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**ORIGINAL RESEARCH ARTICLE**

## **Study of Various Liver Enzymes in Patients with Organophosphorous Poisoning**

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**Abstract:****Introduction:**

Organophosphate (OP) pesticides are used widely for agriculture, vector control, and domestic purposes. Organophosphate poisoning (OPP) is most commonly results from exposure to these pesticides either accidentally or consumed for suicidal purpose. OPP is one of the most common causes of poisoning worldwide including India especially among the farmers. The patients with the OPP are classified according to the **Peradeniya Organophosphorous Poisoning (POP) Scale**. POP scale is a scoring system based on clinical features. In OPP there is decrease in serum cholinesterase level. So serum cholinesterase level is mostly used as a supportive laboratory investigation for the confirmation of diagnosis of OPP and its severity. But this laboratory investigation is not available in all laboratories especially in rural areas where OPP is very common. So we have investigated serum liver enzymes along with serum cholinesterase level in OPP and tried to find out the relation between liver enzymes with OPP and serum cholinesterase.

**Aims and Objectives:**

- 1) Estimation of the level of following parameters before any treatment
  - Serum liver enzymes like alanine transaminase (ALT), aspartate transaminase (AST), and alkaline phosphates (ALP) ,
- 2) Comparison of the above parameters in the controls with the OPP cases.
- 3) Comparison of liver enzymes with serum acetyl cholinesterase level in OPP.

**Material and methods:**

This study will be carried in the department of the Biochemistry in the Dr. Shankarrao Chavan Government Medical College, Nanded (MS).

**Inclusion criteria:**

- 1) Patients with definite history of ingestion of organ phosphate compound poisoning within twenty-four hours of admission.
- 2) Patients with presence of characteristic clinical signs and symptoms of organophosphate compound poisoning.

A **valid written consent** was taken from 60 patients admitted in the Hospital. These patients were divided into two groups as- Group-I is control with 30 patients and Group-II has 30 patients with OPP.

After obtaining history, clinical examination, 5ml of blood sample is taken in plain bulb by single prick for laboratory investigations before any treatment. Serum acetyl cholinesterase and liver enzymes were estimated in the above patients.

Data will be represented as Mean  $\pm$  S.D.

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 11.5.

**Conclusions:**

Serum liver enzymes like alanine transaminase (ALT), aspartate transaminase (AST) and alkaline phosphatase (ALP) increases in all cases of OPP. These enzymes had shown inverse relationship with the levels of serum acetyl cholinesterase. Further level of these enzymes significantly increases in cases where serum cholinesterase activity falls below 50% of normal value which is suggestive of severe OPP. Hence these liver enzymes can be used in OPP instead of acetylcholinesterase where laboratory facilities are limited and they not only help in the diagnosis of OPP but also suggest severity of OPP.

**Keywords:**

Liver enzymes, Organophosphorous Poisoning, acetylcholinesterase

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**Introduction:**

Organophosphate (OP) pesticides are used widely for agriculture, vector control, and domestic purposes. Organophosphate poisoning (OPP) most commonly results from exposure to pesticides. OPP is one of the most common causes of poisoning worldwide including India especially among the farmers. Organophosphate poisoning occurs often misused in various settings, including occupational exposure as well as accidental exposure of children to these agents in the treatment of pets for fleas and other pests. Occupational exposure also occurs in farm workers involved in the application of these agents and those engaged in their manufacture. These agents are also often misused for suicidal purpose. They are the most important cause of severe toxicity and death from acute poisoning worldwide. In developing countries, more than three lakh deaths occur in each year as a result of occupational or deliberate exposure to this

group of pesticides.<sup>1</sup> The WHO estimates that each year nearly 1 million serious accidental and nearly 2 million suicidal attempts involving pesticides occur worldwide.<sup>2</sup>

