

## SERUM AMYLASE AS A BIOCHEMICAL MARKER TO PREDICT THE CLINICAL OUTCOME IN ORGANOPHOSPHORUS POISONING

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### ABSTRACT

#### BACKGROUND

Organophosphorus poisoning is one of the leading causes for suicidal deaths among the rural population of India. Serum cholinesterase is being used as a marker to assess the severity of OPC poisoning. Nowadays, serum amylase is being proposed for the same purpose due to its ready availability.

The present study was carried out to estimate the serum amylase levels in organophosphorus poisoning patients and to correlate it with the clinical outcome of the patient.

#### MATERIALS AND METHODS

This cross-sectional study was conducted in the Emergency ward of Kanyakumari Government Medical College, Asaripallam during the period from September 2017 to October 2018. A total of 80 patients were included in the study after fulfilling the inclusion and exclusion criteria. Serum amylase levels were estimated at the time of admission and 48 hours after treatment.

#### RESULTS

In organophosphorus poisoning patients, serum amylase level was found to be significantly elevated at the time of admission (262.6 U/L). The mean amylase value was 374.5 U/L for the dead patients and 150.7 U/L for the live patients. These values were statistically significant with  $p < 0.01$ . The severity of increase in serum amylase was directly proportional to the risk of developing respiratory failure and prolonged stay in the hospital.

#### CONCLUSION

Serum amylase can be used as a biochemical marker for organophosphorus intoxication and to predict the clinical outcome of the patients, since it enables early recognition of the risk of developing respiratory failure.

#### KEYWORDS

Organophosphorus Poisoning, Respiratory Failure, Serum Amylase, Peradeniya OP Scale.

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#### BACKGROUND

OPC (Organophosphorus Compounds) include a wide range of pesticides that are commonly used in the agricultural fields of our country in order to control pests, weeds and plant diseases. The clinical significance of OPC poisoning in India is important because of the easy availability of these chemicals.<sup>1</sup> Incidents of OPC poisoning as a suicidal method ranges from 10.3% to 43.8%.<sup>2,3</sup>

The OPC compounds inhibit the action of acetylcholinesterase in the neuromuscular junctions and in

all the parasympathetic nerve endings which results in the excessive activity of acetylcholine in these sites.<sup>4</sup> This excess acetylcholine activity is responsible for both muscarinic and nicotinic symptoms of OPC poisoning. Though the clinical diagnosis of OPC poisoning is not so difficult for a good physician, the need for a biochemical marker is still on demand for two purposes-

- i. Medicolegal aspect of documentation.
- ii. To assess and document the prognosis.

The serum cholinesterase is being used for this purpose but the high cost, availability and the wide range of normal values makes it a difficult choice to practice. Presently, serum amylase is being recommended as a better indicator of severity in OPC poisoning.

Hyperamylasaemia, caused by the cholinergic overstimulation of the pancreas, has been well documented in the OPC poisoning study on several animal models.<sup>5</sup> In organophosphorus poisoning raised serum amylase is secondary to pancreatic injury because of the

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parasympathetic overstimulation and hypersecretion. There have been studies showing the elevated serum amylase correlation to the severity of the organophosphorus poisoning such as risk of developing respiratory failure and need for ventilator support and increased mortality.<sup>6</sup> Peradeniya OP (POP) scale, introduced by N. Senonayake, is a simple bedside clinical tool to assess the severity of the OPC poisoning.<sup>7</sup>

### Objectives

This study was conducted with the following two objectives:

- To estimate serum amylase in OPC poisoning.
- To establish the clinical correlation of serum amylase levels with Peradeniya score in assessing the severity of OPC poisoning.

### MATERIALS AND METHODS

#### Study Design and Study Period-

The study design was cross sectional study including 80 patients admitted in the Emergency Department of Kanyakumari Government Medical College during the period from September 2017 to October 2018. The ethical committee approval was obtained to carry out the study of OPC poisoning.

#### Inclusion Criteria

- Patient with history of OPC poisoning.
- Confirmation of OPC poisoning based on the documentation of the compound by the patient's by-standers.

#### Exclusion Criteria

- Age less than 18 years
- Poisoning other than organophosphorus compounds
- Patient with clinical features of OPC poisoning but without documented evidence of the compound name.
- Consumption of poison along with alcohol
- Patients with known pancreatic or biliary tract disease

The patients were included in the study after getting informed written consent. A preformatted proforma was used to collect the information from the patients. The patients were subjected to detailed clinical history, examination and relevant biochemical investigations were done. Peradeniya OP scale (Table 1) was applied to all the patients at the time of admission.

Pupil Size	>2mm	0
	<2mm	1
	Pin point	2
Respiratory Rate	<20/min	0
	>20/min	1
	>20/min with central cyanosis	2
Heart Rate	>60/min	0
	41-60/min	1
	<40/min	2

Fasciculation	None	0
	Present, generalized or continuous	1
	Both generalized and continuous	2
Level of Consciousness	Conscious and rationale	0
	Impaired response to verbal commands	1
	No response to verbal commands	2
Seizures	Absent	0
	Present	1

**Table 1. Peradeniya Organophosphorus Poisoning Scale**

Mild (0-3), moderate (4-7), severe (8-11)

### Sample Collection

From the eligible patients 3ml of venous blood was collected at the time of admission before the administration of atropine and also after 48 hours of admission. Serum amylase was estimated after the centrifugation at 3000rpm for 15 minutes using the auto analyser AUTOPAK. Other biochemical parameters such as blood sugar, blood urea, serum creatinine were noted.

