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A Prospective Study of Blood Sugar as a Prognostic Indicator in Organophosphorus Compound Poisoning

[1]James Milton Aifred and [2]Seethepalli Venkata Ramana

[1]Department of General Medicine, Meenakshi Medical College Hospital Research Institute, Enathur, Kanchipuram, Tamil Nadu-631552, India

[2]Department of General Medicine, NRI Medical College and General Hospital Chinakakani-522 503, Managalgiri (M), Guntur (D), Andhra Pradesh, India

ABSTRACT

Random blood sugar level is one of the factors which influence the severity of the Organophosphorus compound poisoning. This study aims to predict the prognosis and mortality of Organophosphorus compound poisoning based on random blood sugar level and correlate it with pseudocholinesterase activity. 103 cases of OP poisoning were studied. Patients above 18 years of age were included and those patients with mixed poisoning, alcohol consumption and Diabetes were excluded. Detailed history and clinical examination was done according to the proforma with special reference to the need for ventilatory support, admission RBS and pseudocholinesterase levels. Of the 103 patients, males were 57%, females 43%, majority were between 18-25 years with farmers (55%) as the main group and suicidal ingestion (90%) as the main cause. Methyl parathion was the commonest compound (15%) consumed but most of the time the compound was unknown (33%). Commonest symptoms were vomiting (94%) and salivation (94%). Respiratory failure was the commonest complication (30%). Hyperglycemia occurred in 39% of patients with 73% developing complications and 50% requiring ventilator. Pseudocholinesterase was <4000U/L in 19% of patients, with complications occurring in 100% and 79% requiring ventilator support. Mortality was 35% in patients with hyperglycemia ($p<0.05$S) and 79% in patients with pseudo cholinesterase <4000U/L ($p<0.001$ HS). Admission Random Blood sugar >200mg/dl and Pseudo cholinesterase <4000 U/L are reliable parameters to predict mortality and ventilator requirement in organo phosphorous compound poisoning. By Chi Square Test, drop in Pseudocholinesterase level and increase in blood sugar level were associated with ventilator requirements, mortality and complications and was found to be significant.

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Key Words
Organophosphorus poisoning, hyperglycemia, pseudo cholinesterase

Corresponding Author
Seethepalli Venkata Ramana, Department of General Medicine, NRI Medical College and General Hospital Chinakakani-522 503, Managalgiri (M), Guntur (D), Andhra Pradesh, India

Author Designation
[1,2]Associate Professor

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INTRODUCTION

Acute Organophosphorus poisoning (OP) is widespread in the developing world and its frequency is increasing[1,2]. As per world health organization (WHO), 3million cases of pesticide poisoning occur every year and most of them occur in Asia and at least 50% due to organophosphorus poisoning[1,3,7]. In India also it is the commonest poisoning and exposure to compounds in the form of nerve agents and pesticides poses an ever increasing military and civilian threat. India is a predominantly agrarian country with about 60-80% of rural population. Pesticides are routinely used for advanced farming and they are readily available over the counter. Therefore a pesticide is an easy access source for the suicidal purpose[3,4]. They have been imported in India since 1951, but very few knew the nature of these compounds as a virulent poison till the Kerala food poisoning tragedy in 1958. This tragedy took a toll of hundred and odd due to inadvertent stocking of food stuff and folidol packages in the same hold where the folidol containers leaked and contaminated the gunnybags containing food stuff[5,6]. Organophosphorus insecticides inhibit acetylcholinesterase causing accumulation of acetylcholine at central and peripheral cholinergic nerve endings, including neuromuscular junctions[7,8]. Op poisoning is treated by decontamination, antidotes, an anticholinergic atropine, an oxime-pralidoxime and respiratory support[9,10]. A growing body of evidence suggests that hyperglycaemia is associated with increased morbidity and mortality and poor prognosis outcomes in critical illness. The mortality in most large series is 7-12 percent. Study aims at studying random blood sugar values at admission as a prognostic indicator and to correlate it with pseudocholinesterase levels.

MATERIALS AND METHODS

Source of Data: One hundred and three patients of organophosphorous poisoning were included in the study.

Inclusion Criteria:

- Patients were selected irrespective of sex, but cases above the age of 18 yrs were included in the study.
- Patients with history of consumption of organophosphorous compound presenting within 24 hours.

Exclusion Criteria:

- Patients with age <18 years.
- Patients who had consumed alcohol, other poisons, drugs, mixed poisons.
- Patients with history of diabetes mellitus.
- Patients already treated at other centers and referred to our center for further management were excluded from the study.

