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## Serum CPK levels as prognostic marker in development of intermediate syndrome in acute op poisoning

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### Abstract

Organophosphorous (OP) compound poisoning is one of the common cases presenting to medical emergency. Erythrocyte cholinesterase (EchE) and pseudocholinesterase (Butyryl cholinesterase – BchE) are markers used for assessing the severity in OP poisoning. However due to the high expense of this marker there is requirement of better and less expensive marker like Creatinine phosphokinase (CPK). Our study was conducted among hundred patients who presented to the hospital over a period of one year. Thorough clinical examination of patients was done at admission along with laboratory values of serum CPK level assessment. Patients were monitored during hospital stay. Out of study population majority were male and in age group of 21-40 years. Thirty four patients had elevated CPK levels at admission which correlated with development of intermediate syndrome. Thus due to ease of availability and being less expensive CPK levels can be used as prognostic marker in op poisoning.

**Keywords:** Organophosphorous poisoning, Acetylcholine esterase, CPK, Intermediate syndrome

### Introduction

OP compounds are arguably one of the most common causes of insecticide poisoning worldwide. In the developing countries like India, OPs are easily available and inexpensive. Therefore it is a source of both intentional and unintentional poisonings. The incidence of OP poisoning was around 1.26 lakhs during the period of 12 months in 2007 according to an Indian study <sup>[1]</sup>. Acute OP poisoning has three clinical stages initial cholinergic phase, Intermediate syndrome (IMS) and delayed polyneuropathy <sup>[2]</sup>. IMS is a syndrome of muscular paralysis occurring in conscious patients 24–96 h following ingestion and is a major cause of mortality in patients with OP poisoning <sup>[3]</sup>. Reduced serum cholinesterase level in blood is the gold standard for diagnosis of organophosphorus poisoning <sup>[4]</sup>. However, because of wide inter-individual variability, significant depression of the enzyme cholinesterase activity may occur but still fall within the "normal" range <sup>[5]</sup>. Serum enzymes Acetylcholine esterase (AChE) or Butrylcholine esterase measurement is not available regularly in all laboratories and is expensive. Hence, there is a need of an economic and easily quantifiable biochemical marker is needed in relation to OP poisoning like Creatine phosphokinase (CPK). It is documented that there is rhabdomyolysis in "intermediate syndrome" and associated with proportionate raise in CPK level <sup>[6]</sup>.

### Materials and methods

The study was conducted in a tertiary care referral hospital over a period of 1 year. This was a cross-sectional descriptive study with convenience purposive sampling. Patients of age > 14 years with history of consumption of OP compound within the past 24 hrs who were brought to hospital were included in study. Patients with significant comorbidities, cardiac illness and muscular disorder were excluded. Detailed history and examination done at admission with blood investigations including CPK levels. CPK levels were estimated by kinetic method and value > 170 was considered significant.

### Results

In our study 80 patients were male and rest 20 patients were female. Age group 21-40 had highest number of cases (55%). In the group > 60 years there were only male patients (Table 1, Table 2).

**Table 1:** Age and gender wise distribution of study participants

Age	Sex				Total	
	Male		Female			
	Count	%	Count	%	Count	%
<20	6	75	2	25	8	100
21-40	42	76.4	13	23.6	55	100
41-60	24	82.8	5	17.2	29	100
>60	8	100	0	0	8	100
Total	80	80	20	20	100	100

**Table 2:** Gender wise distribution of study participants

Gender	Number	%
Male	80	80
Female	20	20
Total	100	100

In our study most common occupation of people who took the compound were farmers (44%) followed by housewives (13%) (Table 3).

**Table 3:** Occupation wise distribution of study population

Occupation	Number	%
Students	13	13
Farmers	44	44
Housewife	18	18
Other workers	17	17
Unemployed	8	8

In our study 69% patients belonged to the lower middle class and rest belonged to upper middle class. (Table 4).

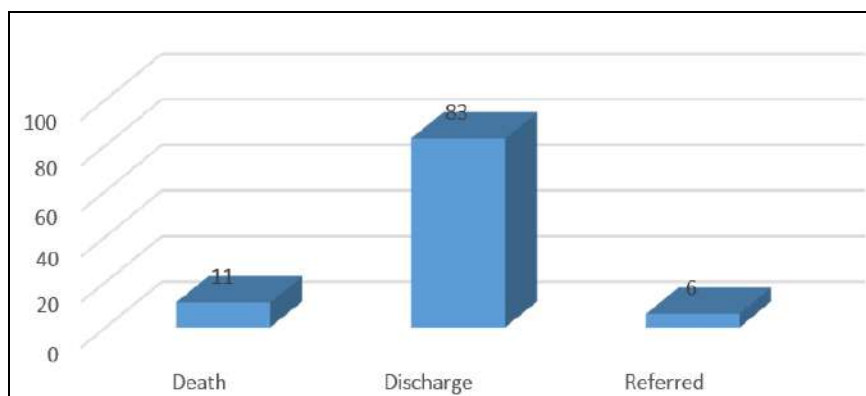
**Table 4:** Distribution of study population according to socioeconomic status

Socio-economic class	Number	%
Upper middle class	31	31
Lower middle class	69	69
Total	100	100