### RESULTS

Statistical analysis was done with the appropriate statistical tests with  $p < 0.05$  as significant. There was a statistically significant fall in serum amylase following 48 hours of appropriate treatment which was analysed by paired t test. The highest serum amylase was 723 and the lowest level was 42. The mean serum amylase levels at the time of admission and 48 hours following the treatment with correlation to the corresponding severity assessed by POP scale is represented in Table 2.

Peradeniya Grading	No. of Patients	Serum Amylase Level	
		At Admission	After 48 Hours
Mild	51	113.07	69.91
Moderate	16	230.06	152.84
Severe	13	409.70	268.8

**Table 2. Serum Amylase Level in OPC Poisoning**

Out of the 80 patients, 12 died and 68 are alive and their mean amylase levels are represented in Table 3.

	No. of Patients	Mean Amylase Value	P Value
Dead	12	374.5	<0.01
Alive	68	150.7	<0.01

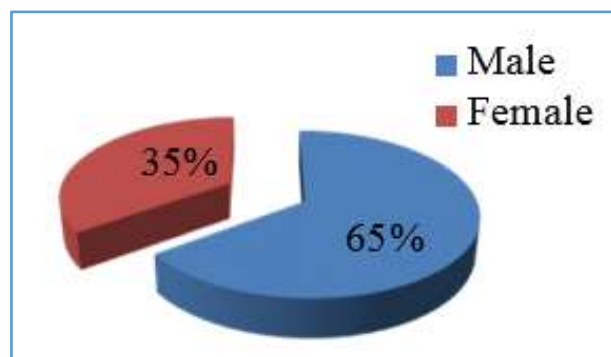
**Table 3. Amylase Value vs. Mortality in OPC**

Out of 12 died, 9 (75%) had high serum amylase levels. The cause of death was respiratory failure. One patient (8.3%) died who had respiratory failure and during the

course of the hospital developed ventilator associated pneumonia. The mean serum amylase level corresponds to the duration of ICU stay also.

## DISCUSSION

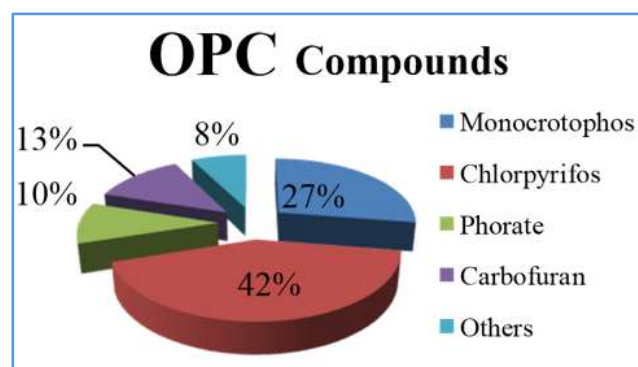
Out of 80 patients who were included in the study after fulfilling the above said inclusion criteria and exclusion criteria, 52 were male and 28 were female (Figure 1).



**Figure 1. Sex Distribution of OPC Poison Cases**

This data was similar to the previous studies.<sup>8,9,10</sup> The mean age of the patients in both male and female was 21-30 which was also similar to the previous studies the

common OPC compounds used for intoxication are enlisted in Figure 2.



**Figure 2. Distribution of Types of OPC Compounds**

The patients with OPC poisoning presented with both the nicotinic and muscarinic symptoms of excessive cholinergic activity. Patients with normal amylase level (<80) did not have any symptoms such as pinpoint pupil, increased secretions or respiratory failure. Patients with serum amylase level (>80) developed severe secretions pinpoint pupil, fasciculation and respiratory failure. The increase in the serum amylase was directly proportional to the risk of developing the respiratory failure.

POP Scale	Serum Amylase	Respiratory Failure Requiring Ventilator Support	Duration of ICU Stay
Mild	113.07	18/51 (35%)	5±2 days
Moderate	230.06	8/16 (50%)	6±2 days
Severe	490.70	13/13 (100%)	10±4 days

**Table 4. POP Scale vs. Amylase Level & Complications in OPC Poisoning**

Also, prolonged stay in the IMCU and hospital were significant with P values <0.01. Similar correlation between the serum amylase and severity of OPC poisoning has been reported by the studies of T.N. Dubey,<sup>11</sup> Rohit N, Salame et al.<sup>12</sup> This study was carried out after getting the approval of the institution's ethical committee.

## CONCLUSION

From the present observational study, it is observed that increased serum amylase is an indicator for organophosphorus compound intoxication. The level of the serum amylase corresponds well with the severity of poisoning and the clinical outcome. However, clinical trials with a larger population are required to confirm the definite relationship between the serum amylase and the severity of OPC poisoning.

## Limitations of the Study

- Small sample size is the main limitation for this study.
- OPC poisoning cases with alcohol intoxication cannot be assessed by using the serum amylase level.

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