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Original Research Article

Profile of organophosphate poising cases, clinical outcome and factors associated with outcome among them in a tertiary care teaching hospital

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ABSTRACT

Background: Poisoning by Organophosphorus poisoning is still one of the most common cause of poisoning and is associated with significant morbidity and mortality. With addition of new compounds and changing patient profile, periodic studies exploring the factors affecting treatment outcomes are vital in providing effective management.
Methods: The current study was conducted with an objective of assessing the profile of organophosphate poisoning and factors affecting the outcome in a tertiary care hospital. The current study was a prospective observational study, conducted in the emergency department of medical inpatient ward and ICU of NRI medical college and Hospital, Andhra Pradesh between June 2015 to July 2016. Patients >18 years admitted to emergency department organophosphorus or carbamate poisoning were included in the study.
Results: One hundred patients presented to the hospital between June 2015 to July 2016 of which 71% were males. About 59% of the patients belonged to 21-30-year group and 67% of them reached our hospital in <6 hours. Grade 1 poisoning was observed in 45% of patients, a dose of <500 units of pseudo cholinesterase was given to 40% of them. A Glasgow Coma Score >10 was found in 75% of the patients and the overall mortality of OP poisoning was 17%.
Conclusions: OP poisoning is more common among younger population, below 30 years with male preponderance. Favourable outcome determinants were younger age, female gender, being admitted to the hospital before 6 hours of OP consumption.

Keywords: Hospital, Organophosphates, Poisoning

INTRODUCTION

Organophosphates (OP) generally refers a class of esters of phosphoric acid and are the basis of various pesticides, herbicides and nerve gases. Organophosphates (OP) are used as insecticides in agricultural and domestic settings across the world. It is estimated that OP pesticide self-poisoning kills around 200, 000 people each year, mainly in the Asia-Pacific region.[1] Such incidents are mostly reported from rural communities and is frequently an impulsive act analogous to self-poisoning with medication in the west. However, the noteworthy difference is an astounding 3-30% case fatality rate in the former while it is about 0.3% for the latter.[2-5] The mortality rate of patients under ventilation could be as high as 50%.[6,7] Further, in hospital based studies mortality rates associated with pesticides have been reported up to as high as 50-70%.[8] As mortality rate of OP poisoning is still high, early diagnosis and appropriate treatment is often lifesaving.[9]

Patients with OP poisoning have a very high rate of respiratory failure, up to 70% and a prolonged Q-T interval corrected for heart rate.[7,10-13] In the industrial

world OP poisoning is of considerable importance due to terrorist or military attack with nerve agents.[14] The molecular mechanism of action of OP is that they complex with acetylcholinesterase (AChE), leading to enzyme deactivation by phosphorylation of the serine hydroxyl group located at the active site of AChE. The consequential accumulation of acetyl choline leads to persistent initial stimulation followed by fatigue of cholinergic synapses.[15-17]

There is considerable variation in the timing of onset and clinical features depending on the type of OP consumed.[18,19] OP poisoning has a high inpatient mortality and many patients have cardiopulmonary arrests after admission in spite of much of them being under intubation. Study of presentation of various cases of organophosphorus poisoning in hospitals its lethality and outcome following intervention may provide insight for preventing death to a significant level. The aim of the present study was to evaluate OP poisoning, its clinical and biochemical presentation and possible outcomes among patients reporting to a hospital in India so that potential ways prevention based on modifiable factors associated with mortality.

METHODS

The current study was conducted with an objective of assessing the profile of organophosphate poisoning and factors affecting the outcome in a tertiary care hospital.

The current study was a prospective observational study, conducted in the emergency department of medical inpatient ward and ICU of NRI medical college and Hospital, Pedakakani, Andhra Pradesh. The data collection for the study was conducted between June 2015 to July 2016.

Inclusion criteria

- Patients >18 years admitted to emergency department organophosphorus or carbamate poisoning.
- Patient presenting with history of consumption of an unknown compound presenting with clinical features of organophosphorus poisoning.

Exclusion criteria

- Patients <18 years
- Patients presenting with poisoning other than organophosphorus/carbamate poisoning.

After obtaining clearance and approval from the institutional ethics committee, 100 patients presenting with organophosphorus poisoning were included for the study. Following data was recorded in all study subjects.

- Demographic data and prehospitalisation period data.
- Clinical data including laboratory data
- PSS and GCS scores were assessed on admission and again after 24 hours and
- subsequently patient was reviewed daily with till discharge or death.

Regarding outcomes patients will be divided into 3 groups

- Survived without intubation
- Survived but required intubation and ventilation
- Death in spite of intubation and ventilation

Other laboratory data chiefly serum pseudocholine esterase levels was also evaluated. The patient was then followed up for above mentioned end points.

