

Correlation of Serum Pseudocholinesterase Level and Peradeniya Organophosphorus Poisoning Scale with the Severity and Inhospital Outcome of Acute Organophosphorus Poisoning

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ABSTRACT

Introduction: Organophosphorus (OP) compounds are commonly used for suicide in rural India. The rate of OP poisoning as a suicidal agents ranges from 10.3% to 43.8% in various studies in India. So present study was done to find the correlation of serum Pseudocholinesterase level and Peradeniya Organophosphorus Poisoning scale with the severity and inhospital outcome of acute organophosphorus poisoning.

Material and methods: Total 100 patients of acute organophosphorus poisoning patients are enrolled in the study after fulfilling inclusion and exclusion criteria. The study was done at K.R.hospital, Mysore medical college and research institute, Mysuru in the period of April 2017 to July 2017. POP score was applied and serum psuedocholinestrse levels are estimated. Suitable statistical methods applied to assess correlation and variables.

Results: Majority of the patients were aged between 18 to 30 years. Bradycardia is the commonest clinical feature. In severe grade of poisoning mean serum psuedocholinestrse level was 617.0952 u/l. There is a significant correlation between POP score and serum psuedocholinestrse level with severity and in hospital outcome (<0.001).

Conclusion: POP scale can be used in assessing severity of OP poisoning where serum pseudocholinesterase estimation is not available. POP scale can be used as a clinical tool in deciding management and predicting in hospital outcome in OP poisoning.

Keywords: Serum Pseudocholinesterase Level, Peradeniya Organophosphorus Poisoning Scale, Acute Organophosphorus Poisoning

INTRODUCTION

Organophosphorus Compounds Inhibit both Acetylcholinesterase (AChE) and pseudocholinesterase (PChE) enzymes, resulting in overstimulation of muscarinic and nicotinic receptors.¹⁻⁴ Serum pseudocholinesterase enzymes levels are routinely measured in OP compound poisoning. Studies by Goswamy et al.⁵ and Chaudhary et al.⁶ states that the estimation of PChE is useful in predicting the prognosis in OP poisoning. Estimation of serum pseudocholinesterase enzyme level is costly and is not routinely available in all the laboratories. Majority of the OP compound patients are poor. Due to limited availability of facilities and resources in health care systems and economically restrain patients, it is necessary to rely more on clinical features to assess the severity of poisoning and to manage the condition properly. The Peradeniya

Organophosphorus Poisoning (POP) scale assesses the severity of the poisoning based on the symptoms at presentation and it is simple to use. In a study by Senanayake et al⁷, patients with a high score on the POP scale had a high rate of morbidity and mortality. This study is thus an attempt to find the correlation of serum pseudocholinesterase level (PChE) and Peradeniya Organophosphorus Poisoning scale (POP) with the severity and inhospital outcome of acute organophosphorus poisoning.

MATERIAL AND METHODS

This was a prospective, observational, descriptive, intention-to-treat study of the patients of OP poisoning attending K.R.Hospital, Mysore medical college, Mysuru, from April 2017 to July 2017.

Inclusion criteria

- A history of exposure to organophosphorus compound within previous 24 hours as indicated by patient or relatives or the referring doctor, with characteristic clinical manifestations of organophosphorus compound poison and physical evidence of the poison consumed.

Exclusion criteria

- Patients with chronic medical conditions or diseases that are likely to alter the respiratory effort due to organophosphorous compound poisoning.
- Patients who consumed other poisons along with organophosphorus compound.
- Patients with chronic lung disease.
- Patients who have consumed poison along with alcohol.

Based on inclusion and exclusion criteria hundred patients were selected. 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 room. Consent of the patient and or guardian was taken. Apart from the routine and detailed clinical examination, assessment was

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also done based on the POP scoring system, which included pupil size, respiratory rate, pulse rate, level of consciousness of the patient and the presence or absence of convulsion and fasciculation. Based on this assessment, a score was given to the patients. Upon the confirmation of the OP poisoning, patients venous blood samples were taken for serum pseudocholinesterase level assay. The patients were routinely managed in the units, with pralidoxime and intravenous (IV) atropine bolus and drip, maintaining the adequate level of atropinization. For clinical outcome, the total duration of hospital stay or death were considered. Complete recovery or death was used as the end point. The study was approved by Institutional Human Ethical Committee (IHEC).

The Peradeniya Organophosphorus Poisoning (POP) Scale is a scoring system introduced by N Senanayake, H J de Silva and L Karalliedde⁷ in 1993. Commonest clinical manifestations of OP poisoning are selected as parameters and each is assessed on a three-points scale varying from 0 to 2 (Table 1). The score is obtained at initial presentation before any medical intervention. A score of 0 to 3 is considered as mild poisoning, 4 to 7 as moderate poisoning and 8 to 11 as severe poisoning.

STATISTICAL ANALYSIS

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 16.0. Univariate correlation between these with the POP scale severity of poisoning and the serum cholinesterase level were evaluated using Pearson correlation coefficient, Chi Square test and Fisher's exact test. A P value of less than 0.05 was considered to be significant.

RESULTS

A total hundred patients were enrolled in the study, based on inclusion and exclusion criteria. Among them 75% were male and 25% were female. The age of the patients ranged from 18 to 66 years. Around 43% of patients are aged between 18 to 30 years. Patients presented to hospital within mean interval of 3 hours after intake of OP poison. Patients consumed chlorpyrifos (19%), monocrotophos (13%), dichlorvos (10%), methyl parathion (6%), dimethoate (18%) and diazinon (11%).