**Table 5:** Serum CPK levels and association with ventilator requirement

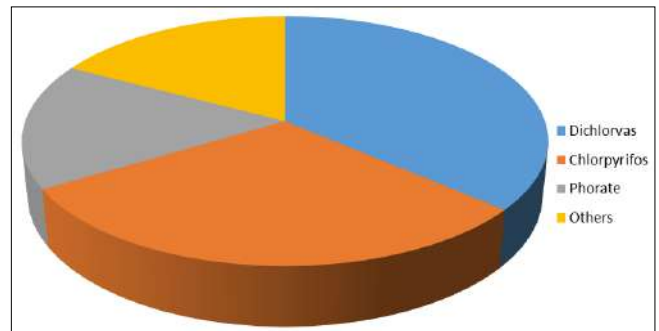
Serum CPK levels	Ventilator requirement				Total		p value
	Required		Not required				
	No.	%	No.	%	No.	%	
≥170	26	76.5	8	23.5	34	100	0.00
<170	3	4.5	63	95.5	66	100	
Total	29	29	71	71	100	100	

The outcome of patient in the study is as follows- 11 deaths, 83 discharged and 6 referrals because of unavailability of ICU beds.

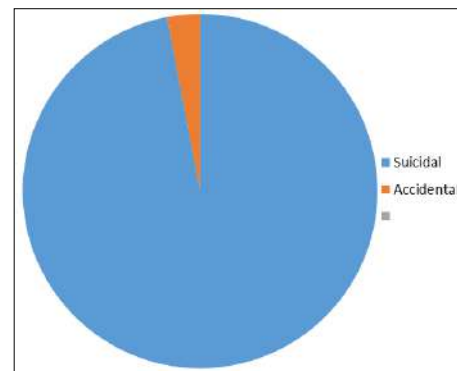


**Fig 3:** Outcome in study population

In the study conducted by us Dichlorvas (40%) was the most common compound followed by Chlorpyrifos (33%) (Figure 1). The mode of ingestion was suicidal (97%) and accidental (3%) (Figure 2).



**Fig 1:** Pie chart showing type of compound consumed.



**Fig 2:** Pie chart showing intension of poisoning

The mean CPK levels in our study was 206.39 IU/L, maximum 1365 IU/L and minimum was 22IU/. 34 patients had raised CPK levels. Patients who required ventilator care were 26 out of 34 patients. This was found to be statistically significant.

## Discussion

OP insecticides are one of the commonest causes of morbidity and mortality due to poisoning worldwide, especially in developing countries like India. In the study conducted by us, 80 patients were males and rest 20 patients were females. Age group 21-40 had highest number of cases (55%) followed by 40-60years (29%) and <20 years as well as the >60 years (8%). Incidence of OP poisoning was more in males when compared to females in our study. In a similar study by Badiger *et al.* [7], the incidence of OP was more among the age group 21-30 years. In a similar study by Dayanand Raddi *et al.* [8], of the 80 cases studied, 45% (36) cases were in the 21 to 30 years age group, 16.25% (13) cases were in 31-40 year age group and 17.5% (14) cases were in below 20 year age group. The majority of cases 61.25 % (49) were between the age group 20 to 40 years. Our study was supported by Bhattacharya *et al.* [9] at Calcutta medical college in which 66.6% were males and 33.3% were females.

In our study the most common occupation of the people who took the compound were farmers- 44% followed by house wife 13% and 69% patients belonged to the lower middle class and rest belonged to the upper middle class. In a similar study by Badiger *et al.* [7] there were 25 (31.2%) farmers, 23 (28.8%) students and 22 (27.5%) housewives.

In the study conducted by us DICHLORVAS (40%) was the most common compound found followed by Chlorpyrifos (33%). The intension of poisoning was suicidal (97%) and accidental (3%). The mode of poisoning in our study was most commonly ingestion (98%) and rest inhalation (2%). In a similar study by Raghavendra Mural *et al.* [10], 100% of cases were suicidal in nature. The most common route of exposure was oral route (73.3%). The most used compound was Chlorpyrifos (23.4%) followed by Methyl parathion (21.9%). In the study by Badiger *et al.* [7] the most commonly used OP compounds were monocrotophos 36 (45.0%), chlorpyrifos 12 (15.0%).

The mean serum CPK levels in our study was 206.39 IU/L. 34 patients had raised serum CPK levels. Patients who required ventilator care were 26 out of 34 who had raised serum CPK levels. This was found to be statistically significant. (p- value: 0.00). In the study by Dayand Raddi *et al.* [8], 52.5 % (42) had creatine kinase < 180 IU/L while 47.5% (38) had creatine kinase > 180 IU/L. Higher mortality was observed in patient group with elevated CPK levels. In the study by Raghavendra Mural *et al.* [10], measurement of CPK levels shows a sensitivity of 70% and a specificity of 82% with a positive predictive value of 95%. They found that high initial CPK level is associated with need for endotracheal intubation and mechanical ventilation and more chances of mortality. Vijayakumar P G [11] *et al.* in their study reported that creatine kinase levels were elevated in organophosphorus compound poisoning cases. Significant creatine kinase levels were elevated in Grade II and Grade III poisoning cases, which were associated with higher rates of respiratory depression and death.

## Conclusion

To conclude, serum CPK level can be an efficient biomarker in case of acute OP poisoning not only due to its easy availability and low cost, but also because serial monitoring of its level during the entire course of therapy can predict the prognosis. However exclusion of other causes of raised

CPK in a patient of acute OP poisoning is required to enhance the specificity.

**Statement of consent:** Informed written consent was obtained from all subjects in the study to publish data for educational purpose

**Conflict of interest:** None

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