Diagnosis: A provisional diagnosis of OP poisoning was made on the basis of definite history of OP poisoning by the patient or attendants and this was substantiated by examination of the container when available. The diagnosis was further substantiated by typical clinical features (miosis, hyper salivation, fasciculation) and characteristic odour of stomach wash or vomitus. Each patient enrolled for study underwent a detailed clinical examination as per the proforma, specially designed for the study, which included examination for presence of respiratory failure, detailed assessment of CNS and cardiovascular examination. All patients were given stomach wash, body and eye wash, in patients who had exposure via uncovered skin and/or eyes. This was followed by 1 gm bolus dose of PAM (Pralidoxime) by slow IV injection. Thereafter, a bolus dose of atropine (2 mg iv push) was administered after correcting cyanosis, till signs of atropinisation (clear lungs, dry axilla, dry mucosa, heart rate >100 bpm and dilated pupils). All patients were monitored closely and continuously and all clinical signs assessed 12thhourly till complete recovery and were followed till discharge from hospital.

Ventilatory Support was Considered in Patients with:

- Apnea or obvious hypoventilation.
- Persistent cyanosis.
- Persistent tachypnea (RR >24/min) and.
- Deranged arterial blood gases (PaO2 <60 mm Hg, PaCO2 >50 mm Hg, pH <7.2).

Investigation: All patients underwent following biochemical investigations:

- Blood routine, Hb%, TC, DC, ESR.
- Admission Blood glucose values.

Method: Glucose Oxidase and Peroxidase method. Principle:Glucose is oxidized to gluconic acid and hydrogen peroxide by glucose oxidase. Hydrogen peroxide reacts with o-dianisidine in the presence of peroxidase to form a coloured product. Oxidized o-dianisidine reacts with sulfuric acid to form a more stable coloured product. The intensity of the pink color measured at 540 nm is proportional to the original glucose concentration.

Admission Blood Glucose >200 mg/dl was Taken as Hyperglycemia:

- Blood urea, Serum creatinine.
- Serum electrolytes.
- Liver function tests.
- E.C.G.
- ABG.
- Admission Serum pseudocholinesterase.

Method of Estimation of Pseudocholinesterase: Measured with S-butyryl thiocholine iodide using Dibucaine as inhibitor. Cholinesterase catalyses the

hydrolysis of S-butyrylthiocholine Iodide to thiocholine iodide and butyrate. Thiocholine iodide reacts with 5.5 -dithiobis-2-nitrobenzoate (DTNB) and forms the yellow coloured product 5-mercapto-2-nitrobenzoate. The substrate specificity prevents interference with cholinesterase liberated from erythrocytes even during slight hemolysis. The rate of formation of 6 mercapto-2-nitro benzoate is directly proportional to the catalytic cholinesterase activity. It is determined by measuring the increase in absorbance at 480nm. Normal values of serum pseudocholinesterase ranges from 4150 to 7200 U/L.

Statistical Test: All the collected data of 103 patients was analysed using appropriate statistical test-Chi Square (x2) for detecting the p value. Other statistical tests like One way ANOVA, Student's unpaired t test and Karl Pearson's coefficient of correlation were used wherever appropriate.

RESULTS AND DISCUSSIONS

- Age groups range from 18-65 years.
- Mean age of the patients is 27.8yrs.
- Majority of the poisoning are found in the age group of 18-25 years (55%).
- Out of 103 cases 59 were males and 44 were females with male to female ratio of 1.34:1.
- In this study male predominance is seen 57%.
- 93 cases were due to suicide and 10 were accidental in nature. So suicidal ingestion was the main motive of poisoning-90%.
- Ingestion in 93 cases (90%) was the main mode of poisoning followed by dermal exposure in 10(10%)
- Farmers are the main group involved in poisoning in 55 cases (55%), followed by students-20(19%).

Table 1: Type of Poison

Types of poison	Number of cases	Percentage
Methyl Parathion(MPN)	15	15
Malathion (MTN)	14	14
Monocrotophos (MCS)	10	10
Chlorpyriphos(CPS)	10	10
Fenthion(FTN)	8	8
Parathion(PTN)	8	8
Dicrotophos(DCR)	2	2
Dimethoate(DMT)	1	1
Temephos(TMS)	1	1
Unknown (U)	34	33

