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A Study on Serum Amylase Levels in Acute Organophoshorous Poisoning and It's Relationship with Clinical Severity And Outcome

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ABSTRACT

Background & Objectives: Acute poisoning by organophosphorous Pesticides (OP) has reached epidemic proportions in most parts of the world, particularly in developing agrarian countries, where the toxicity of available poisons and paucity of appropriate medical facilities ensure a high fatality rate. Earlier, plasma cholinesterase was used to assess the severity of poisoning and determine the clinical course. Presently serum amylase has been recommended as a better indicator of severity. Hence in this study correlation between serum amylase levels and clinical severity of acute OP compound poisoning has been studied.

Methods: A prospective study was conducted on 50 patients admitted to emergency ward within 24 hours of OP intoxication in Mamata Genereal Hospital, Khammam who met the inclusion criteria. Estimation of serum amylase was done at the time of admission and at 24 hours. The data was compared with 50 age matched individuals.

Results: This study revealed significant elevation of serum amylase levels at admission in OP poisoning patients which showed significant decrease with treatment. The overall mean value for amylase was (174.26 in cases U/L Vs 32.08 in controls, p<0.0001) at admission. The bad prognostic factors are very well correlated with serum amylase levels are Fasciculations-311 U/L, Severe secretions-333 U/L, CNS depession-340 U/L, Respiratory failure-368 U/L and Convulsions-441 U/L. The overall mean value of serum amylase is significantly higher in non-survivors Vs survivors (318.4 U/L Vs 75.87 U/L, p<0.0001).

Conclusion: Hyperamylasemia in OP intoxicated patients can provide a high degree of suspicion of subsequent respiratory failure and other complications.

KEYWORDS : Organophosphate poisoning; Acute pancreatitis; Serum amylase; Hyperamylasemia.

INTRODUCTION

Over the last few decades, agricultural pesticides have become a common household item in rural areas of the developing world. As a result of their easy availability, pesticides have also become commonly used for intentional self-poisoning. The incidence is higher in young economically active group with a common fatality ratio of 20% [1].

Several studies [2-6] reported elevated serum amylase levels in patients with organophosphorous compound poisoning (OP) and found hyperamylasaemia to be closely related to clinical severity and the presence of shock. A retrospective study of OP poisoning in the intensive care unit conducted by Matsumiya N and Tanaka M [7] analyze the incidence of respiratory failure, concluded that an increase in plasma amylase above the normal range on the day of admission was related to the development of respiratory failure and the elevation of amylase level was predictive of subsequent respiratory failure. In adults the frequency of acute pancreatitis related to OP poisoning is 12.7%. In 1979, Dressel described the first case report of pancreatitis following OP poisoning. Acute pancreatitis is a well known complication of OP poisoning. Hyperamylasaemia and acute pancreatitis have been reported after oral or dermal exposures in man. The cause and the effect relationship of this disease entity have been demonstrated in animal studies [8]. However, this association may still have not been widely recognized. Neither do commonly used surgical and medical textbooks describe acute pancreatitis as a presenting feature of organophosphorous poisoning nor is organophosphorous poisoning listed as one of the aetiological factors of acute pancreatitis and its complications.

Although we come across a large number of patients with this poisoning now in our clinical practice, there is no local data available regarding the frequency of high amylase levels and this potentially grave complication of pancreatitis in pesticide poisoning. This study was therefore designed to determine the frequency of hyperamylasaemia and its relationship with clinical severity and outcome in organophosphate poisoning in our setup and to reduce mortality and hospital stay by its early detection.

METHODOLOGY

Study Subjects: 50 Patients presenting with OP poisoning.

Study design: Cross sectional study

Study setting: Mamata General Hospital, Khammam.

Ethical considerations: The Ethical committee approval was obtained to carry out the study in the hospital. Informed consent was obtained from each patient.

Inclusion criteria:
50 patients with a history of exposure to OP poison were the study subjects.

Exclusion criteria:
Those patients with indication of exposure to a entirely different poison other than OP poison, double poisoning, Patients who have consumed poison along with alcohol, chronic alcoholics, history suggestive of gall stone disease, lipid disorders, parotid gland disease, renal or hepatic disease, intake of drugs likely to produce pancreatitis such as Azathioprine, 6-Mercaptopurine, Thiazides, Frusemide, Pentamidine.

