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# Lactate Dehydrogenase Concentration in Different Pediatrics Age Groups

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## Abstract

Normalisation of blood LDH level is associated with improved survival in many studies conducted in adults, in children and neonate. The study aimed to estimate the LDH for different pediatrics age groups. An observational study was conducted at Pediatrics ward, Abu Ghraib General Hospital, from January 2018 to December 2019. Study sample included 250 children, their age ranged from 1 day to 16 years. Children of both gender with these age groups admitted to ward, and blood LDH were calculated. The maternal history, fever, umbilical infection, SOB, hypoxia, sepsis, and respiratory distress syndrome (RDS) were documented accordingly. LDH measured as followed: New born: 160 to 450 units per litre (units/L) and child: 60 to 170 units/L. We divided sample to two-groups, newborn babies (1 day to 1 year) and chid (>1 year to 16 years), and the study variables were documented. The LDH concentration and variables correlation calculated. The prognostic value of serial serum LDH monitoring for predicting morbidity and mortality in sick children is confirmed. There is a correlation, although very clear, between the plasma LDH levels with infection, asphyxia, and RDS.

**Keywords:** LDH; RDS; SOB; Hypoxia

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## Introduction

Monitoring of tissue perfusion markers in ill children is necessary for early recognition of disease which will enable to start an appropriate and timely management. Lactate dehydrogenase (LDH) has been considered as a marker of tissue damage. Normalisation of blood LDH level is associated with improved survival in many studies conducted in adults [1], in children [2,3] and neonate [4-7]. LDH concentrations at the moment of the pediatrics ages may be have a positive correlation with the disease prognosis [8,9]. Several measurements of LDH concentrations are valuable in assessing the prognosis and response to treatment [10,11]. Moreover, lactate dehydrogenase (LDH) is an intracellular enzyme that responds to energy shortages in all organs. Therefore, plasma LDH is also an indicator of body tissue hypoxia [12].

The study aimed to estimate the LDH for different pediatrics age groups.

## Methods

An observational study was conducted at Pediatrics ward, Abu Ghraib General Hospital, from January 2018 to December 2019. Study sample included 250 children, their age ranged from 1 day to 16 years. Children of both gender with these age groups admitted to ward, and blood LDH were calculated. Neonates with congenital abnormalities, children with metabolic diseases, children died with in 24 hours of admission, postsurgical cases, and loss of follow-up were excluded. The maternal history, fever, umbilical infection, SOB, hypoxia, sepsis, and neonatal respiratory distress syndrome (RDS) were documented accordingly. Plasma LDH testing was done at the time of admission as baseline record. Two milliliters of serum with Li-heparin and plasma underwent hemolysis by the automated analyzed technique. LDH measured as followed: New born: 160 to 450 units per litre (units/L) and child: 60 to 170 units/L. Statistical analysis performed using SPSS v24 (IBM Inc., Chicago, IL, USA). Descriptive statistics of qualitative variables consist of numbers, and percentages were measured. For quantitative variables, the mean, median, range and SD for categorical data calculated. An association between variables assessed by chi-square test. A two-sided P-value of less than 0.05 was considered statistically significant.

## Results

We divided sample to two-groups, newborn babies (1 day to 1 year) and chid (>1 year to 16 years), and the study variables listed in table 1. The LDH concentration and variables correlation showed in table 2.

## Discussion

In severe cases, the children bodies loss the oxygen and glucose that is metabolized in the anaerobic pathway to produce energy, and pyruvate is oxidized to lactate by the lactate dehydrogenase enzyme. The higher the oxygen deficiency, the greater the anaerobic metabolism, lead to more lactate is produced, the LDH also increases [13].

Studies have shown that elevated LDH values is significantly associated with negative outcome in paediatric age groups [14-16].

