

Original article:

A Cross Sectional Study of estimation of Plasma Pseudo cholinesterase and its Correlation to mortality among organophosphorous poisoning patients

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Abstract:

Introduction: Organophosphorus poisoning is the most common medico toxic emergency in India. Respiratory failure is the most common complication of OP compound leading to death. Early recognition and prompt ventilation may improve survival. The aim of the study was to correlate between the clinical score described by Peradenya Organophosphorus Poisoning (POP) scale, serum pseudocholinesterase level at presentation, ventilator requirement and the outcome.

Methods: Patients of OP poisoning attending Owaisi Hospital from Jan 2013 to Dec 2013 were studied. Sixty Four patients fulfilled the inclusion criteria. Fifty one of them required ventilator support. Twelve of them succumbed. None of the non ventilated patients died. Clinical scoring by Peradenya scoring and serum pseudocholinesterase level was measured in all patients.

Results: The severity of poisoning as measured by POP scale directly correlated with serum cholinesterase level ($P<0.001$). There were 50% patients in moderate poisoning score and only 5% patients in severe poisoning. A total of 18% of the patients died of which 85% belonged to moderate and severe group. POP scale directly correlated with death outcome ($P<0.001$). It was also seen that all the patients with pseudo cholinesterase level less than 50% of normal range were ventilated. Lower Pseudo cholinesterase level also directly correlated to death outcome ($P<0.001$).

Conclusion: The POP scale and serum cholinesterase at presentation appeared useful to assess the severity of poisoning, particularly in terms of need for ventilator and prolonged duration of hospital stay.

Keywords: OPP

Introduction

OP compound poisoning is important indication for emergency admission in most hospital throughout India¹. OP compounds are used as pesticides, herbicides, chemical warfare agents in form of nerve gases¹. Its widespread use and easy availability has increased the likelihood of poisoning with these compounds.

WHO estimates that approximately 3 million pesticide poisoning occur worldwide and cause more than 2,20,000 deaths. Developing countries like India and Srilanka report alarming rates of toxicity and death².

OP acts by inhibiting the enzyme cholinesterase, results in accumulation of acetylcholine at synapses and myoneural junction leading to cholinergic overactivity⁴.

Mortality ranges from 4-30% in Indian studies. Respiratory Failure is most common complication of OP poisoning leading to death. Early recognition and prompt ventilator support may improve survival. Owing to limited availability of resources, all OP poisoning patients are not managed in ICUs in Indian setup. It is therefore important that clinical features and criteria to predict the need for

ventilator support be identified at initial examination.

Serum cholinesterase level is depressed after OP poisoning, as also reported by previous studies done. Peradenya OP compound scale has not been studied much in Indian scenario. It could be a simple and effective system to determine the need for ventilator support early on in the course. In a study by Senayeke et al, patients with a high score on the POP scale had a high rate of morbidity and mortality⁵. The present study aims to correlate serum cholinesterase level and the clinical criteria score described by the POP scale at initial presentation and the severity of poisoning with need for ventilation.

Materials and Methods

The study was done in patients admitted with OP poisoning in the department of medicine at Deccan College of medical Sciences & Owaisi Hospital,

Hyderabad from January 2013 to December 2013. Consecutive patients of OP poisoning who attended the emergency within 24 hours after poisoning, and who had not received any kind of treatment before were taken. Mixed or doubtful poisoning and with co morbidities were excluded. 64 patients were enrolled who met the above criteria. Immediately after the arrival of the patients at the emergency department, history was taken to confirm the type of OP compound taken and the interval between the consumption of poison and arrival at the emergency was noted. Consent of the patient and relative was taken. Apart from the routine and detailed clinical examination, assessment was also done based on the Peradenya Organophosphorus scaling system, which included pupil size, respiratory rate, pulse rate, level of consciousness of the patient and the presence or absence of convulsion and fasciculation.

Table Peradenya Organophosphorus Poisoning Scale

Pupil Size	>2 mm	0
	<2 mm	1
	Pin point	2
Respiratory rate	<20/min	0
	>20/min	1
	>20/min with central cyanosis	2
Heart rate	>60/min	0
	41-60/min	1
	<40/min	2
Fasciculation	None	0
	Present, generalized or continuous	1
	Both generalized and continuous	2
Level of Consciousness	Conscious and rationale	0
	Impaired response to verbal commands	1
	No response to verbal commands	2
Seizures	Absent	0
	Present	1

Based on this assessment, a score was given to the patients. A score of 0 to 3 is considered as mild poisoning, 4 to 7 as moderate poisoning and 8 to 11 as severe poisoning. Patient's venous blood samples were taken for serum pseudocholinesterase level assay. According to pseudocholinesterase activity the OP poisoning was graded as

Table Grade of poisoning based on pseudocholinesterase level

Grade of Poisoning	Cholinesterase activity
Normal	>50%
Mild	20-50%
Moderate	10-20%
Severe	<10%

The patients were managed in intensive care units with adequate dosages of atropine maintaining atropinization. Pralidoxime was given to all patients 2gm IV bolus followed by 0.5-1g IV 6th hourly for 48-72 hrs. Patients with respiratory failure were intubated and mechanical ventilator support was given. Psychiatric counseling was done in all the patients who survived. For clinical outcome, the total duration of hospital stay or death were considered. Complete recovery or death was used as the end point. Autopsy was done in all patients who expired. The study was approved by the Ethical Board of the hospital. Pearson's Chi square test was done to determine significance.