Study protocol:
Patients admitted in Mamata Medical College, Khammam were the study group. A previously designed proforma was used to collect the demographic and clinical details of the patients.

Collaborating department:
Department of Biochemistry, Mamata Medical College, Khammam

Exposure assessment:
The parameters analyzed for association with OP pesticide exposure were demography, Age, Sex, Time of Admission, Economical Status, Familial Status, and Reason for consumption. Poison Particulars like severity grade, symptoms after consumption, immediate steps taken after OP exposure. Biochemical evaluation included serum amylase, blood glucose, urea, creatinine and liver function tests. Clinical Outcome seen was pupil size, pulse, blood pressure, respiratory rate, secretions.

Sample collection:
50 Patients satisfying the inclusion criteria were selected for the study. About 3 ml of venous blood were collected in two occasions from each subject first within 24 hours of consumption of poison (Sample I) and next after 24 hours of first sample (Sample II). Serum Amylase was estimated with **E-pNP-G7 method.**

STATISTICAL ANALYSIS:
Statistical analysis was done by using unpaired student't' test to see the significant difference in mean values between groups and to know the correlation between inter and intra group variations. Means and standard deviation were calculated. A 'p' value less than 0.05 is considered significant.

RESULTS:
In this study total 50 patients fulfilled inclusion and exclusion criteria and were included in the study. Out of these, 32 were male and 18 were females. Maximum cases i.e. 40% were between 21 to 30 years age group and 12% were less than 20 years of age. Mean age being 30.16 years. Out of 50 patients, 60% patients has consumed poison due to familial problems, followed by 28% patients due to financial reason, 8% due to job stress and 4% due to other reasons. 64% patient consumed poison along with water, followed by 22% alone and 14% along with milk.

Out of 50 patients, 50% had consumed Monocrotophos, followed by 26% who consumed Chlorpyrifos, 18% consumed Quinolphos and 6% consumed Phorate. Increased secretions was the most common clinical presentation which was found among 76% patients followed by pin point pupils 52%, bradycardia in 46%, fasciculation in 34%, respiratory failure in 22% and convulsions in 6%.

Out of 50 patients with OP poisoning 28% had normal serum amylase levels and 72% had increased serum amylase levels in first 24 hours.

There was no significant relationship of serum amylase levels with the age, sex, mode of consumption, agents.

Table 1: Relationship of serum amylase levels with clinical severity

Clinical features	Serum amylase levels (Mean ± SD)	
	Day I	Day II
Pinpoint pupil		
Present	244.15±144.48	90.30±54.77
Absent	98.54±127.09	57.21±28.60
p value	0.0001 (Significant)	0.0110 (Significant)
Depressed mental status		
Yes	339.85±127.09	124.85±47.82
No	109.86±55.22	54.80±28.43
p value	0.0001(Significant)	0.0001 (Significant)
Fasciculation		
Present	311.12±133.19	121.59±44.86
Absent	103.75±51.13	50.12±23.67
p value	0.0001(Significant)	0.0001(Significant)
Heart rate		
Bradycardia	255.39±148.00	93.39±55.53
Normal	105.15±58.06	30.58±46.89
p value	0.0001(Significant)	0.0001(Significant)
Convulsions		
Present	441.00±34.07	155.66±23.11
Absent	157.23±116.15	70.10±114.89
p value	0.0001(Significant)	0.0001(Significant)
Respiratory failure		
Yes	368.00±118.59	146.72±29.24
No	119.61±68.82	54.02±25.75
p value	0.0001(Significant)	0.0001(Significant)

The amylase levels was 339.85±127.1 in patients with depressed mental status, 311.12±133.19 in patients with fasciculation, 255.39±148 in patients with bradycardia, 441±34.07 in patients with convulsions, 368±118.59 in patients with respiratory failure all of which are statistically significant. There is significant decrease in serum amylase levels with treatment compared from day 1 to day 2.

Table 2: Relationship of serum amylase levels with outcome

Outcome	Serum amylase levels (Mean ± SD)	
	Day I	Day II
Alive	140.33±85.06	64.69±37.99
Dead	479.60±58.39	162.00±18.53
p value	0.0001	0.0001

Out of 50 patients, 5(10%) died and 45(90%) are alive. The amylase level was 479.6±58.39 in dead patients versus 140.33±85.06 in patients who are alive which is statistically significant.

