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ASSESSMENT OF SEVERITY OF ORGANOPHOSPHOROUS COMPOUND WITH PROGNOSTIC SIGNIFICANCE OF CREATINE PHOSPHOKINASE LEVELS

Medicine

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ABSTRACT

Organophosphorous poisoning (OP poisoning) is common poisoning specially in developing countries like India. Laboratory parameter like erythrocyte cholinesterase activity has been used to support clinical diagnosis and to predict prognosis and it is expensive. Pseudo cholinesterase is cheaper alternative but it is less reliable. CPK is a cheaper investigation and is easily performed in all laboratories. Hence this study was done to evaluate role of Creatine phosphokinase levels to support clinical diagnosis as well as predicting prognosis in acute OP compound poisoning.

Material and Methods: It was a prospective observational study which included 50 patients who presented within 6 hours of consumption of OP compound after considering inclusion and exclusion criteria. Patients were categorized into mild, moderate and severe poisoning according to POP score and initial CPK levels were noted. Data expressed in percentages and Chi-square test was used to know statistical significance.

Results: Out of 50 patients, 28 (56%) had mild, 16 (32%) had moderate and 6(12%) had severe poisoning. Initial CPK levels were positively correlated with POP score. Four deaths occurred in our study, out of which one had moderate poisoning and three patients had severe poisoning.

Conclusion: Initial CPK levels correlated with severity of OP compound poisoning and mortality.

KEYWORDS

Creatine Phosphokinase (CPK); Organophosphorous poisoning (OP)

INTRODUCTION:

Organophosphate compounds are commonest cause of poisoning in developing countries as it is easily available and cheap. According to WHO, one million accidental poisoning and two million suicidal poisoning were reported(1) and in India, 1.26 lakhs cases of OP compound poisoning were reported in a span of one year in 2007(2).

The pathological effects of Organophosphates result from inhibition of cholinesterase enzyme (both RBC and pseudo cholinesterase) at muscuranic, nicotinic receptors and also the receptors in CNS. It results in spectrum of symptoms which can be categorized into three main syndromes, acute cholinergic syndromes, intermediate syndromes (IMS) and Organophosphorous poisoning induced delayed neuropathy. Diagnosis of organophosphate is done by history, clinical features supported by laboratory findings. Evidence of Organophosphorous poisoning is usually confirmed by measuring blood and erythrocyte cholinesterase activities which should be decreased in the OP poisoning. Erythrocyte cholinesterase level is difficult to perform and is not carried in most of the labs, so pseudo cholinesterase level estimation is widely used and it is less reliable. It has been demonstrated in animal model that there is muscle fiber necrosis in acute poisoning(3) and also CPK level is often found to be elevated(4). It can be an alternative to cholinesterase level to support diagnosis and to assess the severity of poisoning.

Review of literature:

- Bhattacharya ket al. done a prospective study on 63 patients with acute OP poisoning and found a statistically significant correlation between CPK and the sewverity of Organo phosphorous poisoning(4)
- Nermeen A M Hassan et al. conducted a study on 60 patients of Organo phosphorous poisoning and found that initial CPK level correlated with severity of poisoning and could be used as an alternate and a cheaper bio-marker in diagnosis and severity assessment of acute Organophosphorous poisoning (5).
- M.Dandapani et al. found association between severity of poisoning and intermediate syndrome(6)
- Vijayakumar PG et al. in their prospective study with OP poisoning found that the raise of CPK was due to respiratory or pulmonary disease (7).

Method of collection of Data

It is a prospective observational study done on 50 patients with history of acute OP poisoning who got admitted to SVIMS Hospital, Tirupati from February 2016 after considering inclusion and exclusion criteria. The diagnosis of OP poisoning was done by detail history, clinical features and OP compound cover got by patient attenders. After stabilizing the patients, complete history including demographic detail, approximate time of consumption, whether it was accidental or self-intake, type of OP compound taken were noted. Initial blood sample was sent soon after stabilizing the patient. Symptoms and signs were noted down and severity of poisoning was calculated according to POP (Paradynia Organophosphorous Poisoning) score. Patients were followed up after admission and dose of atropine required, time taken for recovery; any complications if developed were noted. All information's were entered in the preformed proforma.

Demographic data were expressed as +/- standard deviation. Serum CPK levels were correlated with POP score and total dose of Atropine. Chi-square test was used to assess statistical significance.

Inclusion criteria

- Patients above 15 years
- Patients with history of exposure to OP poisoning within 6 hours
- Patients who gave informed consent to enter the study

Exclusion criteria

- Patients with history of OP poisoning mixed with any other poison
- History suggestive of myopathy, malignancy, trauma, sepsis, renal disease, myocardial infarction, seizures and auto immune disease
- History of drug intake like statins, steroids and furosemide
- Patients who did not give consent to enter the study

RESULTS:

Fifty patients admitted to Emergency room of Sri Venkateswara Institute of Medical Sciences, Tirupati, A.P. with acute OP poisoning were included in our study. There were 32 males and 18 were female patients. They were in the age group of 15 to 55 years with the mean age of presentation being 28.86 years. Most of them were from rural area and farmers by occupation (Table 1).

