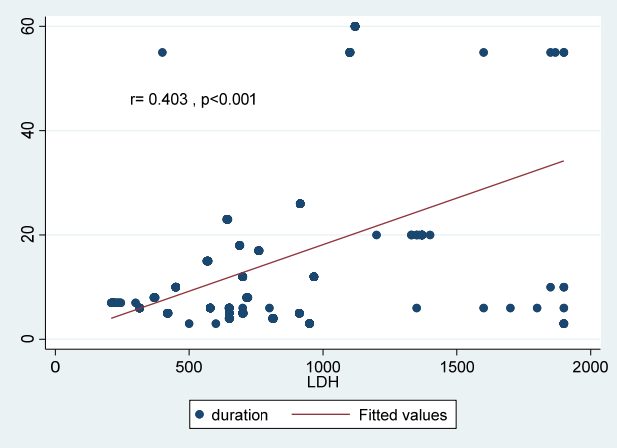


Figure 1. Relationship between serum LDH levels and duration of NICU stay

and pyruvate is converted to lactate by LDH. Consequently, increased lactate production leads to higher LDH levels. Elevated serum LDH is recognized as a marker of tissue hypoxia. Ozkiraz et al. (7) reported a significant positive association between serum LDH level and the duration of oxygen therapy, with a positive predictive value of 88.9%.

In this study, neonates with early-onset sepsis had higher serum LDH levels compared to those without sepsis (685.2 ± 277.5 vs. 371.1 ± 106.3 IU, *P*=0.002). This aligns with the findings of Van Anh et al. (7), where LDH levels were higher in septic neonates (755.5 [645–960.5] vs. 707 [562.25–881.25], *P*=0.003). Other studies also reported increased LDH levels in neonates with infections. For instance, Yilmaz et al. (8) identified a venous lactate level exceeding 3.38 mmol/L at 6 hours after birth as the cut-off value for predicting early-onset clinical sepsis (*P*<0.005). According to Lungu et al. (9), the optimal LDH cutoff value for neonatal sepsis was 589 U/L, with a predictive accuracy of 85.7% for specificity and 76.5% for sensitivity (*P*<0.001). In our study, the mean LDH level of 685.2 ± 277.5 IU indicates that serum LDH serves as a marker of tissue damage in severe sepsis cases.

The present study also showed that neonates requiring respiratory support with CPAP or mechanical ventilation had significantly higher serum LDH levels. In neonates needing CPAP, LDH levels were 888.1 ± 332.6 compared to 737.9 ± 333.1 IU (*P*<0.001), consistent with a 2020 study in Vietnam where CPAP neonates had higher LDH levels (903 vs. 719 IU, *P*=0.042) (6). Ozkiraz et al. (7) reported an LDH cutoff value of 750 U/L with a sensitivity of 90.6% and specificity of 47.6% for neonates requiring oxygen therapy for more than 72 hours. They further reported that higher serum LDH levels were associated with longer oxygen therapy and were also observed in neonates receiving CPAP. In our study, neonates requiring mechanical ventilation had significantly elevated LDH levels (838.1 ± 399.6 vs. 727.0 ± 283.2 IU, *P*=0.001). Similarly, Lee M et al. (10) reported a positive correlation between LDH levels and respiratory support duration. Rahman et al. (11) found similar results, with mean LDH levels of 753 ± 300 IU in neonates requiring supplemental oxygen and 891 ± 350 IU in those needing respiratory support.

