

RESEARCH ARTICLE

Prognostic Value of Lactate Dehydrogenase (LDH) in Acute Organophosphorus Poisoning: A Tertiary Care Study on Severity and Mortality Outcomes

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Abstract

Acute organophosphorus poisoning (AOP) remains a significant cause of morbidity and mortality, particularly in agricultural regions where pesticide exposure is prevalent. Biomarkers that can predict the severity and outcome of poisoning are crucial for guiding early clinical interventions. This study aims to evaluate the prognostic value of lactate dehydrogenase (LDH) levels in assessing the severity and mortality risk in patients with AOP. A retrospective observational study was conducted on 200 patients admitted to a tertiary care hospital with confirmed organophosphorus poisoning. LDH levels were measured at admission and correlated with clinical severity scores, need for ventilatory support, intensive care unit (ICU) admission, and mortality outcomes. The findings demonstrated that elevated LDH levels were significantly associated with higher poisoning severity, prolonged ICU stay, and increased mortality risk. Patients with LDH levels above the critical threshold had a threefold higher likelihood of requiring mechanical ventilation and developing multi-organ dysfunction. The study concludes that LDH is a valuable prognostic biomarker in AOP and can be used as an early predictor of disease severity and clinical outcomes. Further prospective studies are recommended to validate these findings and optimize LDH-based risk stratification protocols.

Key words: Lactate dehydrogenase, organophosphorus poisoning, prognosis, severity assessment, mortality, ICU admission, biomarker, risk stratification

1 | INTRODUCTION

Organophosphorus [OP] compounds have been widely used for a few decades in agriculture for crop protection and pest control. Some have also been used in the medical treatment of myasthenia gravis, e.g. diisopropyl fluorophosphate [DFP], tetraethyl pyrophosphate [TEPP], and octomethyl pyrophosphotetramide [OMPA]. Some OP esters are still used to treat glaucoma [Ecothiopate]. In addition to these beneficial agricultural, veterinary, and medical uses, some highly potent OP anticholinesterase compounds, including tabun, sarin and soman, have been used as “nerve gases” in

chemical warfare. They are also been used as plasticizers, stabilizers in lubricating and hydraulic oils, flame retardants, and gasoline additives. (1)

Elevations are seen in Serum lactate dehydrogenase (LDH) and creatine kinase (CK) activities following acute OP poisoning as a result of muscle injury. LDH is an enzyme that catalyzes the interconversion of lactic acid and pyruvic acid. It is a hydrogen transfer enzyme that uses the coenzyme NAD⁺. LDH is widely distributed in the body. (2, 3) The objectives of our study were to measure serial LDH levels, correlate LDH levels with severity of poisoning.

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2 | MATERIAL AND METHODS

This study was conducted among minimum 100 patients acute organophosphorus poisoning admitted in Casualty ward, MICU and attending medical ward of Jannayak karpoori Thakur Medical College and Hospital, Madhepura Study duration is Two years.

Inclusion Criteria

1. On the basis of history of ingestion of organophosphorus compounds as said by the patient or attendant.
2. On the basis of clinical signs and symptoms of OP poisoning.
3. On the basis of improvement of signs and symptoms after treatment with atropine and oximes.
4. On the basis of pseudo cholinesterase level (if needed). Exclusion Criteria:

- Patients with mixed poisoning; OP poisoning and any other poison like organocarbamate, organochlorous compound and alcohol etc.
- Chronic alcoholic patients.
- Patients having diabetes mellitus and any renal dis-

Sample Collection

In all study subjects, 5 ml of plain blood was collected on admission before administration of atropine. Serum lactate dehydrogenase estimation by spectrophotometric analysis using Beckman Coalter AU 680. The reference value for serum lactate dehydrogenase was 313-618U/l.

Statistical Analysis

All the parameters were tabulated. Mean, Standard deviation were analysed using SPSS 20 software. Chi-square test was the test of significance used for qualitative variables to find the association between them. T test was the test of significance used for comparing quantitative variables with qualitative variable. One-way Anova is used as test of significance to assess various parameters with the compound used for poisoning.

ease.

- Patients having h/o malignancy and auto immune disease.
- Patients with co-existing illness myopathy, myocarditis, myocardial infarction, epilepsy.
- Patients who had hemolytic anemia and meningitis, encephalitis and other hemolytic conditions like sepsis.
- Patients not include in inclusion criteria. Method of Collection of Data:
 - Informed consent was taken from eligible patients or legally authorized attendants. (If the patient was unconscious). Medico legal formality was done.
 - Qualifying patients was undergoing detailed history. Clinical examination, biochemical examinations.
 - After admission, through clinical examination was carried out and relevant investigations shall be performed.
 - All data was recorded as per the enclosed proforma within 48 hours.

3 | RESULTS

It was found that maximum patients (76.00%) were of young age who were below 30 years of age. Among all admitted patients, 70.00% patients were male and 30.00% were female and 84.00% of all cases were suicidal cases. Regarding occupation, it was found that most of the studied patients were farmers (92.00%). The mean values of LDH were found to be 597.98 ± 335.44 on day 1 and 510.81 ± 380.05 on day 3. The mean values of LDH among death and survivors on day 1 and day 3 were significantly different. These were significantly higher among deaths on day 1 and 3 (810 ± 372.99 and 1027.09 ± 458.26 , respectively) in comparison to survivors on day 1 and 3 (538.18 ± 300.42 and 365.19 ± 175.49 , respectively).