Statistical methods

Survival status was considered as primary outcome. Type of poison, age, gender, delay in presentation etc. were considered as primary explanatory variables. Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean ± SD (Min-Max) and results on categorical measurements are presented in Number (%).

Chi-square/Fisher Exact test has been used to find the significance of association between various explanatory and outcome variables. P value <0.05 was considered as statistically significant. IBM SPSS statistical software version 21 was used for analysis.

RESULTS

Among the study population, majority of them (59%) belonged to 21-30 years and majority of them were males (71%) (Table 1).

Table 1: Descriptive analysis of socio demographic parameters in study population (N=100).

Parameter	Frequency	Percent
Age in years		
18-20	13	13.0%
21-30	59	59.0%
31-40	17	17.0 %
41-50	3	3.0%
51-60	5	5.0%
61-70	3	3.0%
Gender		
Male	71	71.0 %
Female	29	29.0 %
Total	100	100.0%

Regarding the type of OP consumed 19 (19.0%) had consumed Methyl Parathion, followed by 18 (18.0%) consuming Clorpyriphos, 9 (9.0%) had taken Dichlorvas,

6(6%) while the status of 38 (38.0%) participants was unknown. The concentration these chemicals in 5 (54.0%) the participants was less than 50ml, 21 (21.0%) had consumed 50 to 100ml and only 1 (1.0%) person consumed more than 100 ml. The mode of OP intake was oral in 99% of them with one inhaling it (Table 2).

Table 2: Descriptive analysis of details of poisoning in study population (N=100).

Parameter	Frequency	Percent
OP Compound		
Clorpyriphos	18	18.0 %
Methyl parathion	19	19.0 %
Dichlorvas	9	9.0 %
Diazinon	6	6.0%
Dimethoate	3	3.0 %
Monocrotophos	2	2.0 %
Quinalphos	2	2.0 %
Triazophos	2	2.0 %
Phosphoran	1	1.0 %
Unknown	38	38.0 %
Amount of poison		
<50 ml	54	54.0 %
50-100 ml	21	21.0 %
>100 ml	1	1.0 %
Unknown	24	24.0 %
Mode of poison consumption		
Ingestion	99	99.0 %
Inhalation	1	1.0 %

Table 3: Descriptive analysis of various parameters in the study population (N=100).

Parameter	Frequency	Percent
Pre-hospitalization period in hours (Time to reach hospital)		
<6 hours	67	67.0 %
7-12 hours	22	22.0%
>12 hours	11	11.0 %
Grade of poisoning		
Grade 1	45	(45.0%)
Grade 2	26	(26.0%)
Grade 3	23	(23.0%)
Grade 4	6	(6.0%)
Pseudo cholinesterase dose given		
<500	40	40.0 %
500-1000	18	18.0 %
1000-5000	25	25.0 %
>5000	17	17.0 %
GCS score		
<10	25	25 (25%)
>10	75	75 (75%)
Out come		
Survived	83	83.0%
Death	17	17.0%

Majority 67 (67.0%) of the participants reached the hospital within six hours while 22 (22.0%) reached in 7 to 12 hours and 11 (11.0%) reached the hospital after 12 hours. The severity of the poisoning was grade 1 in 49%. Grade 2, 3 and 4 poisoning were observed in 26%, 235 and 6% of the population respectively. Among the study population, 40 (40.0%) participants received <500 units of Pseudo cholinesterase dose, 25 (25.0%) of them were given 1000 to 5000 units and 17 (17.0%) received more than 5000 units of the dose. Among the study population in 25 (25.0%) participants GCS score was <10 and in 75 (75.0%) participants it was >10. The proportion of people met with mortality was 17% among study population (Table 3).

There was an increasing trend of mortality with increasing age group till 41 to 50 years. Only 7.7% died in 18 to 20-year age group and 66.7% died in 41 to 50-year age group. The proportion of deaths in 51 to 60-year age group was slightly lesser at 40%. There was a statistically significant association between outcome and age groups (P value 0.031).

Among 71 males, 57 (80.3%) were survived and 14 (19.7%) were dead. Among 29 females, 26 (89.7%) were survived and 3 (10.3%) were dead. The difference in the proportion of outcome between gender status was statistically not significant (P value 0.257). In < 6 hours pre-hospitalized participants, 55 (82.1%) were survived and 12 (17.9%) were died, 22 (100.0%) were survived and 0 (0%) were died in 7 to 12 hours pre-hospitalized participants 6 (54.5%) were survived and 5 (45.5%) were death in >12 hours. The difference in the proportion of outcome between pre-hospitalization status was statistically significant (P value <0.004).