The patients with the OPP are classified according to the **Peradeniya Organophosphorous Poisoning (POP) Scale**. POP scale is a scoring system.<sup>3</sup> This scoring system depends on signs which require experienced physicians. Therefore the supportive biochemical investigations are required which assists the doctors working in the rural areas. The commonly used biochemical parameters in OPP is serum AChE levels. Organophosphate poisoning causes the inhibition of enzyme acetyl cholinesterase (AChE). The inhibition of cholinesterase activity leads to the accumulation of acetylcholine at synapses, causing overstimulation and subsequent disruption of transmission in both the central and peripheral nervous systems. Acetylcholine is a stimulatory neurotransmitter found in red

blood cells, the neuromuscular junction and the peripheral/central nervous systems.

Normal value of serum cholinesterase level is about 4850 U/L and it decreases in OPP. Decreased serum AChE activity in OP poisoning was considered as severe if serum cholinesterase activity decreases below <50% of the laboratory normal value of 4850 U/L<sup>4</sup> i.e. 2425U/L. So this value of serum acetyl cholinesterase below 50% of the normal value is important for diagnosis of severity of poisoning as well as treatment of the patients.

But serum AChE is not done in the biochemical laboratories situated in rural areas. The other biochemical parameters that can be altered in OPP are liver enzymes like serum alanine transaminases (ALT), aspartate transaminase (AST) and alkaline phosphate. These enzymes are routinely done in most of the biochemical laboratories and available in the rural areas. Therefore, we have estimated liver enzymes along with serum cholinesterase in OPP to find out their role in the diagnosis of OPP. Experimentally previous studies have demonstrated abnormal liver function tests, hepatic necrosis, and fatty changes in OP poisoning patients<sup>5</sup>.

Many complications were developed during the course of treatment of the OPP. The common complications are acute respiratory distress syndrome (ARDS), pneumonia,

respiratory failure, convulsions, acute pancreatitis, cardiac arrest and death. When death occurs, it is most commonly due to respiratory failure from the combination of central and peripheral effects, paralysis of respiratory muscles and depression of the brain respiratory center<sup>6</sup>. When these complications occur it leads to prolonged stay in the hospital, ventilator support and deaths. Majority of the cases of OPP are found in rural areas and they are treated at peripheral hospitals. In these hospitals the laboratory facilities are limited. Therefore new cheaper biochemical parameters are required to for the diagnosis of OPP. So we have investigated serum liver enzymes along with serum acetylcholinesterase level in OPP and tried to find out the relation between liver enzymes with OPP and serum cholinesterase.

#### **Aims and Objectives:**

- 1) Estimation of the level of following parameters before any treatment
  - Serum liver enzymes like alanine transferase (ALT), aspartate transferase (AST), and alkaline phosphates (ALP) ,
- 2) Comparison of the above parameters in the controls with the OPP cases.

- 3) Comparison of liver enzymes with serum acetyl cholinesterase level in OPP.

**Material and methods:**

This study will be carried in the department of the Biochemistry in the Dr. Shankarrao Chavan Government Medical College, Nanded (MS).

**Inclusion criteria:**

- 1) Patients with definite history of ingestion of organ phosphate compound poisoning within twenty-four hours of admission.
- 2) Patients with presence of characteristic clinical signs and symptoms of organophosphate compound poisoning.

**Exclusion criteria:**

Patients with-

- 1) OPP more than twenty-four hours prior to admission.
- 2) Poisoning with other compounds along with organophosphates like alcohol, kerosene, sedatives, etc.
- 3) History of any chronic liver disease or pancreatic disease or muscle disease.
- 4) Organophosphorus poisoning in pregnant females.

A **valid written consent** was taken from 60 patients admitted our Hospital. These patients were divided into two groups as-

**Group-I** – Consists of 30 patients admitted to the hospital for various diseases like fever, minor injury etc.

**Group-II** – Consists of 30 patients admitted to the hospital for Organophosphate poisoning (OPP).

After obtaining history, clinical examination, 5ml of blood sample was taken in plain bulb by single prick for laboratory investigations before any treatment.

