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# Single Enzyme SGPT Estimation is a Cheap and Reliable Prognostic Indicator for Organ Phosphorus Poisoning Cases

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***Abstract:*** *This study defines the laboratory investigations and the outcome in acute organophosphate poisoning patients admitted to medicine indoor department of R G Kar Medical College and Hospital, Kolkata 700004, India. Out of 276 OP poisoning patients, it was noticed that suicidal and intentional poisoning being a major cause as recorded in most cases.58 patients could not survive during the treatment. The cases were selected with definite history of OP poisoning coming with poison samples with major signs and symptoms seen by the physicians which were mostly muscarinic and nicotinic manifestations. The activities of serum Total Bilirubin, Direct bilirubin, SGPT, SGOT and ALP parameters of liver function test were estimated and found to be significantly elevated (p≤0.01) in all the poisoning cases indicating muscular functional impairment due to OP toxicity. But the SGPT levels are highly elevated in dead subjectscompared to the survived one and found statistically significant(p≤0.01). Multiple regression analysis showed that the survival rate of the cases was more among the cases with a high serum SGPT. The findings of this study reflect the usefulness of serum SGPT in the management of OP pesticide poisoning and a good prognostic indicator of survival.*

***Keywords:****Organ phosphorus, SGOT, SGPT, ALP,*

## I. Introduction

Organophosphorous (OPs) compounds have been employed as pesticides,petroleum additives and chemical warfare nerve agents. [1] The OPs have been used as pesticides for more than 50 years and are still used in most developing countries including India. [2] They are also named anticholinesterase agents as they act by inhibition of acetyl cholinesterase (AChE) resulting in symptoms and signs associated with cholinergic receptor stimulation. It is believed that between 750,000 and 3,000,000 OP poisoning occur globally every year. [3] Organophosphorous pesticides poisoning can result from occupational, accidental or intentional exposure. Mortality is higher in the developing countries where OP pesticides are readily available and may be used for suicide. They are estimated to cause 300,000 fatalities annually. [4]

Organophosphorous compounds can easily cross the respiratory epithelial and dermal membranes because of their lipophilic structures, and thus they are formed mostly as aerosol.[5, 6] Gastric mucosa is also very permeable to Ops, and is a classical way of absorption in suicidal cases.[7]Organophosphorous compounds are distributed in the whole body, particularly in fatty tissues, and their fast degradation usually inhibits their accumulation. Some OPs are eliminated without considerable metabolism. Two main types of cholinesteraseinclude: 1-Acetyl cholinesterase (AChE) or true cholinesterase and 2-Butyrylcholinesterase (BChE) or pseudo cholinesterase. Acetyl cholinesterase is the principal form that is found in neurons, neuromuscular junctions and erythrocyte membranes. Another form of AChE, which is known as serum cholinesterase (ChE), is a group of enzymes presentin plasma, liver, cerebrospinal fluid and glial cells.[8] However, they usually become degraded and eliminated in urine, feces and exhaled air. Most OP insecticides are activated through oxidation in the liver by enzymes of cytochrome P450 system and flavin-containing monooxygenases.The toxicity of Organphosphorus poisons and paucity of appropriate medical facilities accounts for a highfatality rate. Their ease of access and socio–cultural factors play important role in choice of OP as a self-poison and the incidence is higher among young economically active group with a common fatality ratio of 20%. In India, OP compounds cause more self-poisoning deaths in India.

The enzymes inhibited by OPs provide specific biomarkers of exposure,until the turnover of the enzyme in favorable cases. Accessible AChE is found in red blood cells, andBChE in the plasma.[9]Butyrylcholinesterase is usually preferred as an early biomarker due to its higher presence and sensitivity than AChE, however, is not as specific as AChE. Screening the red blood cell concentrations of AChE in individuals who are exposed to these agents is essential. Although screening has several limitations.[10]A prospective study in workers engaged in OP insecticide production. A total of 161 workers were included as subjects in this study. There were 40 subjects in control group, 50 subjects in maintenance group and 71 subjects in exposed group. The serum levels of SGOT & SGPT, were within normal limits in the maintenance and exposed groups subjects.[11] A cohort study of 106 intensive agriculture workers. They were assessed twice during the course of

a spraying season for changes in serum biochemistry, namely enzymes reflecting cytotoxicity (SGPT, SGOT, CK, and amino-oxidase) and other biochemical parameters, such as markers of nephrotoxicity (urea, creatinine) and lipid profile (cholesterol and triglycerides). Several criteria for estimating pesticide exposure were used, the most important one being serum cholinesterase depression greater than 25% from baseline to peak exposure. Their results revealed an association of pesticide exposure with changes in SGOT (increased activity).[12] Another prospective study on 109 patients and concluded that butyril cholinesteraseactivity was significantly decreased in the pesticides exposed farmers as compared to controls . Plasma biochemical markers including ALT, AST, CK, LDH and phosphate were significantly raised in the pesticides exposed farmers as compared to control group. Total pesticides residues revealed a significant positive correlation with SGOT, LDH, SGPT.[13]

Estimation of acetyl cholinesterase and butyryl choline esterase is very cumbersome as well as costly procedure and available in very few diagnostic centre. So our aim is to provide aeasy, reliable, readily available parameter in all kind of set ups for diagnosing the severity of Ops poisoning.