Among 57 participants who consumed < 50ml poison, 49 (90.8%) participants were survived and 5 (9.2%) participants were died. in 21 members who had 50 to 100ml poison 15 (71.42%) were survived and 6 (28.5%) were died, the person who consumed >100ml of poison was survived. Among 24 participants who consumed unknown 18 (75.0%) were survived and 6 (25%) were died. The difference in the proportion of outcome between amount of poison consumed in ml status was statistically not significant (P value 0.134)

Among 40 participants who received <500 pseudo cholinesterase, 32 (80%) participants were survived and 8 (20%) were died, among 18 participants of 500 to 1000 dosage group 17 (94.4%) were survived and 1 (5.5%) were died. In 1000 to 5000 dosages group 19 (76%) were survived and 6 (24%) were died.

Among 17 participants who received >5000 pseudo cholinesterase, 15 (88.2%) participants were survived and 2 (11.8%) were died. The difference in the proportion of outcome between pseudo cholinesterase status was statistically not significant (P value 0.372) (Table 4).

Table 4: Factors associated with mortality in study population.

Parameter	Outcome		Chi-square	P-value
	Survived	Death		
Age in years				
18-20 (N=13)	12 (92.3%)	1 (7.7%)	12.29	0.031
21-30 (N=59)	53 (89.9%)	6 (10.1%)		
31-40 (N=17)	12 (70.6%)	5 (29.4%)		
41-50 (N=3)	2 (66.7%)	1 (33.3%)		
51-60 (N=5)	3 (60%)	2 (40%)		
61-70 (N=3)	1 (33.3%)	2 (66.7%)		
Gender				
Male (N=71)	57 (80.3%)	14 (19.7%)	1.282	0.257
Female (N=29)	26 (89.7%)	3 (10.3%)		
Pre hospitalization (hours)				
<6hours (N=67)	55 (82.1%)	12 (17.9%)	10.857	<0.004
7-12hours (N=22)	22 (100.0%)	0 (0%)		
>12 hours (N=11)	6 (54.5%)	5 (45.5%)		
Amount of poison consumed in ml				
<50ml (N=54)	49 (90.8%)	5 (9.2%)	5.579	0.134
50-100ml (N=21)	15 (71.42%)	6 (28.5%)		
>100ml (N=1)	1 (100%)	0 (0%)		
Unknown (N=24)	18 (75.0%)	6 (25%)		
Pseudo cholinesterase				
<500 (N=40)	32 (80%)	8 (20%)	3.124	0.372
500-1000 (N=18)	17 (94.4%)	1 (5.5%)		
1000-5000 (N=25)	19 (76%)	6 (24%)		
>5000 (N=17)	15 (88.2%)	2 (11.8%)		

Table 5: Association of compound with outcome of study population (N= 100).

Compound	Outcome			P value
	Survived without Intubation (n=69)	Survived with Intubation (n=14)	Death (n=17)	
Clorpyriphos	15 (21.7%)	1 (7.1%)	2 (11.8%)	0.443
Diazinon	3 (4.3%)	2 (14.3%)	1 (5.9%)	0.252
Dichlorvas	6 (8.7%)	2 (14.3%)	1 (5.9%)	0.745
Dimethoate	2 (2.9%)	1 (7.1%)	0 (0%)	0.427
Methyl parathion	13 (14.5%)	3 (0%)	3 (5.9%)	0.338
Monocrotophos	1 (1.4%)	0 (0%)	1 (5.9%)	0.526
Phosphoran	1 (1.4%)	0 (0%)	0 (0%)	1.000
Quinalphos	1 (1.4%)	1 (7.1%)	0 (0%)	0.289
Triazophos	1 (1.4%)	1 (7.1%)	0 (0%)	0.289
Unknown	26 (37.7%)	3 (21.4%)	9 (52.9%)	0.208

Among the clorpyriphos consumed participants, 15 (21.7%) were survived without intubation and 1 (7.1%) person was survived with intubation, 2 (11.8%) participants were dead (P value 0.443). Among the diazinon consumed participants, 3 (4.3%) were survived without intubation and 2 (14.3%) were survived with intubation, 1 (5.9%) participant was dead (P value 0.252). Among the dichlorvas consumed participants 6 (8.7%) were survived without intubation and 2 (14.3%) were survived with intubation, 1 (5.9%) was dead (P value 0.745). Among the dimethoate consumed participants, 2 (2.9%) were survived without intubation and 1 (7.1%) was survived with intubation and no participant was dead (P value 0.427). Among the methyl parathion consumed participants 13 (14.5%) were survived without intubation and 3 (7.1%) participants were survived with intubation, 3 (5.9%) were dead (P value 0.338). Among the monocrotophos consumed participants, 1 (1.4%)

participant was survived without intubation, no participant was survived with intubation and 1 (5.9%) was dead (P value 0.526). Among the phosphoran consumed participants, 1 (1.4%) was survived without intubation and no participant was 0 (0%) survived with intubation and none was dead, (P value 1.000) One (7.1%) participant who consumed quinalphos was survived with intubation and 1 (7.1%) participant who consumed triazophos (P value 0.289). Among the unknown compound consumed persons 26 (37.7%) were survived without intubation and 3 (21.4%) were survived with intubation, 9 (52.9%) were dead (P value 0.208). The difference in the proportion of outcome between compound status was statistically not significant (Table 5).