Table1: Age and Gender Distribution of patients

Age group in years	Male	Female	Total
15-20	5	2	7
20-30	12	10	22
30-40	9	3	12
40-50	5	3	8
>50	1	0	1
Total	32	18	50

Many of our patients presented with multiple symptoms. Maximum patients had vomiting followed by excessive sweating. Frequency of symptoms noted in our study is shown in Table 2. 56% 0f patients had consumed Chlorpyrifos pesticide, 16% patients had taken Monochrotophos pesticides, 8% patients methyl parathion pesticides,

6% Dimethoate, 8% quinolphos, 4% profenophos, 2% Triazophos (Table3).

Table 2: Frequency of Clinical findings observed

Clinical Presentation	Number
Vomiting	43 (86%)
Excessive salivation	30 (60%)
Excessive sweating	32(64%)
Bradycardia	28(56%)
Meiosis	22(44%)
Seizures	05(10%)
Altered sensorium	06 (12%)
Fasciculation	08(16%)

Table 3: Organophosphate compound consumed

Compound consumed	Percentage
Chlorpyrifos	56%
Monochrotophos	16%
Methyl parathion pesticides	8%
Dimethoate	6%
Quinolphos	8%
Profenophos	4%
Triazophos	2%

Mean time of presentation from the time of intake of OP compound was 3.5±1.2 hours. 28 (56%) patients were classified under mild degree, 16 (32%) patients under moderate degree and 6 (12%) patients under severe degree of poisoning according to POP classification as shown in Table 4. Initial CPK levels were directly proportional to degree of POP score. Higher initial CPK levels were mostly in the grade two or three of POP score. One patient who had higher initial CPK but had mild degree of poisoning according to POP score. But he had history of strenuous exercise prior poisoning.

Table 4: Percentage cases based on severity and based on POP scoring

Severity	Number	Percentage
Mild	28	56%
Moderate	16	32%
Severe	6	12%

Patients who had higher initial CPK levels required large dose of atropine, lengthy hospital stay and also mortality was higher compared to patients with lower initial CPK. Patients with mild degree of poisoning all recovered. One patient with moderate degree of poisoning expired. Causes of death were due to respiratory distress, ARDS and acute renal failure, and arrhythmias (Table-5).

Table 5: Correlation of death with POP score and initial CPK values

POP score	Initial CPK(IU/L) Mean (+/-SD)	Death
Mild (0-3)	266.46(102.56)	0(0%)
Moderate (5-7)	465.38(65.78)	1(6.25%)
Severe (8-11)	1025.48(180.34)	3(50%)

DISCUSSION:

Organophosphate is used as pesticide in agricultural fields. It is most common compound of acute poisoning. Commonly used OP compounds are Malathion, parathion, diazinon, fenthion, dichlorvos, chlorpyrifos, Ethion.

Organophosphate poisoning is more commonly seen in developing countries due to its ease of availability and low cost. Organophosphate acts on muscuranic and nicotinic receptors and inhibits acetylcholinesterase enzyme thereby increasing acetylcholine enzyme activity. It produces spectrum of symptoms which include vomiting, meiosis, increased sweating, excessive salivation, altered sensorium, respiratory muscle paralysis, central respiration depression, bronchospasm, bradycardia, fasciculation, blurring of vision, It causes acidosis, Intermediate syndrome, acute renal failure, coma and sometimes death.

Fatality rate in acute OP poisoning ranges from 10-20% in developing countries. Cause of death include respiratory depression, acute renal failure, ARDS, arrhythmias etc. In order to reduce complications and fatality rate there is need for early diagnosis and prediction of complications. Hence few studies are done to know the biochemical markers in acute OP poisoning. Estimation of erythrocytes cholinesterase is a good marker but it is costly. Other biochemical markers now which are studied are CPK, lipase, amylase. In a study by Bhattacharya et al. it is shown that CPK is raised even in absence of intermediate syndrome where as in a study, it was found that CPK level was raised due to rhabdomyolysis in intermediate syndrome(8).

In our study, 32 patients were males, 8 patients were females and they were in the age group of 5-55 years. Majority were in the age group between 20-40 years. Mean time of presentation was 3.36±1.32 hours. In our study, there was a statistically significant (p value<0.001) correlation between initial CPK levels. POP score this was similar to other studies (4,5) where as in a study done by Sumathi et al. (9) though CPK, lipase, amylase was negativity correlated with severity of OP poisoning only amylase levels were statistically significant as a prognostic tool. Elevated CPK level in OP poisoning was also noted in a study done by Bhattacharya et al. and in the same study there was decrease in the CPK level as patients recovered after treatment. In a study done by Kumar et al. (10) in which only mild and moderate OP poisoning according to POP score was included in the study, there was weak positive correlation between CPK levels and atropine dose required. In our study, there was statistically significant positive co-relation between initial CPK levels, POP score. Death observed in our study was nil in mild cases, one in moderate cases and three in severe cases.

CONCLUSION:

Initial CPK value has role in diagnosis as well as predicting prognosis of acute OP poisoning. It may emerge as prognostic marker in OP compound poisoning and helps in management of OP compound poisoning. Because of its non-specificity it may limits its use in small set of patients. However, sample size in our study is relatively low in our study, further studies on large group and different geographical area to include more ethnic groups is necessary.

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