- In this study the most common agent encountered is Methylparathion, followed by malathion and monocrotphos. However in 33% of case the poison was unknown.
- In this study majority cases had consumed between 50-100 ml.
- In the study majority of patients came within 2-4 hrs of exposure (51%).
- In this study vomiting and hypersalivation-94% was the major symptom followed by sweating (64%),Lacrimation (64%), Blurring(50%).
- In this study 42% patients developed complications.
- Most common complication in this study was respiratory failure requiring ventiltaory support in 30% patients.
- In our study, 40 patients (39%) had RBS >200 mg/dl which was taken as hyperglycemia.
- In our study 18% patients had pseudocholinesterase <4000U/l.
  36% between 4000-5000 U/l and 46% >5000 U/l.
- Of all the patients with hyperglycemia, 29 (73%) developed at least one complication, while complications were absent in 49 (78%) of normoglycemic patients.
- 19 (100%) patients with Pseudocholinesterase <4000 U/l developed complications where as complications were seen in 21 (57%) with pseudocholinesterase between 4000-5000 U/l. Complications were absent in 44 (94%) patients whose Pseudocholinesterase was >5000 U/l ventilator support as compared to 14 (22%) of normoglycemic patients 20 (50%) patients with hyperglycemia needed it.
- 15 (79%) of patients with pseudocholinesterase <4000 U/l needed ventilator support. Only 3 (6%) patients with Pseudocholinesterase >5000 U/l needed ventilator.
- 26 (65%) patients with hyperglycemia improved where as 14 (35%) expired as compared to 59 (94%) of normoglycemic patients who improved.
- 15(79%) of patients with Pseudocholinesterase <4000 U/l expired as compared to 1 (2%) of patients with Pseudocholinesterase >5000 U/l.
- 14 (35%) of patients with hyperglycemia had Pseudocholinesterase <4000 U/l where as 37 (59%) of patients normoglycemia had Pseudocholinesterase >5000 U/l.

Acute Organophosphorus poisoning (OP) is widespread in the developing world and its frequency is increasing[1]. WHO has estimated that nearly 2,00,000 people worldwide die from pesticide poisoning. In India also it is the commonest poisoning. Owing to limited availability of facilities and finances in the developing countries, all OP poisoning patients cannot be managed in the intensive care unit. It is therefore important that clinical features and other factors which indicate severity of poisoning and also predict the need for ventilatory support, be identified at the initial examination at admission in the emergency ward. The present study shows maximum cases consuming amount 50-100ml.This result was comparable to the study of Tanveer *et al* in which mean amount consumed was 77.5ml. In the study of Kavya *et al,* 38% consumed 60ml of OP poison. In majority of cases of present study time interval between exposure to Organophosphorus poison and start of treatment was 2-4 hours (51%). The study of Shyam Chand *et al*, showed that majority(75%) of cases present within 6hours[11-13]. The present study shows maximum incidence of organophosphorus compound poisoning among 18-25 years of age group (55 %) with mean age of 27.8 years. The present study goes in concurrence with the above mentioned studies. This could be attributed to the fact that men are exposed to more stresses of life and perhaps they are less efficient in managing the same when compared to women. In the present study, in 93% cases mode of poisoning is

ingestion, which is consistent with the results of Sungur[14], where in 93.6% cases mode of poisoning is ingestion. In the present study, Methyl parathion is the most common organophosphorus compound consumed by the victims (15%). In all above studies most common OP compound poison was observed to be Methyl parathion, similar to the present study. However, the most common poison in Kale bhagwat[3] study was dimethoate. In all the above mentioned studies, vomiting is the most common symptom followed by excess salivation. Respiratory failure was the most common complication seen in the present study which was 30%. Similar results were observed in Goel *et al* study, in which most common complication was respiratory failure (34.95%). In the Sungur *et al* study, 29.7% incidence of respiratory failure were observed which goes in concurrence with the present study. Serum Pseudocholinesterase levels were reduced in case of OP poisoning. Aygun[15] found that serum cholinesterase level estimation is useful in diagnosis of OP poisoning in acute phase. In the present study it was noted that Pseudocholinesterase values<4000U/L ($p<0.001$) was associated with complication in 100% which was statistically significant ($p<0.001$). In this study it was observed that admission hyperglycemia (RBS>200 mg/dl) was associated with complications in 73% cases as compared to 22% in normoglycemics. This showed a correlation that was highly significant ($p<0.001$). This correlates with the study done by Pritee G Pendkar et al1 where hyperglycaemia (>200mg/dl) was associated with complications in 72% cases compared to normoglycaemics (22%). In addition hyperglycemia also showed a significant association with need for ventilator support($p<0.05$) in the present study. 50% of patients with hyperglycaemia were found to need ventilator support as compared to 22% with normoglycaemia. The present study matches with the study of Pritee[1] in which 50% of hyperglycaemic patients need ventilatory support and 22% normoglycaemic patients were in need of ventilatory support. It was observed that there was mortality of 65% in patients with hyperglycemia which was significant ($p<0.05$). The above results indicate RBS value >200mg/dl is a good marker for predicting the mortality and also for assessing the need for ventilator support. Admission RBS was comparable to the drop in pseudocholinesterase levels.

CONCLUSION

Young males of rural background with agricultural occupation are the risk factors associated with op poisoning cases. Poisoning is diagnosed on the basis of history and clinical examination which can be confirmed by biochemical investigation. Hyperglycemia can occur in moderate to severe organophosphorous poisoning. The occurrence of hyperglycemia correlates with complications, requirement of ventilator support and poor prognosis. Hyperglycemia also correlated with low levels of pseudocholinesterase in predicting mortality and ventilator support. In conclusion admission RBS >200 mg/dl can be considered as a prognostic factor in predicting the morbidity and mortality of organophosphorous poisoning.

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