DISCUSSION

According to the World Health Organization, 1 million serious accidentals and 2 million suicidal poisonings with insecticides occur worldwide every year, and of these, approximately 200,000 die, mostly in developing countries.[20] Scoring systems have been continuously developed to predict outcomes in patients with severe illness, to improve resource allocation and to assist in clinical decision-making particularly for intensive care unit (ICU) patients. Our study investigated the utility of PSS (poison severity score) and GCS (Glasgow coma scale) scoring systems in predicting severity and clinical outcomes in 100 patients with OP poisoning.

The mean age of the patients presenting to our emergency department was 30.07±10.91 years. Majority of cases presented were in age group of 21-30 years (59 %) and least was in age group of 61-70 years (3%). Added to the largely younger population being affected, is their absence of any co-morbidities there by leading to loss of productivity. These findings are in line with that of Akdur O et al, Thunga G et al and Nilamadhab K, Kora S A et al.[21-24] Another study by Rao et al, revealed that about two-third of the patients, admitted in Warangal due to acute exposure of OP poisoning were less than 30 years.[25]

A significant difference was observed in the gender of the study population with 71% males and 29% females. This is in concurrence with that reported by Sam et al, where in 76% were males and 24% were females and the studies by Thunga G et al, Nilamadhab K.[22,23,26] Contrastingly a female preponderance was observed in the studies by Akdur O et al, Kora S A et al and Banerjee I et al.[3,21,24]

The average pre-hospitalization time was higher in our study as compared to other studies where in the mean time lapse was 6.43±4.80 hours while the median was 5 hours. A relatively lower mean time lapse of 4 hrs each was found in the studies by Banerjee I et al, and Kora SA et al, while it was 3hrs in that of Thunga G et al.[3,22,24] This time delay also can be due to the fact that patients are referred from a lower centre where first aid (e.g. stomach wash, first dose of atropine etc.) was done to control poisoning effects to some extent and also due to the issues related to longer distance and transportation to the tertiary hospital. This could also be a limitation of our study as these measures were not recorded in the peripheral centres its effects cannot be explained in this study.

The type OP compound consumed could only be ascertained only among 62% cases, in which the commonest compound consumed was Methyl Parathion followed by Clorpyriphos. Methyl Parathion was also the most common compound consumed in the studies by Sam KG et al, Thunga G et al and Bannergee I et al.[3,22,23] In studies done by Akdur O et al and Davis et al commonest compound was clorpyriphos.[18,21] Of the 100 patients, 69% survived without intubation, 14% patients survived but required intubation and prolonged ICU stay and 17% patients died even with intubation. The proportion of mortality cases was higher compared to that of Sam KG et al, Akdur O et al and Davis et al.[18,21,26]

Another notable finding of the study was that the outcome was significantly associated with the age with most of the younger subjects surviving while the mortality was high as the age increased notably those above 30years of age. A relatively higher proportion of deaths were observed among males (19.7%) than females (10.3%), though the difference was not significant. A similar higher preponderance of male deaths with a ratio of 2.7:1 were reported by Kar N, that could suggest that OP poisoning is more prevalent among males especially in hospital settings.[1]

The time taken for reporting of the patients to our hospital showed that mortality increased among those bought to hospital with more than 12hrs of consumption of OP with about 18% deaths observed even among those admitted within 6hours of OP intake and these differences were statistically significant. In developing countries like India, most part of the time from consumption of poison to initiation of treatment was spent travelling/arranging transport to the hospital. Many patients are referred to secondary and tertiary centres for lack of facilities locally, hence some of them are brought dead to hospital.[1,5] Provision for basic facilities for treatment of OP poisoning at primary health centres (PHC) and local hospitals may change this unfavourable outcome for many, if not for all.

CONCLUSION

It can be concluded that OP poisoning is more common among younger population, below 30 years with male preponderance. Favourable outcome determinants were younger age, female gender, being admitted to the hospital before 6 hours of OP consumption. Hence efforts to decrease the elapsed between intake of poison and initiation of specific treatment may help to minimize the chance of death in some.

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