There was no significant relationship between age, blood urea, serum creatinine and outcome. Out of 5 patients who died had pin point pupils, depressed mental status, severe secretions, fasciculation, bradycardia and respiratory failure. All the patients presented with convulsions died.

DISCUSSION
With the ease of availability, it is not surprising that the use of OP compounds in suicide attempts has mushroomed from a disturbing early trend to being one of the commonest modes of suicidal poisoning which accounted for 100% in our study. This rate was consistent with the findings of CH. Srinivas Rao et al. [9] (96%) whereas it was reported to be 68% by Murat Sungur et al [10]. There was no accidental exposure in our study. This alarming incidence of suicidal attempts may be probably because of the uncontrolled sale and use of these agents all over the country.

The management of organophosphate poisoning depends very much on its severity. In mild cases, removing the patient from the area of exposure and a low dose of atropine may suffice.

However, in severe cases, mechanical ventilation, high doses of antidotes and resuscitation become necessary. In developing counties like India where there is paucity of health care facilities, precise disease classification and accurate outcome prediction can optimize usage of facilities by reducing unnecessary low risk monitored-only patients and futile care of terminally sick patients. In this regard a prognostic marker allows the clinician to estimate individual patient risk and permit proper allocation of available means at a time of economic constraint and resource limitation.

Estimation of acetyl cholinesterase poorly correlates with the severity of the OP poisoning. Several studies [7, 11] showed that elevated Serum amylase levels are associated with clinical severity and poor outcome.

Age, Gender Prevalence
The vast majority of poisonings followed oral ingestion of liquid form and almost for all the patients gastric lavage was immediately done. The incidence was higher (40%) in the age group of 21-30 followed by (34%) in the age group of 31-40. These are consistent with the findings of Muhammet Guven et al [12] and AM Saadeh et al [13], where the mean ages were 27.2 and 23.95 respectively. Men outnumbered women (64% vs. 36%) with all pesticide types.

Clinical symptoms
Both the present study, and the study by Matsumiya N et al [7], found association between the Serum Amylase levels and the severity of poisoning and clinical manifestations. The most marked muscarinic signs in our study population were: miosis (52%), excessive secretions (76%), and respiratory distress (22%). The most prominent of the nicotinic effect is muscular end plate block, resulting in muscle weakness and fasciculation (34%). The CNS symptoms, like depressed mental status was found in 28% patients where as reported to be 76% by Murat Sungur et al [10].

Biochemical evaluation
A positive correlation existed between the glycemic changes and the

severity of poisoning which was also indicated by Uchil Sudhir et al [14]. Other biochemical parameters (Serum creatinine & urea) results have not shown much variation from the normal levels in our study.

Serum Amylase levels in OP poisoning

Age and sex of the patients had no significant relationship with the amylase levels. In our study, there was a significant correlation between elevated Amylase levels and the outcome. From the observation we made, it could be suggested that OP pesticide poisoning is a serious condition that needs rapid diagnosis and treatment. It can be suggested that estimation of Serum Amylase levels would be extremely useful to assess the clinical severity.

CONCLUSION

The mean Amylase level in first 24 hours of OP poisoning was 174.26 U/L. The bad bedside prognostic factors which correlated very well with serum Amylase levels in the order of increasing severity include Fasciculations (311U/L), Severe secretions (333 U/L), CNS depression (340 U/L), Respiratory failure (368U/L), Convulsions (441 U/L).

Hence Serum amylase levels may be considered as a marker of Organophosphorous intoxication, since it enables the early recognition of severity and also helps to identify those at risk of developing the complications of Organophosphorous poisoning.

Limitations of this study:

a) In this present study, patients were not subjected to CT / USG Abdomen because the study was limited to serum Amylase only.
b) Autopsy study of pancreas was not done in the view of social limitation.
c) Subsets of Amylase such as pancreatic and salivary Amylase was not estimated due to laboratory constraints.
d) Urinary Amylase was not estimated due to technical limitations.
e) Other biochemical parameters related to pancreatic involvement was not attempted due to financial constraints.

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