Results

A total of 64 patients were taken for the study. Among them 83% were male. The age of the patients varied from 20 to 70 yrs with 65% of them between 21-30 age group. About 58% belonged to lower socioeconomic state. 32% were agriculturist followed by coolie (21%), student (11%), housewives (11%) and others (25%). About 38% consumed less than 60 ml of poison and 10% more than 120 ml of poison. The symptom and sign are shown in Figure 1. None of the patients developed seizures. The values of different parameters in the three grades of poisoning as per the POP scale are shown in Table 3. Based on pseudocholinesterase level the different parameters are shown in Table 4. There was significant correlation between the severity of poisoning categorized by the POP scale and the serum cholinesterase at the time of initial presentation of the patients ($P<0.001$). There was also positive relationship between POP scoring and lower pseudocholinesterase level to that of need for ventilation. Incidence of mortality was significantly associated with lower pseudocholinesterase level ($P<0.001$) and POP Scoring ($P<0.001$). The time-interval between consumption and presentation to hospital was positively associated with mortality and need for ventilation.

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Table Values of different parameters in three grades of poisoning as per POP scale

POP SCALE	Number of patients	Patients requiring ventilator		Not requiring Ventilator	
		Survived	Death	Survived	Death
0-3 (mild)	29 (45%)	14	2	13	0
4-7 (moderate)	32 (50%)	25	7	0	0
8-11 (severe)	3 (5%)	0	3	0	0
Total	64	39	12	13	0

Table Values of different parameters as per pseudocholinesterase level

Pseudocholinesterase level	Number of patients	Patients requiring Ventilator		Not requiring Ventilator	
		Survived	Death	Survived	Death
<10%	15 (24%)	5	10	0	0
10-20%	9 (14%)	8	1	0	0
20-50%	13 (20%)	12	1	0	0
>50%	27 (42%)	14	0	13	0
Total	64	39	12	13	0

Table Correlation between different parameters of the patients

Variables	Outcome		P value
	Survived	Death	
Age in years	31.27±11.71	30.08±9.08	0.744
Quantity (ml)	70.38±36.83	91.66±38.80	0.079+
Pulse rate(PR)	64.48±9.84	94.66±7.83	0.001**
Respiratory rate (RR)	17.51±2.55	22.08±1.08	<0.001**
Total score	3.13±0.56	6.00±1.90	<0.001**
Pseudocholinesterase level	2948.34±1989.31	463.08±356.77	<0.001**

Discussion

In this study about 65% patients belonged to age group of 21-30 which was comparable to other studies¹⁰⁻¹². In most of the other studies¹⁰⁻¹⁴ majority of poisoning was seen in females whereas in our study majority of them were males (83%). Most of the patients were agricultural workers (32%) and coolie (21%) which is in comparison with other studies¹². 60% of patients in this study belonged to low socioeconomic status. All patients in our study had consumed poison with intention of committing suicide. About 40% of patients reported to hospital within 2 hrs of consumption of poison whereas about 15% reported after 5 hrs. 38% of patients had consumed less than 60 ml of poison whereas 10% more than 120 ml.

Abdominal pain, nausea and increased secretions with altered sensorium were the main presenting symptoms, while tachypnea, bradycardia, miosis and neck muscle weakness were prominent clinical findings. However fasciculation were infrequent. These are comparable to other studies in the past¹⁰⁻¹⁴. As all the patients were managed in an intensive care unit and only those patients who reported to hospital within 24 hrs of consumption were included, intermediate syndrome was not seen in any patient. The hospital stay for the patients who died was about 4 days. All those who survived had an average stay of about 9 days. 6 of our patients stayed for more than 20 days in close observation and all of them survived. The 10% patients who had taken 120 ml or more of the poison had high POP score and low pseudocholinesterase level and high mortality rate. Incidence of death was found to be significantly more associated with greater time interval between consumption and hospitalization with $P=0.043^*$.

The current study observed significant correlation between the degree of derangement in serum cholinesterase level and severity of poisoning at the

initial presentation. The higher the score on the POP scale, the higher was the degree of derangement in the serum cholinesterase levels. A significant correlation was also observed between the deranged serum cholinesterase level and the mortality and morbidity of the patients in terms of prolonged duration of hospital stay. Need of ventilation was more in people with high POP scale and low pseudocholinesterase level.

There were 50% patients in moderate poisoning score and only 5% patients in severe poisoning. A total of 18% of the patients died of which 85% belonged to moderate and severe group indicating that patients with even mild degree of poisoning had also died. However POP scale directly correlated with death outcome ($P<0.001$). The co-morbid conditions like pneumonia, septicemia and cardiac arrhythmias also have a role in the mortality after OP poisoning. So, the interplay of these factors in this study could have affected the correlation. Fatalities from acute OP poisoning generally result from respiratory failure due to a combination of depression of the CNS respiratory center, neuromuscular weakness, excessive respiratory secretions, bronchoconstriction, and occasionally due to cardiovascular collapse. It was also seen that all the patients with pseudocholinesterase levels less than 50% of normal range were ventilated. 15 patients had value less than 10% of normal range out of which 10 patients died. Lower Pseudocholinesterase level also directly correlated to death outcome ($P<0.001$). These findings were consistent with other studies¹¹⁻¹².

Our study had mortality of about 18%. Delay in hospitalization and high POP scoring with low pseudocholinesterase level accounted for these. Out of 51 patients who were ventilated 12 died and 39 survived. However none of the non ventilated patient died. In all the patients who were ventilated

POP scoring and pseudocholinesterase level were deranged. Ventilator support positively accounted for high survival rate.

Conclusion

In summary, POP scale and pseudocholinesterase levels at presentation appear useful in assessing the

severity and need for ventilation. Most of the moderate to severe degree of poisoning land up in respiratory distress where ventilator support is required which improves survival.

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