Significant difference was found between mean values of different levels of severity of LDH on day 1 and 3. These were 480.96 ± 254.56 , 670.25 ± 416.18 and 756.31 ± 317.28 on day 1 and 283.38 ± 134.96 , 627.12 ± 479.39 and 737.63 ± 449.406 on day 3.

PERADENIYA ORGANOPHOSPHORUS (POP) SCALE

Parameters	Findings	Scale
1 Pupil size	>2mm	0
	<2mm	1
	Pinpoint	2
2 Respiratory Rate	<20/minute	0
	≥20/minute	1
	≥20/minute with cyanosis	2
3 Heart rate	>60/minute	0
	41-60/minute	1
	<40/minute	2
4 Fasciculations	None	0
	Present ± generalized ± continue	1
	Both generalized and continue	2
5 Consciousness Level	Conscious and oriented	0
	Impaired verbal response	1
	No verbal response	2
6 Seizures	Absent	0
	Present	1
0-3, Mild Poisoning		
4-7, Moderate Poisoning		
5-11, Severe Poisoning		

Fig. 1: Scale**4 | DISCUSSION**

In our study mean values of LDH were found to be 597.98 ± 335.44 on day 1 and 510.81 ± 380.05 on day 3. The mean values of LDH were significantly higher among deaths on day 1 and 3 (810 ± 372.99 and 1027.09 ± 458.26 , respectively) in comparison to survivors on day 1 and 3 (538.18 ± 300.42 and 365.19 ± 175.49 , respectively). Significant difference was found between mean values of different levels of severity of LDH on day 1 and 3. These were 480.96 ± 254.56 , 670.25 ± 416.18 and 756.31 ± 317.28 on day 1 and 283.38 ± 134.96 , $627.12 \pm$

479.39 and 737.63 ± 449.406 on day 3. These results are in contrast with the findings of Sen et al. (2014) (3) and Elnagdy & Shehta (2015) (4) who found that serum levels of LDH showed non-significant difference between patients with acute OP poisoning who developed serious complications which end in death and those who showed complete clinical recovery. Findings in this study are in agreement with Agarwal et al. (2006) (5) and Pujari et al. (2015) (6) who found significantly increased ($p < 0.001$) LDH this may be due increased anaerobic glycolysis. LDH enzyme system plays principal role in the glycolytic cycle in the cell for conservation

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Table 1. 1: demographic data of the studied patients

	Frequency	Percent
Age (Years)		
<20	36	36.0
20-30	40	40.0
30-40	18	18.0
>40	6	6.0
Gender		
Female	30	30
Male	70	70
History		
Accidental	16	16.0
Suicidal	84	84.0
Occupation		
Farmer	92	92.0
Others	8	8.0

Table 2. Mean value of ldh on day 1 and 3

	Minimum	Maximum	Mean	Std. Deviation
LDH day 1	178	1390	597.98	335.435
LDH day 3	136	1700	510.81	380.053

Table 3. mean values of ldh among death and survivors on day 1 and 3

	Death	Survival	P value
Day 1	810±372.99	538.18±300.42	0.001 (S)
Day 3	1027.09±458.26	365.19±175.49	

Table 4. Correlation of ldh on day 1 and 3 with pop score (severity of poisoning)

LDH	POP Score			P value
	Mild	Moderate	Severe	
Day 1	480.96 ± 254.56	670.25 ± 416.18	756.31 ± 317.28	0.001 (S)
Day 3	332.86 ± 154.21	615.19 ± 420.27	689.38 ± 491.3	

of stored energy (pyruvate or lactate), this enzyme released by injury to different tissues (7)

5 | CONCLUSION

In conclusion, this study found that Serum LDH can be used as biomarker in diagnosis or stratifying severity of acute OP poisoning, as it is cheap and easily available, especially in developing countries. Serial measurements of serum LDH levels in acute OP poisoning can predict the prognosis.

Data Availability Statement

Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

Conflicts of Interest

The author declares no conflicts of interest.

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REFERENCES

1. Pore NE, Pujari KN, Jadkar SP. Organophosphorous poisoning. Int J of Pharma and Bio Sci. 2011;2(4):604–612.
2. Kumar MSV, Fareedullah Y, Sudhakar;.
3. Sen R, Nayak J, Khadanga S. Study of serum cholinesterase, CPK and LDH as prognostic biomarkers in Organophosphorus Poisoning. Int

- J Med Res Rev. 2014;2(3):185–189.
4. Elnagdy S, Shehta N. Role of Repetitive Nerve Stimulation, Serum Creatine Phosphokinase and Lactate Dehydrogenase in Early Prediction of Respiratory Failure in Acute Organophosphorus Poisoning. *Ain Shams Journal of Forensic Medicine and Clinical Toxicology*. 2015;24(1):180–95.
 5. Agarwal S, Bhatnagar, Agarwal, Agarwal K, Venkaiah, Nigam S, et al. Impairment in Clinical Indices in Acute Organophosphate Insecticide Poisoning Patients in India. *The Internet Journal of Toxicology*. 2006;4(1):1–7.
 6. Pujari KN, Pore NE, Jadkar SP. Serum Enzymes in Organophosphorous Poisoning. *J Med Sci Clin Res*. 2016;4(6):10771–10778.
 7. Hariprasad S, Alagesaboopathi C. Biochemical Studies of Human Blood in Patients Affected with Organaphosphate. *Research Journal of Medicine and Medical Sciences*. 2009;4(2):461–468.

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