

A study of prevalence and factors associated with organo phosphorus poisoning at tertiary care center

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Abstract

Background: Organophosphate (OP) poisoning is a common problem particularly in developing countries, with one million serious unintentional poisonings and an additional two million hospital admissions for suicidal attempts every year. In general, accidental poisoning is more common in children; whereas poisoning with suicidal intentions is more common in young adults. OP compounds inhibit acetylcholinesterase, resulting in the accumulation of acetylcholine and overstimulation of cholinergic synapses. **Materials and 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 ***** medical college and Hospital, between June 2018 to July 2019. 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 2018 to July 2019 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%. **Conclusion:** 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.

Key Words: Hospital, Organophosphates, Poisoning.

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INTRODUCTION

Organophosphate (OP) poisoning is a common problem particularly in developing countries, with one million serious unintentional poisonings and an additional two

million hospital admissions for suicidal attempts every year.¹ In general, accidental poisoning is more common in children; whereas poisoning with suicidal intentions is more common in young adults. OP compounds inhibit acetylcholinesterase, resulting in the accumulation of acetylcholine and overstimulation of cholinergic synapses.² Clinical symptoms and signs are variable depending on the nature of the OP compound, amount consumed, severity, time lapse between exposure and presentation to the hospital. The standard treatment of OP poisoning involves supportive measures, administration of the antimuscarinic agents atropine and acetyl cholinesterase reactivation with pralidoxime.³ WHO estimated that approximately 3 million pesticide poisoning occurs worldwide and cause more than 2,20,000 deaths per year.⁴ Developing countries like India and Sri Lanka

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report alarming rates of toxicity and death. Suicidal poisoning with Organophosphorus compound is seen with increasing frequency and carries 4-30% mortality in Indian studies.⁵ Respiratory failure is a common complication of Organophosphorus poisoning which responsible for a high mortality, so timely effective treatment is crucial for survival.

MATERIALS AND 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 ***** medical college and Hospital. The data collection for the study was conducted between June 2018 to July 2019.

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	Percentage
Age in years		
18-20	13	13%
21-30	59	59%
31-40	17	17%
41-50	3	3%
51-60	5	5%
61-70	3	3%
Gender		
Male	71	71%
Female	29	29%
Total	100	100%

Regarding the type of OP consumed 19 (19.0%) had consumed Methyl Parathion, followed by 18 (18.0%) consuming Clorpyrifos, 9 (9.0%) had taken Dichlorvas, 6(6%) while the status of 38 (38.0%) participants was unknown. The concentration these chemicals in 5 (5.0%) 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	Percentage
OP Compound		
Clorpyrifos	18	18%
Methyl parathion	19	19%
Dichlorvas	9	9%
Diazinon	6	6%
Dimethoate	3	3%
Monocrotophos	2	2%
Quinalphos	2	2%
Triazophos	2	2%
Phosphoran	1	1%
Unknown	38	38%
Amount of poison		
<50 ml	54	54%
50-100 ml	21	21%
>100 ml	1	1%
Unknown	24	24%
Mode of poison consumption		
Ingestion	99	99%
Inhalation	1	1%

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%, 23 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 3: Descriptive analysis of various parameters in the study population (N=100)

Parameter	Frequency	Percentage
Pre-hospitalization period in hours (Time to reach hospital)		
<6 hours	67	67%
7-12 hours	22	22%
>12 hours	11	11%
Grade of poisoning		
Grade I	45	45%
Grade II	26	26%

Grade III	23	23%
Grade IV	6	6%
Pseudo cholinesterase dose given		
<500	40	40%
500-1000	18	18%
1000-5000	25	25%
>5000	17	17%
GCS Score		
<10	25	25%
>10	75	75%
Out come		
Survived	83	83%
Death	17	17%

Table 4: Factors associated with mortality in study population

Parameter	Outcome	
	Survived	Death
Age in years		
18-20 (N=13)	12 (92.3%)	1 (7.7%)
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%)
Female (N=29)	26 (89.7%)	3 (10.3%)
Pre hospitalization (hours)		
<6hours (N=67)	55 (82.1%)	12 (17.9%)
7-12hours (N=22)	22 (100%)	0 (0%)
>12 hours (N=11)		
Amount of poison consumed in ml		
<50ml (N=54)	6 (54.5%)	5 (45.5%)
50-100ml (N=21)	15 (71.42%)	6 (28.5%)
>100ml (N=1)	1 (100%)	0 (0%)
	Unknown (24) 18 (75%)	6 (25%)
Pseudo cholinesterase		
<500 (N=40)	32 (80%)	8 (20%)
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%)

Compound	Outcome		
	Survived without Intubation (n=69)	Survived with Intubation (n=14)	Death (n=17)
Clorpyrifos	15 (21.7%)	1 (7.1%)	2 (11.8%)
Diazinon	3 (4.3%)	2 (14.3%)	1 (5.9%)
Dichlorvas	6 (8.7%)	2 (14.3%)	1 (5.9%)
Dimethoate	2 (2.9%)	1 (7.1%)	0 (0%)
Methyl parathion	13 (14.5%)	3 (0%)	3 (5.9%)
Monocrotophos	1 (1.4%)	0 (0%)	1 (5.9%)
Phosphoran	1 (1.4%)	0 (0%)	0 (0%)
Quinalphos	1 (1.4%)	1 (7.1%)	0 (0%)
Triazophos	1 (1.4%)	1 (7.1%)	0 (0%)
Unknown	26 (37.7%)	3 (21.4%)	9 (52.9%)

DISCUSSION

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*. 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.⁶ 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. Contrastingly a female preponderance was observed in the studies by Akdur O *et al*, Kora S A *et al* and Banerjee I *et al*.⁷ 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*.⁸ 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.^{9,10,11} The type OP compound consumed could only be ascertained only among 62% cases, in which the commonest compound consumed was Methyl Parathion followed by Clorpyrifos.^{12,13} Methyl Parathion was also the most common compound consumed in the studies by Sam KG *et al*, Thunga G *et al* and Banerjee I *et al*. In studies done by Akdur O *et al* and Davis *et al* commonest compound was clorpyrifos. 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*.¹⁴ 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.¹⁵

CONCLUSION

It can be concluded that OP poisoning is more common among younger population, below 30 years with male preponderance. 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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