According to our findings, preterm neonates had lower mean LDH levels compared to term neonates (752.0 ± 320.2 IU vs. 810.5 ± 370.9 IU, *P*=0.09). Although not statistically significant, this aligns with Van Anh's study (6), where preterm neonates had lower LDH levels than term neonates (594 vs. 751 IU, *P*=0.006). Rahman et al. (11) also reported similar findings (preterm: 759 ± 215 IU vs. term: 862 ± 349 IU). The lower LDH levels in preterm neonates may be due to the physiological immaturity of LDH activity, reduced transaminase enzyme activity, or decreased cellular metabolism in response to hypoxia. In our study, serum LDH levels were higher in neonates with asphyxia

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compared to those without (1195.3 ± 379.2 IU vs. 708.6 ± 282.8 IU, P=0.001). Antil et al. (12) also reported a positive correlation between LDH levels and asphyxia severity at birth, concluding that LDH at 24 hours had higher diagnostic accuracy for distinguishing asphyxiated neonates from non-asphyxiated ones. LDH levels at 24 hours were 772.33 ± 108.61 IU, 1103.69 ± 605.25 IU, and 2457 ± 1019.81 IU for mild, moderate, and severe asphyxia, respectively (P<0.001). Munteanu et al. (13) found that 76.9% of asphyxiated neonates had LDH levels above normal, with a mean LDH of 1235 IU in patients with poor prognosis. They concluded that LDH is a reliable predictor of hypoxic-ischemic encephalopathy (HIE) within the first 12–24 hours after birth. Chawla et al. (14) suggested that LDH had greater diagnostic value than CK-MB for distinguishing asphyxiated neonates. Naseh et al. (15) reported similar findings. Overall, LDH levels increase after asphyxia due to cellular damage, making it a clinically significant, cost-effective, and reliable tool for predicting birth asphyxia.

Finally, as expected, higher serum LDH levels were associated with longer hospitalization and lower survival rates. The LDH levels were 1109.3 ± 431.1 IU in deceased neonates and 692.7 ± 383.9 IU in surviving neonates. This aligns with studies by Osefori (16) and Kumar (17), which showed that elevated LDH levels predict disease severity and worse outcomes.

Strengths, limitations, and future directions

The strengths of this study include its prospective design, two-center setting, and relatively large sample size. Serum LDH was measured early after NICU admission, allowing its association with clinical severity and adverse outcomes to be evaluated. However, LDH was measured at a single time point, and its nonspecific nature may limit the interpretation of its association with disease severity. Future prospective studies involving larger and more diverse neonatal populations, with serial LDH measurements, are warranted to further evaluate its prognostic value and determine clinically useful LDH thresholds.

Conclusion

Based on the findings of this study, higher serum LDH levels were associated with poorer outcomes among neonates admitted to the NICU, particularly those with sepsis and those requiring respiratory support. These results indicate that serum LDH concentrations could provide useful prognostic information in neonates, supporting early recognition of those who may require more intensive surveillance and clinical care.

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Conflict of Interests

The authors declare that they have no competing interests.

Authors' Contributions

MM and MKS contributed to the study design. MM and MS contributed to the data acquisition and analysis. MS, BB, and FE contributed to the data interpretation. YM cleaned and analyzed the data. MS, BB, FE, and MKS drafted or substantially contributed to revising the work. All authors read and approved the manuscript.

Ethical Considerations

This study was approved by the Ethics Committee of Hamadan University of Medical Sciences (IR.UMSHA.REC.1400.933). Written informed consent was obtained from the parents or legal guardians of all participating infants after providing adequate information about the study. Consent was also obtained for the use of the infants' clinical data for research and publication purposes.

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Data Availability

The data analyzed in this study are available from the corresponding author upon reasonable request.

AI Use Statement

The authors did not use artificial intelligence or AI-assisted technologies in the preparation of this manuscript.