Around 68% of patient presented with bradycardia, 28% of patients with miosis, 28% of patients with altered sensorium, 21% of patient with tachypnea, 15% of patients fasciculation and 10% of patients with seizures (table 2). Mean serum pseudocholinesterase level in mild poisoning was 5680.653U/L, moderate poisoning was 4707 U/L, severe poisoning was 175.133 U/L (table 3).

Most of the patients (73%) who had been recovered completely and discharged without ventilator support, their serum pseudocholinesterase level was above 5000 U/L, POP Score was below 5 and Mean duration of hospital was 5 days. The longest hospital stay was of a male patient who had consumed parathion and was in hospital for 55 days (POP scale 9). He presented with respiratory failure within 6 hours of consumption and was intubated for 13 days and

Parameter	Criteria	Score
Pupil size	>2mm	0
	<2mm	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
Fasiculations	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

Table-1: Peradeniya Organophosphorus Poisoning Scale⁶

Clinical features	Percentage
Bradycardia	68
Miosis	28
Altered Sensorium	28
Tachypnea	21
Fasiculation	15
Seizure	10

Table-2: Distribution of patients according to clinical features of OP poisoning

POP Scale Score	Grades of poisoning	Serum psuedocholinestrse Mean(SD)
0-3	Mild	5680.653(2006.407)
4-7	Moderate	4707(2378.893)
8-11	Severe	617.0952(175.1336)

Table-3: Distribution of Mean serum psuedocholinestrse level in relation with POP scale

tracheostomy was done and had complete recovery and discharged after 55 days. 27% of patients required ventilator support. death has occurred in 10% of patients. POP Score in death patients was above 8, mean psuedocholinestrse level was 571U/L. 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 ($P<0.001$), requirements of atropine on the first day of admission, the total amount of atropine needed ($P<0.001$) and the average duration of hospital stay ($P<0.001$) (table 4).

DISCUSSION

In present study, majority of patients were in 18 to 30 years of age group, this may be due to the increase in stress because of unemployment, poverty, depression due to various causes

Parameters	Pearson correlation (r)	p value
Serum pseudocholinesterase and POP score	-0.7582	<0.001
Serum pseudocholinesterase and hospital stay	-0.3781	0.001
Serum pseudocholinesterase and atropine dose	-0.6572	< 0.001
POP score and hospital stay	0.2724	0.064
POP score and atropine dose	0.8494	< 0.001
Atropine dose and hospital stay	0.2451	0.014

Table-4: Correlation between different parameters of the patients

in this age group. Most of the patients were from rural part of Mysuru. This pattern of age group and demographic factors were reported in other studies also.⁸⁻¹⁰ Majority of the patients were below poverty line and from agricultural background. Most of the patients had consumed chlorpyrifos and dimethoate. These insecticide agents are widely used in rural areas of Karnataka and easily available. This may be the reason for increased incidence of OP compounds for self harm purpose. Studies done in India and outside of our country where agriculture is a main occupation has highlighted this fact.^{8,9,11,12}

Zawar S D et al.¹³, Rehiman S et al,⁸ Arup K K et al.¹⁴ showed that bradycardia, miosis, tachypnea, diarrhea, vomiting, altered sensorium and fasciculations are commonly present in OP poisoning patients, which is comparable to present study. These clinical features are due to increased muscarinic, nicotinic and central effects of acute cholinergic manifestations of OP poisoning. Clinical manifestation depends upon type of OP compound. The severity of the clinical features at presentation used in POP scale correlated well with need for ventilator support.¹⁵

Present study showed significant correlation between the degree of derangement in serum pseudocholinesterase 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 pseudo cholinesterase level. There was significant correlation between POP score, serum pseudocholinesterase and in hospital outcome. Higher the POP scale, there is increased morbidity in terms of need for ventilator support and hospital stay. High POP scale patients had lower serum pseudocholinesterase level in this study. These findings are consistent with studies done by Rehiman et al.⁸, Zawar S D et al.¹³, Jha S et al.¹⁰, Goel et al.¹⁶, Sam KG et al.¹⁷, Aygun et al.¹⁸ Patients who needed higher initial dose of atropine had high pop score and low pseudocholineesterase level. Majority of these patients had been managed with ventilator support and had prolonged hospital stay. A study done in India also concluded with the need of a higher amount of atropine and mechanical respiratory supports in the management of severely poisoned patients.¹⁶

Study by Subhash et al¹⁹ showed need for ventilator support in 62.5% of patients with moderate poisoning and 100% of patients with severe poisoning according to POP scale. In present study patients with severe grades of poisoning are managed with ventilator support. Respiratory failure was common feature in severe grade of poisoning, which is primarily due to respiratory paralysis due to nicotinic effect and increased work load on respiratory muscles due

to muscarinic effect.

In present study 10% of patients had died which is comparable to other similar studies.^{16,20,21} In all the patients who were died had high POP scoring and low serum pseudocholinesterase level at time of initial presentation. Death is usually a result of respiratory paralysis. The other complications which can lead to fatality are asphyxia as a result of increased bronchial secretions and bronchoconstriction and rarely pulmonary edema. Occasionally serious cardiac arrhythmias can lead to fatality.²² To conclude from our study, It is important to assess clinically at the time of initial presentation of OP poisoning to decide the level of care and to decrease the mortality and morbidity.

CONCLUSION

POP scale can be used in assessing severity of op poisoning where serum pseudocholinesterase estimation is not available. POP scale can be used to treat OP poisoning patients in terms of need of ventilator, hospital stay and atropine dose. POP scale can be used readily in all level of health care from primary to tertiary level health care.

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