The following investigations were done in the above patients.

- 1) The serum cholinesterase level will be estimated according to method of Ellman et al. (1961) on semiautomated analyzer using kits for cholinesterase<sup>7</sup>.
- 2) Serum alanine transaminase (ALT) will be estimated according to IFCC method without PLP on semiautomated analyzer.
- 3) Serum level of aspartate transaminase (AST) will be estimated according to IFCC method without PLP on semiautomated analyzer.
- 4) Serum level of alkaline phosphates (ALP) will be estimated according to AMP method.

Data will be represented as Mean  $\pm$  S.D.

Statistical analysis was performed using the (SPSS) version 11.5.  
Statistical Package for the Social Sciences

**Observations:**

**Table – 1**

Table showing the results of all parameters:

Sr. No.	Parameters	Controls	Cases
1.	Serum cholinesterase(U/L)	5432 .50± 10	3133 .34 ± 123
2.	Serum ALT (U/L)	28 .19 ± 14	92 .16 ±28
3.	Serum AST (U/L)	22 .59 ± 13	73.66 ± 18
4.	Serum ALP (U/L)	35 .5 ± 10	57 .83 ± 18

**Table-2**

Table showing the comparison of serum ALT in controls and cases

Sr. No	Controls	Cases	P value
1	28 .19 ± 14	92 .16 ±28	P < 0.05

**Table-3**

Table showing the comparison of serum AST in controls and cases

Sr. No	Controls	Cases	P value
1	22 .59 ± 13	73.66 ± 18	P < 0.05

**Table-4**

Table showing the comparison of serum ALP in controls and cases

Sr. No	Controls	Cases	P value
1	35 .5 ± 10	57 .83 ± 18	P < 0.05

**Table-5**

Table showing the comparison of serum liver enzymes with serum Acetyl cholinesterase in cases

Sr. No	Liver enzymes in cases	Cases with serum cholinesterase activity decreases <b>below</b> <50% of the laboratory normal value of 4850 U/L n=10	Cases with serum cholinesterase activity is <b>above</b> 50% of the laboratory normal value of 4850 U/L. n=20	P value
1	Alanine transaminases (U/L)	125.5 ± 22	75.5 ± 34	P < 0.05
2	Aspartate transaminase	90.50 ± 12	65.25 ± 30	P < 0.05
3	Alkaline phosphatase	68.5 ± 10	52.5 ± 24	P < 0.05

### Discussion:

In our study we have found decrease in serum acetyl cholinesterase activity in OPP which is inversely related to the severity of OPP. Our study results correlates with the results found by Rehiman S et al, who observed significant correlation between the degree of derangement in serum cholinesterase level and severity of poisoning. A significant correlation was also observed between the deranged serum cholinesterase level and the morbidity of the patients in terms of prolonged duration of hospital stay<sup>8</sup>. Out of 30 cases in our study 10 cases showed serum

cholinesterase level below 50% of their normal value.

We had found increase in serum liver enzymes like ALT, AST and ALP activity in OPP which is related to the severity of OPP. Hui K. found elevated liver enzymes in OPP<sup>9</sup>. S V Kumar *et al* found Congestion, Centrilobular necrosis, Fatty changes, Alcoholic hepatitis and Sinusoidal dilatation in OPP at autopsy. At high doses of OP, rats exhibited extreme injury in their liver<sup>10</sup>.

**Conclusions:**

Serum liver enzymes like alanine transaminase (ALT), aspartate transaminase (AST) and alkaline phosphatase (ALP) increases in all cases of OPP. These enzymes had shown inverse relationship with the levels of serum acetyl cholinesterase. Further level of these enzymes significantly increases in cases where serum cholinesterase activity falls below 50% of normal value which is suggestive of severe OPP. Hence these liver enzymes can be used in OPP instead of acetyl cholinesterase where laboratory facilities are limited and they not only help in the diagnosis of OPP but also suggest severity of OPP.

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**Conflict of Interest: None to Declare**

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