**Table 1:** General variables of the study groups.

| Variables | | No. | % | P value |
|---|---|---|---|---|
| Age | New born | 88 | 35.2 | 0.06 |
| | Child | 162 | 64.8 | |
| Gender | Male | 142 | 58.4 | 0.092 |
| | Female | 108 | 41.6 | |
| Mode of delivery | Normal | 178 | 71.2 | 0.05 |
| | CS | 72 | 28.8 | |
| Fever | Yes | 39 | 15.6 | 0.049 |
| | No | 211 | 84.4 | |
| Umbilical infection | Yes | 41 | 16.4 | 0.01 |
| | No | 209 | 83.6 | |
| SOB | Yes | 98 | 39.2 | 0.056 |
| | No | 152 | 60.8 | |
| Hypoxia | Yes | 33 | 13.2 | 0.025 |
| | No | 217 | 86.8 | |
| Neonatal sepsis | Yes | 28 | 11.2 | 0.02 |
| | No | 222 | 88.8 | |
| RDS | Yes | 8 | 3.2 | 0.001 |
| | No | 242 | 96.8 | |

**Table 2:** The LDH concentration and variables.

| Variables | | LDH (U/L) Mean (median) | P value |
|---|---|---|---|
| Age | New born | 488.3 (442) | 0.01 |
| | Child | 205.5 (195) | |
| Gender | Male | 312.2 (305) | 0.56 |
| | Female | 342.7 (336) | |
| Mode of delivery | Normal | 255.6 (248) | 0.5 |
| | CS | 332.7 (312) | |
| Fever | Yes | 428.2 (410) | 0.01 |
| | No | 201.3 (196) | |
| Umbilical infection | Yes | 477.5 (458) | 0.03 |
| | No | 200.6 (202) | |
| SOB | Yes | 387.4 (380) | 0.02 |
| | No | 198.9 (195) | |
| Hypoxia | Yes | 389.3 (375) | 0.08 |
| | No | 222.4 (200) | |
| Neonatal sepsis | Yes | 413.8 (410) | 0.005 |
| | No | 189.6 (182) | |
| RDS | Yes | 488.5 (475) | 0.04 |
| | No | 176.4 (172) | |

As, a point calculation of serum LDH does not reflect the events that occur after 24 to 48 hours of hospitalization. Interpretation of single LDH has its own limitations as an increased level might indicate other mechanisms of hyperlactatemia like increased lactate production via catecholamine-driven pathways or decreased lactate clearance due to hepatic dysfunction. In the study group of 275 newborn infants at Hue University Hospital, the median of the plasma LDH levels was 719 U/l, the 25th percentile was 578.25 U/l, and the 75th percentile was 892.5 U/l [12]. In the Eva study, the 25th and 75th percentiles of intravenous cord plasma LDH were 252-636 U/L [17].

This study showed newborn babies have LDH level significantly higher than in child (P=0.01). This is explained by the fact that the cell membranes with cell hypoxia in infants are more persistent and that cell metabolism is more incomplete in preterm infants compared to full-term and post-term infants [18].

When comparing newborn with child among severe clinical signs to those without signs, child with signs of fever, umbilical infection, SOB, hypoxia, sepsis, and RDS had higher plasma LDH levels than those with normal status. According to a study by Karlsson M, et al. (2012) [19], infants with respiratory symptoms, such as coughing, wheezing, or rapid breathing, showed no difference (p = 0.05) between the group requiring active neonatal care and that requiring no active neonatal care or between the group with no fever. The plasma LDH levels in the sero-negative neonatal intensive care groups were also higher than those without active neonatal care [19]. Reddy S, et al. (2008) [20], study concluded that the plasma LDH levels most accurately distinguish asphyxiated newborn infants from asymptomatic asphyxiated neonates. Sanjay KM, et al. (2014) [21], study had a mean cut-off LDH value of 580 U/l with a sensitivity of 59.18% and a specificity of 92%.

There is, moreover, a difference in the LDH levels between hypoxia degrees [22]. A study by Karlsson M, et al. (2010) [23], showed that postpartum hypoxia is a poor predictor of LDH levels. The LDH cut-off of 1049 U/l is the best predictor, with a sensitivity of 100% and a specificity of 97%.

