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Original Research Article

Lactate Dehydrogenase (LDH) as a Prognostic Marker in Acute Organophosphorus Poisoning: Association with Severity and Mortality - A Tertiary Care Hospital Experience

Manish Kumar[1], Santosh Kumar Bhagat[2], Anand Kumar Jha[3]

[1]Senior Resident, Department of General Medicine, JNKTMCH, Madhepura
[2]Senior Resident, Department of General Medicine, JNKTMCH, Madhepura
[3]Associate Professor, Department of General Medicine, JNKTMCH, Madhepura

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Corresponding Author: Dr. Santosh Kumar Bhagat
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Abstract:

Background: Organophosphorus compounds have been widely used for a few decades in agriculture for crop protection and pest control. In India Organophosphorus poisoning is the most common. The objective of our study was to measure the LDH Level in acute organophosphorus poisoning. Organophosphorus poisoning (OPP) is a significant public health concern. Lactate dehydrogenase (LDH) is a potential biomarker for tissue damage.

Methods: This study was conducted among minimum 100 patients acute organophosphorus poisoning admitted in Casualty ward, MICU and attending medical ward of JNKTMCH, Madhepura. Study duration is Two years. Serum lactate dehydrogenase estimation by spectrophotometric analysis using Beckman Coalter AU 680.

Results: 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.

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.

Keywords: LDH, OP poisoning, Severity.

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 phosphorofluoridate [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.

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 disease.
- 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.

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

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.

Results

Table 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

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%).

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

The mean values of LDH were found to be 597.98±335.44 on day 1 and 510.81±380.05 on day 3.

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	

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).

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	±	670.25	±	756.31	±	0.001 (S)
	254.56		416.18		317.28		
Day 3	332.86	±	615.19	±	689.38 ± 491.3		0.001 (S)
	154.21		420.27				

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.

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 ± 479.39 and737.63 ± 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 of stored energy (pyruvate or lactate), this enzyme released by injury to different tissues [7]

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.

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