References

1. Balaj M, York HW, Sripada K, Besnier E, Vonen HD, Aravkin A, et al.Parental education and inequalities in child mortality: a global systematic review and meta-analysis. Lancet. 2021;398(10300):608-620.
2. Habibelahi A, Heidarzadeh M, Abdollahi L, Taheri M, Ghaffari-Fam S, Vakilian R, et al.Clinical cause of neonatal mortality in Iran: analysis of the national Iranian Maternal And Neonatal network. BMJ Paediatr Open. 2024;8(1):e002315.
3. Mohamed NA, Youness ER. Clinical role of serum lactic dehydrogenase assessment in critically ill pediatric patients with sepsis. 2021;89(9):1917-1927.
4. Liu R, Huang Y, Jia Z, Joseph MJ, Chai K, Xiong T, et al. Elevated serum AST and LDH levels are associated with infant death in premature babies with neonatal leukemoid reaction: a cohort study. Transl Pediatr 2022;11(12):1920-1927.
5. Moustafa A, Mohamed Ahmed M, El-Mazary A, Abdullah N. Can serum lactate dehydrogenase differentiate between respiratory distress syndrome (RDS) and transient tachypnea of newborn (TTN) in preterm neonates? Ann Neonatol. 2024;6(2):92-101.
6. Van Anh TN, Kiem Hao T, Huu Hoang H. The role of plasma lactate dehydrogenase testing in the prediction of severe conditions in newborn infants: a prospective study. Res Rep Neonatol. 2020;10:31-35.
7. Ozkiraz S, Gokmen Z, Boke SB, Kilicdag H, Ozel D, Sert A. Lactate and lactate dehydrogenase in predicting the severity of transient tachypnea of the newborn. j Maternal-Fetal Neonatal Med. 2013;26 (12):1245–1248.
8. Yilmaz A, Kaya N, Gonen I, Uygur A, Perk Y, Vural M. Evaluating of neonatal early onset sepsis through lactate and base excess monitoring. Sci Rep. 2023;13(1):14837.
9. Lungu N, Popescu DE, Manea AM, Jura AMC, Doandes FM, Popa ZL, et al. Hemoglobin, ferritin, and lactate dehydrogenase as predictive markers for neonatal sepsis. J Pers Med. 2024;14(5):476.
10. Lee M, Lee N, Bae MH, Han YM, Park KH, Byun SY, et al. Using lactate dehydrogenase to predict the severity of respiratory distress in term newborn infants with no perinatal asphyxia. Turk J Pediatr. 2021;63(3):393-403.
11. Rahman M, Karmaker P, Rasel M, Nasrin UT, Perveen J, Afreen S, et

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[DOI: 10.47176/mjiri.40.114]

al. Association of plasma lactate dehydrogenase concentration with oxygen dependence in newborns with respiratory distress. Pediatr Rev Int J Pediatr Res. 2023;10(4):69-77.
12. Antil PK, Mahajan K, Chandwani C, Rathee S, Bhardwaj AK, Maini B, et al. Serum lactate dehydrogenase levels with birth asphyxia in term neonates. J Clin Diagn Res. 2020;14(2):SC01-SC03.
13. Munteanu AI, Manea AM, Jinca CM, Boia M. Basic biochemical and hematological parameters in perinatal asphyxia and their correlation with hypoxic ischemic encephalopathy. Exp Ther Med. 2021;21(3):259.
14. Chawla S, Singh RR, Bhatta NK. Lactate dehydrogenase and CK-MB as predictors of hypoxic-ischaemic encephalopathy in newborns with perinatal asphyxia. MedPulse Int J Pediatr. 2019;11(2):58-64.
15. Naseh A, Ashrafzadeh S, Erfanian-Taghvaie M. Is serum lactate dehydrogenase level a good indicator for diagnosis of neonatal birth asphyxia? Ann Pediatr. 2021;4(2):1088.
16. Osefori M, Doya LJ, Nezha B, Dayoub A. Lactate dehydrogenase level as an early predictor of transient tachypnea of the newborn duration and complications. Int J Pediatr Res. 2021;7:075.
17. Kumar N, Yadav A. Umbilical cord arterial blood lactate dehydrogenase and pH as predictors of perinatal outcome in high-risk term pregnancies: a cohort study. J Mother Child. 2022;26(1):27-34.

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