## II. Materials and Methods

A total of 276 diagnosed OP poisoning cases (Patients bringing with them the poison samples with signs and symptoms of Acute OP Poisoning) admitted to indoor Patient Department of R .G . Kar Medical College and Hospital Kolkata 700004, India were studied.Cases with known liver dysfunction, malnutrition, chronic infections, hypersensitivity reactions,and on drugs like codine, morphine orhaving pregnancy, age greater than 60 years were excluded from the study.Disparity arising due to the time period of medical care initiation was excluded from the study as all the sampleswere all taken at 24 hours from the time of incidence. Information on age, sex, residential address, socioeconomic status, education, history of marital life, psychological problems, major illness, past hospitalization, family disturbances and symptoms observed during hospitalization etc. were recorded in pre-recorded proforma. Complete occupational history was also noted on subjects belonging to industrial background. History of present illness at the time of admission i.e. presenting complaints and symptoms observed during hospitalization and medication, if any, were also noted.. The clinical examination as per the proforma consists of general and systemic examination including neurological examination, respiratory, cardiovascular system (including electrocardiogram recording) and gastrointestinal system. A sample of venous blood sample was withdrawn from each patient for laboratory investigations. The activities of serum SGPT,SGOT and other liver function test parameter were measured by automated analyzer XL 600 by standard reagents.

Data are presented as Mean ± SD. SPSS software was used to calculate t-test for significance levels between the control and poisoning cases and correlation was used for studying various relationships. Two sided p values were calculated throughout. P values ≤ 0.05 were considered significant.

## III. ResultsAnd Discussion

Out of the 276 patients, 58 patients who died were considered to be cases for the study, and the rest of the patients who survived were the controls. Both these group received same treatment regimen and were subjected to the blood investigation for Serum Total Bilirubin, SGOT level, SGPT level And ALP level.
The descriptive statistics were tabulated as follows (TABLE 1)

**Table 1**

| | | N | Mean | Std. Deviation |
|---|---|---|---|---|
| BILIRUBIN | CASE | 58 | 1.89 | 0.21 |
| | CONTROL | 218 | 1.34 | 0.29 |
| SGOT | CASE | 58 | 201.41 | 8.02 |
| | CONTROL | 218 | 41.11 | 2.26 |
| SGPT | CASE | 58 | 36.16 | 2.35 |
| | CONTROL | 218 | 29.45 | 4.09 |
| ALP | CASE | 58 | 151.88 | 6.14 |
| | CONTROL | 218 | 145.05 | 3.46 |

For all the cases who died the mean Total bilirubin level was 1.89 with SD of 0.21, where as for the people who survived (the control group) the mean Total bilirubin level was 1.34 with SD of 0.29.
All the cases who died the mean SGOT level was 201.41with SD of 8.02, where as for the people who survived ( the control group) the mean SGOT level was 41.11 with SD of 2.26.All the cases who died the mean SGPT level was 36.16with SD of 2.35, where as for the people who survived ( the control group) the mean SGPT level was 29.45 with SD of 4.09.All the cases who died the mean ALP level was 151.88with SD of 6.14, where as for the people who survived (the control group) the mean ALP level was 145.05with SD of 3.46.

To find out if there is any difference between means of different studied parameters of cases and controls independent samples't' test was performed (TABLE 2)

**Table 2**

| | 't' VALUE | 'P' VALUE |
|---|---|---|
| **TOTAL BILIRUBIN** | 3.706 | <0.001 |
| **SGOT** | 259.939 | <0.001 |
| **SGPT** | 11.964 | <0.001 |
| **ALP** | 11.105 | <0.001 |

So, the means of all the studied parameters differ significantly at p<0.001 level in cases from that of controls.

Now to determine which parameter is most dependable to predict the outcome estimation of the area under the curve was done by the ROC curve was calculated (Fig. 1)

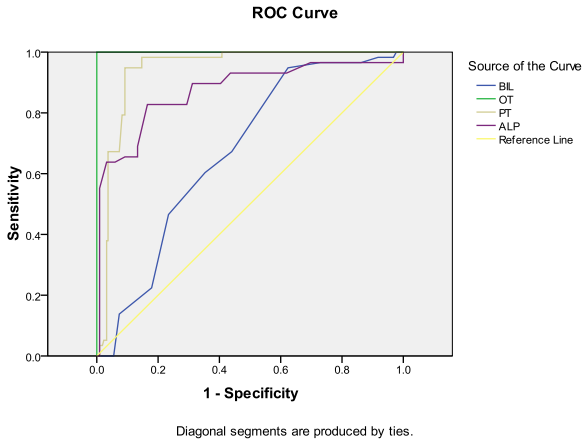


**Figure 1**

The above ROC curve was thus explained as below (TABLE 3)

**Table 3**

| Variables | Area Under The Curve | Std. Error[a] |
|---|---|---|
| **Total Bilirubin** | .672 | 0.035 |
| **Sgot** | 1.000 | 0.000 |
| **Sgpt** | .942 | 0.014 |
| **Alp** | .874 | 0.031 |

These areas under the curves with their respective standard errors were compared by Z statistics to find out the statistical significance. (Table 4)

**Table 4**

| | SGOT Vs SGPT | SGOT Vs ALP | SGOT Vs BIL |
|---|---|---|---|
| Z Statistic | 4.143 | 4.065 | 9.371 |
| P Value | <0.0001 | <0.0001 | <0.0001 |

Estimation of Sgot differs significantly from all the other parameters at p<0.0001 level.So, estimation of SGOT can predict the outcome most efficiently than the other parameters.Though the biasness due to varying time of initiation of medical care was not a influencing factor in our study .However, it could be dependent or influenced by the quantum of exposure and toxicity of insecticide. In most of the cases the confounding factor were made minimised by matching.

## IV. Conclusion

In spite of the above limitation the study thus conducted clearly has the potential of being a presumptive predictor for fatal outcome of the OP poisoning cases. As this is a routine procedure to conduct a

LFT among these type of cases as it causes liver damage due to the passage of it through the organ, SGOT level can easily predict the outcome of case fatality. This cheap method of detection can make the physicians more vigilant about the liver damage in OP poisoning cases.

**Conflict of Interest**

This study has got no conflict of interest.

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