Morini F, et al. (2009) [24], study concluded that blood LDL levels were significantly increased with infections ($p < 0.005$). A study by Powers DW, et al. (1974) [25], found that peripheral plasma LDH levels elevated in infants with bacterial meningitis. A study by Zein JG, et al. (2004) [26], concluded that elevated plasma LDH levels in severe infections, as a marker of tissue damage.

## Conclusions

The prognostic value of serial serum LDH monitoring for predicting morbidity and mortality in sick children is confirmed. There is a correlation, although very clear, between the plasma LDH levels with infection, asphyxia, and RDS.

## Funding Supporting

None.

## Conflict of Interest

None.

### References

1. Vincent JL, Quintairos E Silva A, Couto L Jr, Taccone FS (2016) The value of blood lactate kinetics in critically ill patients: a systematic review. Crit Care 20: 257. https://doi.org/10.1186/s13054-016-1403-5
2. Sauaia A, Moore EE, Johnson JL, Chin TL, Banerjee A, et al. (2014) Temporal trends of postinjury multiple-organ failure: still resource intensive, morbid, and lethal. J Trauma Acute Care Surg 76: 582-592. https://doi.org/10.1097/TA.0000000000000147
3. Russell JA, Singer J, Bernard GR, Wheeler A, Fulkerson W, et al. (2000) Changing pattern of organ dysfunction in early human sepsis is related to mortality. Crit Care Med 28: 3405-3411.
4. Aly SA, Zurakowski D, Glass P, Skurow-Todd K, Jonas RA, et al. (2017) Cerebral tissue oxygenation index and lactate at 24 hours postoperative predict survival and neurodevelopmental outcome after neonatal cardiac surgery. Congenit Heart Dis 12: 188-195. https://doi.org/10.1111/chd.12426
5. Schumacher KR, Reichel RA, Vlasic JR, Yu S, Donohue J, et al. (2014) Rate of increase in serum lactate level risk-stratifies infants after surgery for congenital heart disease. J Thorac Cardiovasc Surg 148: 589-595. https://doi.org/10.1016/j.jtcvs.2013.09.002
6. Isfordink CJ, Dekker D, Monkelbaan JF (2018) Clinical value of serum lactate measurement in diagnosing acute mesenteric ischaemia. Neth J Med 76: 60-64.
7. Klee P, Rimensberger PC, Karam O (2020) Association between lactates, blood glucose, and systemic oxygen delivery in children after cardiopulmonary bypass. Front Pediatr 8: 332. https://doi.org/10.3389/fped.2020.00332
8. Kalyanaraman M, DeCampli WM, Campbell AI, Bhalala U, Harmon TG, et al. (2008) Serial blood lactate levels as a predictor of mortality in children after cardiopulmonary

bypass surgery. Pediatr Crit Care Med 9: 285-288. https://doi.org/10.1097/PCC.0b013e31816c6f31

9. Saleh M, Barr TM (2005) The impact of slow rewarming on inotropy, tissue metabolism, and "after drop" of body temperature in pediatric patients. J Extra Corpor Technol 37: 173-179.

10. Chen H, Gong SR, Yu RG (2022) Increased normalized lactate load is associated with higher mortality in both sepsis and non-sepsis patients: an analysis of the MIMIC-IV database. BMC Anesthesiol 22: 79. https://doi.org/10.1186/s12871-022-01617-5

11. Oi Y, Mori K, Yamagata H, Nogaki A, Takeda T, et al. (2022) Peripheral venous lactate levels substitute arterial lactate levels in the emergency department. Int J Emerg Med 15: 7. https://doi.org/10.1186/s12245-022-00410-y

12. Van Anh TN, Kiem Hao T, Huynh HH (2020) The role of plasma lactate dehydrogenase testing in the prediction of severe conditions in newborn infants: a prospective study. Res Rep Neonatol 10: 31-35. https://doi.org/10.2147/RRN.S254500

13. Burtis CA, Ashwood ER, Bruns DE (2012) Lactate dehydrogenase. Tietz Textbook Clin Chem Molecular Diagnostics.

14. Jat KR, Jhamb U, Gupta VK (2011) Serum lactate levels as the predictor of outcome in pediatric septic shock. Indian J Crit Care Med. 15: 102-107. https://doi.org/10.4103/0972-5229.83017

15. Gorgis N, Asselin JM, Fontana C, Heidersbach RS, Flori HR, et al. (2019) Evaluation of the association of early elevated lactate with outcomes in children with severe sepsis or septic shock. Pediatr Emerg Care 35: 661-665. https://doi.org/10.1097/PEC.0000000000001021

16. Bui-Binh-Bao S, Nguyen-Thi-My T, Nguyen-Duy-Nam A, Kim Hoa NT, Pham-Van D (2021) Is serum lactate a good predictor of mortality in children aged 2 months to 5 years with pneumonia in Central Vietnam. Glob Pediatr Health. 8: 2333794X211060806. https://doi.org/10.1177/2333794X211060806

17. Eva WI, Hampus J, Nana W, Linus O, Birger W, et al. (2015) Lactic dehydrogenase in umbilical cord blood in healthy infants after different modes of delivery. J Neonatal Biol 4: 1-4. http://dx.doi.org/10.4172/2167-0897.1000204

18. Zanardo V, Bondio M, Perini G, Temporin GF (1985) Serum glutamic-oxaloacetic transaminase and glutamic-pyruvic transaminase activity in premature and full-term asphyxiated newborns. Biol Neonate 47: 61-69. https://doi.org/10.1159/000242092

19. Karlsson M, Dung KT, Thi TL, Borgström E, Jonstam K, et al. (2012) Lactate dehydrogenase as an indicator of severe illness in neonatal intensive care patients: a longitudinal cohort study. Acta Paediatr 101: 1225-1231. https://doi.org/10.1111/apa.12014

20. Reddy S, Dutta S, Narang A (2008) Evaluation of lactate dehydrogenase, creatine kinase and hepatic enzymes for the retrospective diagnosis of perinatal asphyxia among sick neonates. Indian Pediatr 45: 144-147.

21. Sanjay KM, Sarasu M, Sulekha C, Vijayalakshmi M (2014) Evaluation of serum creatine kinase muscle-brain fraction (CK-MB) and lactate dehydrogenase (LDH) as markers of perinatal asphyxia in term neonates. Int J Med Health Sci 3: 190-194.

22. Choudhary M, Sharma D, Dabi D, Lamba M, Pandita A, et al. (2015) Hepatic dysfunction in asphyxiated neonates: prospective case-controlled study. Clin Med Insights Pediatr 9: 1-6. https://doi.org/10.4137/CMPed.S21426

23. Karlsson M, Wiberg-Itzel E, Chakkarapani E, Blennow M, Winbladh B, et al. (2010) Lactate dehydrogenase predicts hypoxic ischaemic encephalopathy in newborn infants: a preliminary study. Acta Paediatr 99: 1139-1144. https://doi.org/10.1111/j.1651-2227.2010.01802.x

24. Morini F, Ronchetti MP, Bagolan P (2009) Increased serum activity of lactate dehydrogenase in infants with necrotising enterocolitis: a potential marker of advanced disease. Paediatr Child Health 19: S60-S64. https://doi.org/10.1016/j.paed.2009.05.024

25. Powers DW, Ayoub EM (1974) Leukocyte lactate dehydrogenase in bacterial meningitis. Pediatrics 54: 27-33. https://doi.org/10.1542/peds.54.1.27

26. Zein JG, Lee GL, Tawk M, Dabaja M, Kinasewitz GT (2004) Prognostic significance of elevated serum lactate dehydrogenase (LDH) in patients with severe sepsis. Chest 126: 873. https://doi.org/10.1378/chest.126.4_MeetingAbstracts.873S